INTERGOVERNMENTAL OCEANOGRAPHIC
COMMISSION (OF UNESCO)

WORLD METEOROLOGICAL
ORGANIZATION

DATA BUOY COOPERATION PANEL

ANNUAL REPORT FOR 1998

1999

DBCP Technical Document No. 13

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FOREWORD

I am pleased to present this twelfth Annual Report for the Data Buoy Co-operation Panel, covering the Panel's activities during 1998.

The Panel has had another successful year, with a considerable amount of work being undertaken. The six existing action groups have operated very well during the intersessional period. Another action group covering the TAO Implementation Panel (TIP) was affiliated with the Panel since the last report, bringing the total number of action groups to seven.

I would like to thank all those people who have participated in the activities of the Panel, and whose work is essential for the continuing success of the Panel. In particular, I would like to thank Piet LeRoux, who has recently retired from the South African Weather Bureau, for his contribution to the Buoy community over a considerable number of years. I would also like to thank Bill Woodward who has been one of the Panel's vice-chairmen for the last three years, and has recently announced his intention to retire from NOAA, for his assistance and wise counsel during his time in office.

Graeme Brough
Chairman, DBCP

SUMMARY

Introduction

The Drifting Buoy Co-operation Panel was established in 1985 by WMO Resolution 10 (EC-XXXVII) and IOC Resolution EC-XIX.7. In 1993 the governing bodies of IOC and WMO agreed to change the name of the panel to the Data Buoy Co-operation Panel (DBCP) and to slightly modify its terms of reference, so that the panel might also provide any international co-ordination required for moored buoy programmes supporting major WMO and IOC programmes (IOC Resolution XVII-6 and WMO Resolution 9 (EC-XLV)).

1. Current and Planned Programmes

Twelve countries, seven action groups and two data management centres submitted reports on their data buoy activities. The TAO Implementation Panel (TIP) was formally affiliated with the panel during the intersessional period as a new action group.

2. Real-time Data Flow

The data from buoys available in real-time on the GTS decreased slightly over the past year, in August 1998 543 buoys (44.1% of the total operational buoys) were reporting on the GTS. The total number of active buoys increased slightly, with the actual increase being 6.1% compared to the same period last year; however the number of buoys reporting via the GTS decreased compared to the previous year - a decrease by 6.5%.

3. Data Quality

The Panel's QC methods continue to be extremely effective in ensuring data quality is maintained at the highest level. The quality control system that operates in near real-time via an Internet mailing list is widely used and has been most successful. Twelve Principal Meteorological or Oceanographic Centres (PMOCs) responsible for Quality Control of GTS buoy data are now participating in this system.

4. Data Archival

The Marine Environmental Data Service (MEDS) in Canada has acted as the RNODC for drifting buoys on behalf of the IOC and WMO since 1986. The number of messages MEDS archived per month increased from approximately 129,710 in 1997, to approximately 137,970 during the first seven months of 1998. The IGOSS Specialised Oceanographic Centre (SOC) for Drifting Buoys operated by Météo France collects and archives buoy reports daily. The French SOC produces a range of products including monthly global maps of the distribution of ship and drifter reports of wind, pressure, air temperature and sea surface temperature.

5. Technical Developments

The SVP barometer drifter has continued to increase their numbers in the Buoy market during the past year, and investigations are continuing into adding a wind speed measuring capability to the SVP platform. The technical coordinator is in the process of updating the SVP construction manual to reflect ongoing developments in the technology.

The technical coordinator also moved the DBCP's World Wide Web Internet server (located at the NOAA/NOS headquarters) to a more powerful computer and upgraded the related system tools. He added many more topics to the server to assist the application and accessibility of Buoy data by the user community. He also enhanced the GTS sub-system to cater for specific user community requirements and generated an advisory document on inserting data onto the GTS.

6. **Communications System Status**

The Argos system has continued to provide a reliable service for recovery and processing of drifting buoy real-time data. Various minor system enhancements were undertaken during the year and future developments of the system were discussed at the annual meeting. Discussions were also held on emerging alternative communications systems utilising Low Earth Orbiting (LEO) satellites, such as Iridium.

7. **Publications**

The Panel produced two technical documents in the DBCP series, covering the Technical Presentations made at the thirteenth session, and the Annual Report for 1997. The Panel also reviewed the draft of a brochure that will be printed and distributed during the forthcoming coming year.

8. **Administrative Matters**

The Panel now has seven action groups: the European Group on Ocean Stations (EGOS); the International Arctic Buoy Programme (IABP); the International Programme for Antarctic Buoys (IPAB); the International South Atlantic Buoy Programme (ISABP); the International Buoy Programme for the Indian Ocean (IBPIO); the Global Drifter Programme (GDP); and the TAO Implementation Panel (TIP).

Twelve countries contributing on a voluntary basis to the financial support of the Panel in 1998 were: Australia, Canada, France, Greece, Iceland, Ireland, Netherlands, New Zealand, Norway, South Africa, United Kingdom and USA.

The Panel's technical coordinator, Mr Etienne Charpentier, has continued to be employed by UNESCO/IOC as a **fund-in-trust** expert and located with CLS/Service Argos in Toulouse, France.

For the Panel's next financial year (1 June 1999 to 31 May 2000), a total budget of US$132,347 - is planned to be allocated as follows:

	US$
Salary/travel of technical coordinator	105,000
CLS/Service Argos contract	15,000
Travel of Chair/Vice-chairs	6,000
WMO Costs	500
Publications	4,000
Consultancies/Experts	1,500
Contingencies	347
	132,347

RÉSUMÉ

Introduction

Le Groupe de coopération pour la mise en œuvre des programmes de bouées dérivantes a été créé en 1985 en vertu de la résolution 10 (EC-XXXVII) de l'OMM et de la résolution EC-XIX.7 de la COI. En 1993, les organes directeurs de la COI et de l'OMM ont décidé de le rebaptiser Groupe de coopération pour les programmes de bouées de mesure (DBCP) et d'en modifier légèrement le mandat, afin qu'il puisse également assurer la coordination internationale requise pour les programmes de bouées ancrées qui servent d'appui aux grandes programmes de l'OMM et de la COI (résolution XVII-6 de la COI et résolution 9 (EC-XLV) de l'OMM).

1. Programmes actuels et programmes prévus

Douze pays, sept groupes d'action et deux centres de gestion des données ont présenté des rapports sur leurs activités concernant les bouées de mesure. Le Groupe d'experts de la mise en œuvre du réseau d'observation océan-atmosphère dans les mers tropicales (TAO) s'est officiellement affilié au DBCP pendant l'intersession en tant que nouveau groupe d'action.

2. Acheminement des données en temps réel

Le nombre de données en provenance de bouées disponibles en temps réel sur le SMT a légèrement diminué au cours de l'année passée. En août 1998, les bouées transmettant des messages sur le SMT étaient au nombre de 543 (44,1% de l'ensemble des bouées en service). Le nombre total de bouées communiquant des messages a légèrement augmenté – de 6,1% - par rapport à la période correspondante de l'année précédente ; toutefois, le nombre de bouées communiquant des messages via le SMT a accusé une baisse de 6,5% par rapport à l'année précédente.

3. Qualité des données

Les méthodes de contrôle de la qualité appliquées par le Groupe de coopération continuent d'être extrêmement efficaces et de garantir le niveau de qualité le plus élevé. Le système de contrôle de la qualité en temps quasi réel par courrier électronique via l'Internet est largement utilisé et se révèle très efficace. Douze centres météorologiques ou océanographiques principaux responsables du contrôle de la qualité des données communiquées par des bouées sur le SMT participent désormais à l'exploitation de ce système.

4. Archivage des données

Le Marine Environmental Data Service (MEDS), au Canada, exerce les fonctions de Centre national des données océanographiques « responsable » en ce qui concerne les bouées dérivantes pour le compte de la COI et de l'OMM depuis 1986. Le nombre de messages MEDS archivés par mois est passé d'environ 129 710 en 1997 à environ 137 970 durant les sept premiers mois de 1998. Le Centre océanographique spécialisé (SOC) du SMISO pour les bouées dérivantes exploité par Météo-France recueille et archive quotidiennement des messages d'observation en provenance de bouées. Le SOC français produit toute une gamme de produits, notamment des cartes mondiales mensuelles de la répartition des navires et des messages d'observation du vent, de la pression, de la température de l'air et de la température de la mer en surface en provenance de bouées dérivantes.

5. Progrès techniques

Le nombre de bouées dérivantes SVP équipées de baromètres n'a cessé d'augmenter tout au long de l'année écoulée et l'on continue d'étudier la mise au point d'un système de mesure de la vitesse du vent pour le programme SVP. Le coordonnateur technique a entrepris d'actualiser en conséquence le manuel technique.

Le coordonnateur technique a également transféré le serveur World Wide Web du DBCP (situé au siège de la NOAA/NOS) dans un ordinateur plus puissant et a modernisé les caractéristiques techniques du système. Il a ajouté de nombreuses fonctions au serveur pour faciliter l'accès aux données de bouées et favoriser leur exploitation par les utilisateurs. Enfin, il a amélioré la fonction SMT du système pour tenir compte des besoins spécifiques des utilisateurs et a élaboré un document d'orientation sur la procédure à suivre pour transmettre les données sur le SMT.

6. Etat du système de communication

Le système Argos a continué d'assurer un service fiable de récupération et de traitement des données fournies en temps réel par des bouées dérivantes. Diverses améliorations d'importance mineure ont été apportées durant l'année écoulée et les participants à la réunion annuelle ont examiné plusieurs possibilités d'évolution future du système. Ils ont aussi discuté des nouveaux systèmes de communication qui, comme Iridium, utilisent les satellites sur orbite basse.

7. Publications

Le Groupe de coopération a produit deux documents techniques (dans la série consacrée au DBCP) regroupant les exposés présentés à sa treizième session, ainsi que le rapport annuel pour 1997. Il a aussi examiné la version préliminaire d'une brochure qui sera imprimée et distribuée dans le courant de l'année.

8. Questions administratives

Le Groupe de coopération compte désormais sept groupes d'action : le Groupe européen pour les stations océaniques (EGOS), le Programme international de bouées de l'Arctique (IABP), le Programme international de bouées de l'Antarctique (IPAB), le Programme international de bouées de l'Atlantique Sud (ISABP), le Programme international de bouées pour l'océan Indien (PIBOI), le Programme mondial sur les dériveurs (GDP) et le Groupe d'experts de la mise en œuvre du Réseau d'observation océan-atmosphère dans les mers tropicales.

Les douze pays ayant fourni une contribution financière volontaire au Groupe de coopération en 1998 sont les suivants : Afrique du Sud, Australie, Canada, Etats-Unis d'Amérique, France, Grèce, Irlande, Islande, Norvège, Nouvelle-Zélande, Pays-Bas et Royaume-Uni.

Le coordonnateur technique du Groupe de coopération, M. Etienne Charpentier, a continué de travailler pour le compte de l'UNESCO/COI, en tant qu'expert dont les activités sont financées par un **fonds d'affectation spéciale**, au CLS/Service Argos à Toulouse, France.

Pour le prochain exercice financier du Groupe de coopération (1er juin 1999 au 31 mai 2000), il est prévu un budget total de 132 347 dollars des Etats-Unis, répartis comme suit :

	(en dollars E.-U.)
Rémunération et frais de voyage du coordonnateur technique	105 000
Contrat CLS/Service Argos	15 000
Frais de voyage du président et des vice-présidents	6 000
Frais OMM	500
Publications	4 000
Consultants/experts	1 500
Faux frais	347
	132 347

RESUMEN

Introducción

El Grupo de cooperación sobre boyas a la deriva (GCBD) fue establecido en 1985 en virtud de la Resolución 10 de la OMM (EC-XXXVII) y de la Resolución EC-XIX.7 de la COI. En 1993, los órganos rectores de la COI y de la OMM decidieron cambiar el nombre del grupo, que pasó a ser el Grupo de cooperación sobre boyas de acopio de datos (GCBD), y modificar ligeramente su mandato de modo que también pudiera facilitar la coordinación internacional que exigieran los programas de boyas fondeadas en apoyo de los principales programas de la OMM y de la COI (Resolución XVII-6 de la COI y Resolución 9 de la OMM (EC-XLV)).

1. Programas actuales y previstos

Doce países, siete grupos de acción y dos centros de gestión de datos presentaron informes sobre sus actividades de acopio de datos de boyas. Durante el período interreuniones un nuevo grupo de acción, el Grupo de ejecución del TAO se adhirió formalmente a los trabajos del GCBD.

2. Flujo de datos en tiempo real

Durante el año pasado, los datos de boyas transmitidos en tiempo real por el Sistema Mundial de Telecomunicación (SMT) disminuyeron ligeramente y, en agosto de 1998, 543 boyas transmitían sus datos a través del SMT (es decir el 44,1% de las boyas en funcionamiento). El número de boyas en servicio registró un ligero aumento del 6,1% en comparación con el mismo período del año anterior, pero el número de boyas que transmiten datos por el SMT sufrió una disminución del 6,5% en comparación con el año anterior.

3. Calidad de los datos

El Grupo que se ocupa de los métodos de control de calidad sigue velando muy eficazmente por que la calidad de los datos se mantenga al nivel más elevado posible. El sistema de control de calidad, que funciona casi en tiempo real a través de una lista de direcciones de Internet, es un sistema muy generalizado y que tiene gran éxito. Actualmente participan en él doce centros meteorológicos u oceanográficos principales, responsables del control de calidad de los datos recopilados por boyas y transmitidos por el SMT.

4. Datos de archivo

Desde 1986, el Servicio de datos sobre el medio ambiente marino (MEDS) del Canadá actúa, en nombre de la COI y de la OMM, como Centro nacional responsable de datos oceanográficos (CNRDO) respecto de las boyas a la deriva. El número de mensajes archivados mensualmente por el MEDS aumentó de aproximadamente 129.710 en 1997 a unos 137.970 durante los siete primeros meses de en 1998. El Centro Oceanográfico Especializado (COE) del Sistema Global Integrado de Servicios Oceánicos (SGISO) para las boyas a la deriva, que explota Météo France, recopila y archiva diariamente los informes transmitidos por boyas. El COE francés elabora diversos productos, por ejemplo mapas mensuales de la distribución en el mundo de informes procedentes de buques y de boyas a la deriva que facilitan datos sobre el viento, la presión y la temperatura del aire y de la superficie del mar.

5. Evolución técnica

Durante el pasado año ha seguido aumentando el número de barómetros a la deriva del Programa de medida de la velocidad de las corrientes en superficie (SVP), y continúan los trabajos de investigación para dotar al SVP de capacidad anemométrica. El coordinador técnico se ocupa de actualizar el manual técnico sobre el SVP teniendo en cuenta los últimos adelantos tecnológicos.

El coordinador técnico también trasladó el servidor de la World Wide Web de Internet del GCBD (ubicado en la sede de la NOAA/NOS) a un ordenador más potente y perfeccionó los dispositivos del sistema conexos. Añadió muchos otros temas en el servidor a fin de facilitar a los círculos de usuarios el acceso a los datos de boyas, y su aplicación en la práctica. También mejoró el subsistema del SMT para atender las necesidades específicas de los usuarios y elaboró un documento de consulta relativo a la introducción de datos en el SMT.

6. Situación en que se encuentra el sistema de comunicaciones

El sistema Argos ha seguido proporcionando un servicio fiable de recuperación y proceso de datos en tiempo real procedentes de boyas a la deriva. Durante el año se realizaron varias pequeñas mejoras en el sistema. En la reunión anual se analizaron las perspectivas futuras del sistema y también diversos sistemas de comunicaciones alternativos que están apareciendo y que utilizan satélites en órbita baja (LEO), por ejemplo Iridium.

7. Publicaciones

El Grupo elaboró dos documentos técnicos de la serie GCBD, que corresponden a las comunicaciones técnicas presentadas en la decimotercera reunión y al informe anual de 1997. El Grupo también examinó el proyecto de un folleto que se imprimirá y distribuirá el próximo año.

8. Cuestiones administrativas

El Grupo cuenta ya con seis grupos de acción, a saber: el Grupo europeo para las estaciones oceánicas (EGOS), el Programa Internacional de Boyas del Ártico (PIBA), el Programa Internacional de Boyas del Atlántico Sur (PIBAS), el Programa Internacional de Boyas del Océano Índico (PIBOI), el Programa Mundial de Derivadores (PMD) y el Grupo de ejecución del TAO (GET).

Los doce países que facilitaron apoyo financiero voluntario al Grupo de expertos en 1998 son los siguientes: Australia, Canadá, Estados Unidos de América, Francia, Grecia, Irlanda, Islandia, Nueva Zelandia, Noruega, Países Bajos, Reino Unido y Sudáfrica.

El Sr. Etienne Charpentier, coordinador técnico del Grupo, sigue trabajando para la UNESCO/COI como experto remunerado con cargo a un **fondo fiduciario**, y está destacado en el CLS del Servicio Argos de Toulouse (Francia).

Para el próximo ejercicio financiero (del 1 de junio de 1999 al 31 de mayo de 2000), el presupuesto total del Grupo asciende a 132.347 dólares estadounidenses, desglosados de la manera siguiente:

	US$
Coordinador técnico (sueldo y viajes)	105.000
Contrato CLS/Servicio Argos	15.000
Viajes del Presidente y los Vicepresidentes	6.000
Gastos de la OMM	500
Publicaciones	4.000
Consultores/Expertos	1.500
Imprevistos	347
TOTAL	132.347

РЕЗЮМЕ

Введение

В 1985 г. в соответствии с резолюцией 10 (ЕС-XXXVII) ВМО и резолюцией ЕС-XIX.7 МОК была создана Группа сотрудничества по дрейфующим буям. В 1993 г. руководящие органы МОК и ВМО решили переименовать ее в Группу сотрудничества по буям для сбора данных (ДБКП), а также незначительно изменить круг ее обязанностей, с тем чтобы группа могла также обеспечивать любую международную координацию, необходимую для программ по заякоренным буям, поддерживающих основные программы ВМО и МОК (резолюция XVII-6 МОК и резолюция 9 (ЕС-XLV) ВМО.

1. Текущие и планируемые программы

Двенадцать стран, семь групп действий и два центра управления данными представили отчеты о своей деятельности в отношении буев для сбора данных. В течение межсессионного периода группа экспертов по осуществлению ТАО (TIP) была официально объединена с группой сотрудничества в качестве новой группы действий.

2. Поток данных в реальном масштабе времени

За истекший год объем данных с буев в реальном масштабе времени в ГСТ несколько сократился; в августе 1998 г. по ГСТ передавались сводки с 543 буев (44,1 % от общего количества оперативных буев). В сравнении с тем же периодом предыдущего года общее число действующих буев несколько увеличилось фактически на 6,1 %, а количество буев, передающих данные через ГСТ, уменьшилось по сравнению с предыдущим годом - на 6,5 %.

3. Качество данных

Применяемые группой методы контроля качества (КК) по-прежнему чрезвычайно эффективны в обеспечении поддержания качества данных на самом высоком уровне. Система контроля качества, которая функционирует через список адресатов Интернет в близком к реальному масштабу времени, широко и весьма успешно используется. В настоящее время в данной системе участвуют двенадцать основных метеорологических или океанографических центров (ПМОК), ответственных за контроль качества данных с буев в ГСТ.

4. Архивация данных

С 1986 г. Служба данных о морской среде (МЕДС) в Канаде выступает от имени МОК и ВМО в качестве ОНЦОД по дрейфующим буям. Приблизительное количество сообщений, ежемесячно помещаемых МЕДС в архив, увеличилось с 129 710 в 1997 г. до приблизительно 137 970 в течение первых семи месяцев 1998 г. Специализированный океанографический центр ОГСОС (СОЦ) по дрейфующим буям, действующий в рамках МЕТЕОФРАНС, ежедневно собирает и помещает в архив сводки с буев. СОЦ во Франции производит ряд видов продукции, включая ежемесячные глобальные карты распределения сводок, поступающих с судов и дрейфующих платформ, с данными о ветре, давлении, температуре воздуха и температуре поверхности моря.

5. Техническое развитие

В истекший год с успехом продолжалось применение барометрического дрейфующего буя СВП, и ныне начаты исследования с целью расширения возможностей измерения скорости ветра в рамках СВП. Технический координатор работает над усовершенствованием наставления по конструкции СВП, для того чтобы отразить текущие разработки в технологии.

Технический координатор значительно расширил характеристики сервера ДБКП в World Wide Web Интернет, который располагается в штаб-квартире НОАА/НОС, и усовершенствовал связанные с ним системные средства. Он добавил гораздо больше тем в сервер для содействия в применении и возможности доступа к информации с буев для сообщества пользователей. Он также расширил подсистему ГСТ для обслуживания конкретных потребностей сообщества пользователей и разработал консультативный документ по внесению данных на ГСТ.

6. Состояние системы связи

Система Аргос продолжала предоставлять надежное обслуживание, обеспечивая сбор и обработку данных с дрейфующих буев в реальном масштабе времени. Различные незначительные улучшения системы были осуществлены в течение года, и на ежегодном совещании было обсуждено будущее развитие системы. Рассматривались также появляющиеся альтернативные системы связи с использованием спутников с низкой околоземной орбитой (НОО), такие как Иридий.

7. Публикации

Группа сотрудничества выпустила два технических документа в серии ДБКП, охватывающие технические средства, наглядно представленные на тринадцатой сессии и в ежегодном отчете за 1997 г. Группа сотрудничества также рассмотрела проект брошюры, который будет отпечатан и распространен в течение предстоящего года.

8. Административные вопросы

В настоящее время в группе имеется семь групп действий: европейская группа по океаническим станциям (ЕГОС); Группа по Международной программе по арктическим буям (ИАПБ); Группа по Международной программе по антарктическим буям (ИПАБ); Группа по Международной программе по буям для Южной Атлантики (ИСАБП); Группа по Международной программе по буям для Индийского океана (ИБПИО); Группа по Глобальной программе по дрейфующим платформам (ГДП) и Группа экспертов по осуществлению ТАО (TIP).

В 1998 г. на добровольной основе вносили свой вклад в финансовую поддержку группы следующие двенадцать стран: Австралия, Канада, Франция, Греция, Исландия, Ирландия, Нидерланды, Новая Зеландия, Норвегия, Южная Африка, Соединенное Королевство и США.

Технический координатор группы г-н Этьен Шарпантье продолжал состоять в штате ЮНЕСКО/МОК в качестве эксперта, **финансируемого из целевого фонда,** а его рабочее место находилось в КЛС/Службе Аргос в Тулузе, Франция.

В следующем финансовом году (1 июня 1999 г. - 31 мая 2000 г.) планируется распределить общий бюджет группы в сумме 132 347 долл. США следующим образом:

	долл. США
Технический координатор (заработная плата, путевые расходы, материальное обеспечение)	105 000
Контракт с КЛС/Служба Аргос	15 000
Путевые расходы председателя и заместителей председателя	6 000
Расходы ВМО	500
Публикации	4 000
Консультации/эксперты	1 500
Непредвиденные расходы	347
ИТОГО	132 347

REPORT

1 CURRENT AND PLANNED PROGRAMMES

Reports on national and international data buoy programmes are attached as Annexes I and II and reports on data management centres as Annex III.

2 REAL-TIME DATA FLOW

2.1 Number of buoys reporting over the Global Telecommunication System (GTS)

During August 1998, data from a total of 1230 buoys were collected and processed at the Argos Global Processing Centres in Toulouse, France, and Landover, Maryland, USA, for distribution in real time and delayed mode to the respective Principal Investigators. These buoys were operated by 25 countries. (A detailed breakdown by countries is given for the month of August 1998 in Annex IV).

Some 44.1% (543) of the 1230 buoys transmitted their data over the GTS in real- or quasi real-time. At the same time, in 1997, the total number of buoys was 1580 and 39% of them (612) were transmitting data over the GTS. (The number and location of BUOY reports received in Toulouse during October 1998 is given in Annex V).

The data availability index maps produced on a monthly basis by Météo-France since February 1994 (see examples of these maps in Annex III) allow the identification of data sparse areas for each kind of geophysical variable. The index is representative of how the requirements (such as of WWW, WCRP or GOOS-GCOS) are met: an index of 100 means that an average of eight observations of the variable concerned per day per five hundred km area has been received during the month. Maps are produced for air pressure, air temperature, sea surface temperature and wind. The index takes into account the observations transmitted in SHIP and BUOY code forms and another figure gives the percentage of BUOY reports from the total of SHIP plus BUOY reports received.

2.2 Data reception

The Argos Global Processing Centres (GPCs) in Toulouse and Landover both receive real-time and delayed-mode data from the ground stations in the USA (Fairbanks, Wallop Island, Hawaii), France (Lannion), Japan (Tokyo), Australia (Melbourne, Casey, Darwin, Perth) and New Zealand (Wellington). The Cape Town receiving station was established in June 1997, but it had some operational problems. The Reunion Island receiving station is not yet in operation due to technical problems of adaptation to the data transmission network.

An average of 98% real-time data from Argos platforms which are within coverage of Fairbanks, Wallop Island, Lannion, Casey, Perth, Darwin, Melbourne and Wellington are provided within one hour (see Fig.1). 80% of delayed mode data issued from NESDIS (Wallops and Fairbanks) and METEO-FRANCE (Lannion) are available to the users within three hours (see Fig.2)

3 DATA QUALITY

One of the principal aims of the panel is to encourage operators of data buoys and users of buoy data to improve the quality of data at source and through the processing chain. The statistics gathered through the year show that the quality of air pressure data (including SVPB), and sea surface temperature, from drifting boys is excellent. Mean RMS (Obs-FG) field for air pressure using the ECMWF model is now in the order of 1.3 hPa (see Annex V). 44% of the

RMS values are now lower than 1hPa and another 47% between 1 and 2 hPa. For SST, 65% of the data are within 1 Celsius, and 85% within 2 Celsius (see Annex VI). Mean RMS using the NOAA/NCEP model is in the order of 1 Celsius.

Such a result is most probably attributable to the implementation of the DBCP quality control guidelines for GTS data which worked very efficiency during the period. Activity was a little lower than for the previous years and fewer buoys had their status changed (132 this year (August 97 to July 98), versus 171 in 1997 and 210 in 1996). It can be assumed that monitoring centres (PMOC's) rely increasingly on buoy data and are more confident in the quality of the data.

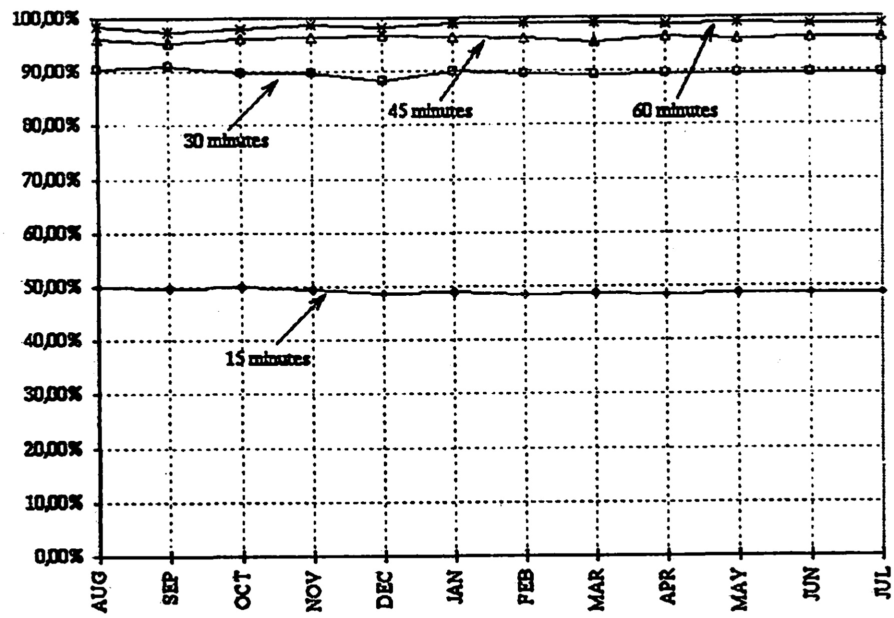


Figure 1 - Real-time coverage

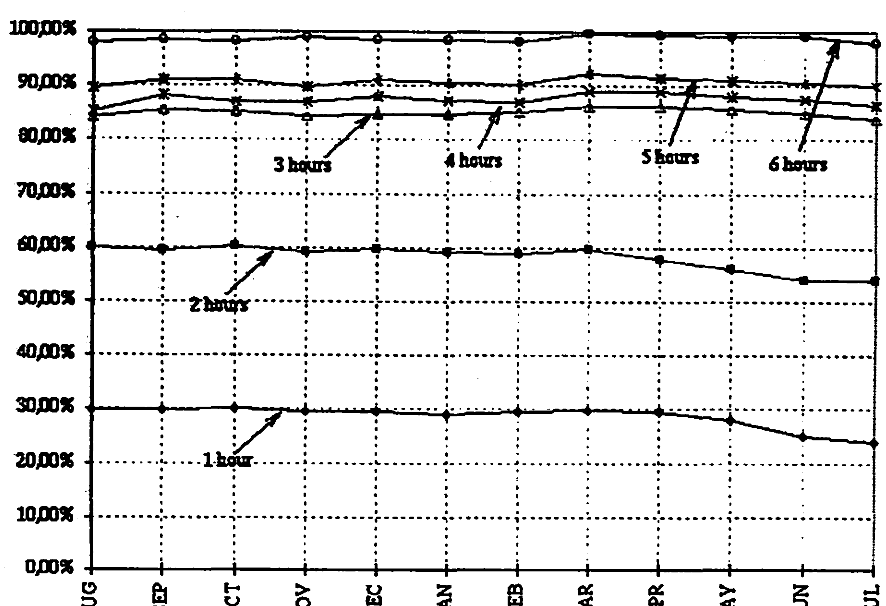


Figure 2 - Global coverage

The quality control status information as graphics is now available through the DBCP Web Server and the Quality Control Guidelines are also detailed on the web site. The server is maintained at the NOAA National Ocean Service since February 1995 (http://dbcp.nos.noaa.gov/dbcp/monstats.html).

4 DATA ARCHIVAL

The Marine Environmental Data Service (MEDS) in Canada became the Responsible National Oceanographic Data Centre (RNODC) for drifting buoy data on behalf of IOC and WMO in January 1986. The full report of MEDS is given in Annex III.

5 TECHNICAL DEVELOPMENTS

5.1 PALACE floats

A number of autonomous sub-surface drifting platforms, in particular the Profiling Autonomous Lagrangian Circulation Explorer (PALACE), are now deployed quasi-operationally, to measure and report sub-surface ocean variables. The Institute of Ocean Sciences (IOS, Canada), Scripps Institution of Oceanography, Woods Hole Oceanographic Institute (WHOI) and NOAA/AOML deployed a number of PALACE floats which are reporting via Argos and have data inserted on the GTS via NOAA/NWS or MEDS. All the floats measure temperature profiles while ascending and descending. They have cycles of 5 to 15 days and a lifetime of about 100 cycles. They can dive as deep as 1500 metres. Some floats are capable of measuring water conductivity hence salinity and may be deployed in large quantities in the future. The ARGO programme plans to deploy about 3000 PALACE floats in the world oceans.

The floats presently reporting on GTS are using FM 64-IX TESAC(KKXX) format which is adequate provided that the number of profile points does not exceed 20 significant points in the upper 500 metres. FM 63-X Ext. BATHY(JJYY) would be suitable for floats reporting temperature profiles only and is also limited to 20 points in the upper 500 metres. FM 18-X BUOY(ZZYY) code is also adequate and is not limited to 20 points in the upper 500 metres. The DBCP agreed on a special buoy number allocation system for floats, which became operational on 1 December 1998.

5.2 Lifetime of drifting buoys

As during previous years, the technical co-ordinator made a study of the lifetime of drifting buoys based on that of their air-pressure sensor. The histogram reproduced in Annex VII shows the results of this study.

5.3 SVP drifter experiment

A presentation by Mr Sergey Motyzhev (Marine Hydrophisical Institute of National Academy of Science of Ukraine) of the SVP-B drifter manufacturing programme in the Ukraine, and in particular a deployment exercise in the South Atlantic, is given in Annex VIII.

6 COMMUNICATION SYSTEM STATUS

6.1 Argos system

6.1.1 SPACE SEGMENT

Two satellites are operational: NOAA-12 (D) and NOAA-14 (J) since 14 May 1991 and 30 December 1994, respectively. Satellite NOAA-15(K)was launched successfully in May 1998 and should replace NOAA 12(D) as the primary morning satellite. NOAA 12(D) should be the secondary AM satellite and back up NOAA-15 (K) when needed. Its global data is transmitted according to the "third satellite" transmission characteristics. NOAA 11 and 10 are on "stand by" status, both with normal Argos equipment operating indirect transmission mode. NOAA-9 was decommissioned in February 1998.

6.1.2 GROUND SEGMENT

The three global receiving ground stations of Fairbanks, Wallops Island and Lannion are fully operational and give complete satisfaction. They provide the Argos system with global coverage and the data are processed by the French and US Global Processing Centres (GPCs). Those stations also receive data in near-real time from platforms in their regional coverage areas. In addition, regional stations are operational in Melbourne, Casey, Darwin, Perth, Tokyo and Wellington (the data are processed in Melbourne; some of them are sent to the French GPC for quality control and forwarding over the GTS); and in Hawaii (the data are relayed to the US GPC for processing). Annex IX shows the network and the regional coverage areas for near-real time data collection.

The Argos Global Processing Centres in Toulouse and Landover were operational over 99.9% of the time and the GTS sub-system remains fully operational.

6.1.3 ARGOS ENHANCEMENT

The Internet and public transmission networks (mainly due to the connection to GTS network) are the main communication links used by Argos centres. Internet use is growing, particularly for distributing results to users from regional receiving stations. To maintain maximum availability and reliability, CLS will keep its leased line for transmission between France and the USA. The second line is cancelled and replaced by Internet as a backup solution.

NOAA-K is the first satellite to fly the new-generation Argos-2 instrument. Enhanced capabilities will include:

- four times more capacity, with twice as many data recovery units (DRUs) capable of receiving and processing more messages simultaneously, and greater receiver bandwidth;
- higher-quality reception, thanks to greater receiver sensitivity, making it easier to pick up low-power signals (transmitted by platforms used for wildlife biology, for example);
- higher-quality transmission: thanks to increased satellite band-width, transmitter frequencies will be spread across a wider range, thus increasing the quantity and quality of messages received.

7 ADMINISTRATIVE MATTERS

7.1 Action groups

[*See at beginning of Annex II the guidelines for the action groups of the panel.*]

7.1.1 EUROPEAN GROUP ON OCEAN STATIONS (EGOS)

EGOS was formally established on 1 December 1988 and was *de facto* an action group of the panel as the successor to COST-43. EGOS now has the following membership:

Denmark	Danish Meteorological Institute
Germany	German Weather Service
France	Météo-France
Iceland	Icelandic Meteorological Office
Ireland	Irish Meteorological Service

Netherlands	Royal Netherlands Meteorological Institute
Norway	Norwegian Meteorological Institute
Sweden	Swedish Meteorological and Hydrological Institute
United Kingdom	United Kingdom Meteorological Office

The full report by EGOS is reproduced in Annex II.

7.1.2 INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP)

IABP was formally established on 18 September 1991 and became officially an action group of the panel at the seventh session of the DBCP (Toulouse, October 1991). The following organizations are participating in IABP:

Canada	Environment Canada, Canadian Coast Guard, Institute of Ocean Sciences, Marine Environmental Data Service
China	Institute of Oceanology of the China Academy of Sciences
Finland	Arctic Centre of the University of Lapland
France / USA	Service Argos
Germany	Alfred-Wegener Institute for Polar and Marine Research
Japan	Japan Marine Science and Technology Centre
Norway	Chr. Milchelsen Rearch AS, Nansen Envioronmental and Remote Sensing Centre, Norsk Polarinstitutt, Norwegian Meteorological Institute
Russian Federation	Arctic and Antarctic Research Institute, Russian Federal Service of Hydrometeorology and Environmental Monitoring
United Kingdom	Scott Polar Research Institute, United Kingdom Meteorological Office
USA	National Ice Centre (representing the National Aeronautics and Space Administration, the Nation Science Foundation, the National Oceanic and Atmospheric Administration, the Office of Naval Research and the US Coast Guard), Pacific Marine Environmental Laboratory (of NOAA), Polar Science Centre of the Applied Physics Laboratory of the University of Washington, Woods Hole Oceanographic Institution, Naval Oceanographic Office, Naval Meteorology and Oceanography Command
International Organizations	World Climate Research Programme of WMO, IOC and ICSU

The full report by the IABP is reproduced in Annex II.

7.1.3 INTERNATIONAL PROGRAMME FOR ANTARCTIC BUOYS (IPAB)

The IPAB was established in 1994 and became an action group of the panel in October 1994. The following organizations are participating in IABP:

Australia	Antarctic Co-operation Research Centre, Australian Antarctic Division
Canada	Marine Environmental Data Service
Finland	Finnish Institute of Marine Research
France / USA	CLS/Service Argos
Germany	Alfred Wegener Institute for Polar and Marine Research, Institute für Meteorologic und Klimaforschung Universität Karlruhe
Italy	National Programme for Antarctic Research
Japan	Hydrological Department of the Maritime Safety Agency, National Institute of Polar Research
Russian Federation	Arctic and Antarctic Research Institute
South Africa	South African Weather Bureau

United Kingdom	Scott Polar Research Institute
USA	National Ice Centre (see above under IABP), Polar Science Centre, World Data Centre A for Glaciology, Geophysical Institute, University of Alaska Fairbanks

The full report by the IPAB is reproduced in Annex II

7.1.4 INTERNATIONAL SOUTH ATLANTIC BUOY PROGRAMME (ISABP)

The ISABP was established in 1994 and became an action group of the panel in November 1994. The following organizations are participating in the ISABP:

Argentina	Servicio Meteoroligico, Servicio de Hidrografia Naval
Brazil	Diretoria de Hidrografia e Navegacao
Canada	Marine Environmental Data Service
France / USA	CLS/Service Argos
Namibia	The Meteorological Service
South Africa	South African Weather Bureau, Sea Fisheries Research Institute
United Kingdom	United Kingdom Meteorological Office
USA	Atlantic Oceanographic and Meteorological Laboratory, National Data Buoy Center

The full report by the ISABP is reproduced in Annex II.

7.1.5 INTERNATIONAL BUOY PROGRAMME FOR THE INDIAN OCEAN (IBPIO)

The IBPIO was established in 1996 and became an action group of the panel in October 1996. The following organizations are participating in the IPBIO:

Australia	Australian Bureau of Meteorology
France	Météo-France
France / USA	CLS/Service Argos
India	National Institute of Oceanography
South Africa	South African Weather Bureau
USA	Global Drifter Center of NOAA/AOML

Some other institutes expressed their willingness to participate:

India	India Meteorological Department
Indonesia	Faculty of Fisheries
Mauritius	Mauritius Meteorological Service
South Africa	University of Cape Town
USA	Navoceano

The full report by IBPIO is reproduced in Annex II.

7.1.6 GLOBAL DRIFTER PROGRAMME (GDP)

The GDP was established in 1996 as the follow-up to the Surface Velocity Programme (SVP) of TOGA and WOCE and became an action group of the Panel in 1997. The Global Drifter Center (GDC) is hosted by the NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML) in Miami, FL. The full report of the GDP is reproduced in Annex II.

7.1.7 TAO IMPLEMENTATION PANEL (TIP)

The Tropical Atmosphere-Ocean (TAO) Implementation Panel(TIP) became an Action Group of the Data Buoy Cooperation Panel (DBCP) during the past year. This first annual report introduces

TAO to the DBCP (see Annex II), focusing on what TAO is, how it is structured, and other issues which are relevant to the DBCP.

7.1.8 NORTHEAST PACIFIC COOPERATIVE PROGRAMME (NPCP)

The NPCP was developed by the United States and Canada to prepare accurate forecasts for the coastal areas of the Northeast Pacific. Although the Northeast Pacific is apparently well served by the USA and Canadian moored buoys, and Voluntary Observing Ships, large expanses of ocean still exist where little meteorological information is available to forecasters. The full report of the NPCDP is reproduced in Annex II

7.2 Membership

7.2.1 IOC MEMBER STATES AND WMO MEMBERS DIRECTLY INVOLVED IN THE PANEL'S ACTIVITIES

The following countries were represented at the recent sessions of the panel:

- Tenth session (La Jolla, CA, USA, November 1994): Australia, Brazil, Canada, China, France, Greece, Iceland, Netherlands, South Africa, United Kingdom, USA
- Eleventh session (Pretoria, South Africa, October 1995): Argentina, Australia, Brazil, France, Iceland, Netherlands, New Zealand, South Africa, Ukraine, United Kingdom, USA
- Twelfth session (Henley-on-Thames, October 1996):Australia, Brazil, Canada, China, France, Iceland, Netherlands, South Africa, United Kingdom, USA
- Thirteenth session (Saint-Denis, La Réunion, France, October 1997): Australia, Brazil, Canada, France, Iceland, Netherlands, New Zealand, South Africa, Spain, United Kingdom, USA.
- Fourteenth session (Marathon, Florida, USA, October 1998): Australia, Brazil, Canada, France, Iceland, India, Netherlands, New Zealand, South Africa, United Kingdom, USA.

7.2.2 NATIONAL FOCAL POINTS

The present list of national focal points for the DBCP is attached as Annex XI.

7.3 Technical co-ordinator

The panel's technical co-ordinator continues to be Mr. Etienne Charpentier (France). Since 1 June 1993, he has been employed by UNESCO/IOC as a *fund-in-trust expert* and located at Collecte-Localisation-Satellite (CLS)/Service Argos in Toulouse, France.

7.4 Finances

Overall management of the panel's finances has continued to be undertaken by WMO during 1998, while IOC has arranged contracts for the employment of the technical co-ordinator as well as for his logistic support. Annex X contains financial statements as follows:

(a) Finalized IOC Statement of Account for the period 1 June 1997 to 31 May 1998;

(b) Interim WMO Statement of Account as at 30 September 1998.

For the financial year 1999-2000, the panel agreed the following draft budget, to which contributions will be made by twelve countries (Australia, Canada, France, Greece, Iceland, Ireland, Netherlands, New Zealand, Norway, South Africa, United Kingdom, USA):

A. Expenditures	US$
Technical coordinator (salary, travel, logistic support)	120,000
Travel of Chairman and Vice-chairmen	6,000
Experts	1,500
Publications	4,000
WMO Costs	500
Contingencies	347
TOTAL	132,347

B. Income	
Contributions	129,350
Carry-over 1997-1998	2,297
TOTAL	132,347

ANNEX I

NATIONAL REPORTS ON DATA BUOY ACTIVITIES

The following pages contain national reports on data buoy activities submitted by the following countries:

DATA BUOY CO-OPERATION PANEL

Country: Australia

Year: 1998

CURRENT BUOY PROGRAMME

Number and type of buoys:

(a) deployed during the previous year:
5 TOGA style, 2 TOGA/WSD, 3 SVP-B

(b) operational at 31st August 1998:
12 TOGA, 2 TOGA/WSD, 4 SVP-B

(c) reporting on GTS at 31st August 1998:
all buoys as above

Purpose of programmes:
to collect operational meteorological data

Main deployment areas:
15 to 60 South
75 to 120 East

PLANNED PROGRAMMES

Over the next 12 months, the Australian Bureau of Meteorology plans to deploy the following number of buoys as a continuation of our operational meteorology requirements :

5 TOGA style, 2 TOGA/WSD, and 3 SVP-B buoys

They will be deployed in the usual areas to the north west and south west of Australia between 15 and 60 South and 75 to 120 East.

The Bureau of Meteorology also expects to deploy up to two WOTAN buoys for comparison with the existing TOGA style wind buoys.

A moored TOGA/WSD buoy will be maintained for tropical cyclone watch in the Gulf of Carpentaria.

In addition, the Bureau expects to be able to fund up to five barometers to be fitted in Metocean SVP buoys provided by the AOML for deployment in the Indian Ocean in support of the IBPIO.

TECHNICAL ISSUES

The two WOTAN buoys being evaluated were returned to Metocean at their request so that necessary modifications involving the integrity of the water-tightness of the hulls could be incorporated. These buoys will be deployed as soon as possible after their return in September, 1998.

BUOY LIFETIMES

During the last 12 months, the Bureau has experienced two early failures. The transmissions from one TOGA style buoy 2695/56543 became too weak to be located after only four months at sea. As the battery voltage was still good, and the signal strength had reduced fairly suddenly by about 20dB, it must be assumed that the performance of the antenna had greatly deteriorated, possibly due to water ingress and the fact that the air temperature sensor has also failed.

The expected life of SVP-B drifters supplied to the Bureau by Metocean is about 12 months, however, the first one of three failed at only eight months due to battery failure.

Data Buoy Cooperation Panel

Report on Buoy Programmes by Participants

Australia

Purpose

1. This report provides details of the Australian Bureau of Meteorology's buoy activities for the period July 1997 - June 1998 and the proposed deployment plans for period July 1998 - June 1999. The report also summarises GTS delays and experience with SVP-B buoys.

Background

2. The Australian Bureau of Meteorology (BoM) has deployed drifting buoys since the late 1970s. Commencing with FGGE, the Bureau has maintained a modest buoy program in the Indian and Southern Oceans, utilising merchant, passenger and research vessels and the Royal Australian Navy.

3. During TOGA (1985 - 1994), the BoM deployed up to six buoys annually, purchased from its own Capital program. The US NDBC provided an equivalent number of buoys for deployment as part of the Bureau's logistic support for TOGA. The BoM also provides logistic support for other agencies (e.g. AOML) requiring buoy deployments in the Southern and Indian Oceans.

4. The BoM's buoy program is funded separately for Capital and Argos Communications, where the latter usually governs the number of buoys that can be deployed each financial year.

5. Since 1993/94, the BoM has deployed a mix of FGGE and SVP-B type buoys which is expected to continue in the foreseeable future. The standard FGGE type buoy with air pressure, air temperature, sea temperature and pressure tendency has a nominal life of two years, although the BoM has several recorded cases of FGGE type buoys surviving between 3½ to 4 years. Our experience with SVP-B type buoys (air pressure and sea temperature only) has provided variable success.

1997/98 Deployments

6. Ten drogued BoM owned buoys were successfully deployed in the Indian and Southern Oceans during 1997/98. Table 1. provides details of all 1997/98 deployments whilst Fig. 1. shows the deployment locations.

7. One deployment was the biennial replacement of the moored wind speed and wind direction buoy in the Gulf of Carpentaria to assist forecasting operations during the Tropical Cyclone season.

1998/99 Deployment Plans

8. The BoM expects to deploy 5 standard FGGE buoys, 2 FGGE WS/WD buoys and 3 SVP-B buoys during 1998/99. All deployments are discretionary and effected on an opportunity basis, however the plan allows for several strategic deployments, viz:

a) Two FGGE wind speed and wind direction buoys to be deployed near 19°S 109°E (October and January) for the Tropical Cyclone season.

b) Two buoys routinely deployed in early December each year from the R.V. Shirase at 43°S 110°E and 47°S 110°E. These buoys are essential for forecasting Summer severe weather events over South Eastern Australia.

c) One high latitude deployment to assist Antarctic Operations.

Num	Argos	WMO	Vessel	Make	Type	Date	Lat	Long
1	2942	52624	HMAS Ipswich	Metocean	FW	19/8/97	14.00 S	139.00 E
2	4879	53550	HMAS Dubbo	Metocean	S	15/10/97	14.00 S	120.00 E
3	2930	56537	Botany Bay	Metocean	FW	29/10/97	20.36 S	110.08 E
4	4878	56538	Shirase	Metocean	S	5/12/97	43.00 S	104.00 E
5	8035	56539	Shirase	Metocean	F	6/12/97	47.00 S	98.60 E
6	8036	74539	Shirase	Metocean	F	11/12/97	60.00 S	58.47 E
7	4877	56540	Botany Bay	Metocean	S	22/1/98	19.38 S	110.18 E
8	8037	56541	Aurora Australis	Metocean	F	2/2/98	57.59 S	100.01 E
9	8038	56542	Austral Leader	Metocean	F	3/5/98	50.16 S	76.01 E
10	2695	56543	Austral Leader	Metocean	F	3/5/98	51.28 S	72.33 E

Table 1. Australian Bureau of Meteorology Deployments in 1997/98

Key to buoy type: S = SVP-B, F = FGGE, W = WS/WD

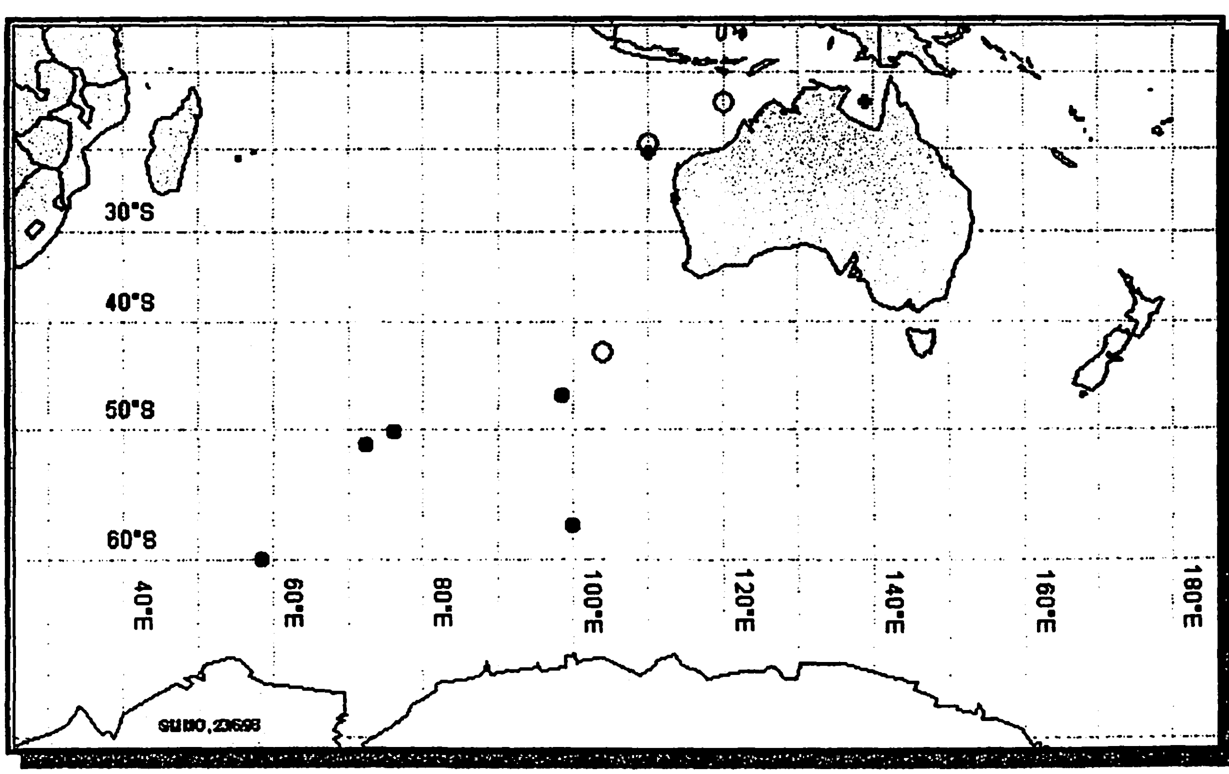


Figure 1. 1997/98 deployment locations

dot = std FGGE (AP,AT,SST), cross = std FGGE +WS/WD, circle = SVP (AP,SST)

Num	Type	Date	Lat	Long	Vessel
1	S	Sept 98	14 S	120 E	(Navy)
2	F	Sept 98	40 S	85 E	TBA
3	FW	Oct 98	19 S	109 E	TBA
4	F	Dec 98	43 S	110 E	Shirase
5	F	Dec 98	47 S	110 E	Shirase
6	S	Jan 99	38 S	100 E	TBA
7	FW	Jan 99	19 S	109 E	TBA
8	F	Feb 99	51 S	76 E	TBA
9	F	Feb 99	60 S	90 E	Aurora Australis
10	S	May 99	30 S	90 E	TBA

Table 2. Proposed buoy deployments for 1998/99
where: S = SVP-B, F = FGGE, W = WS/WD.

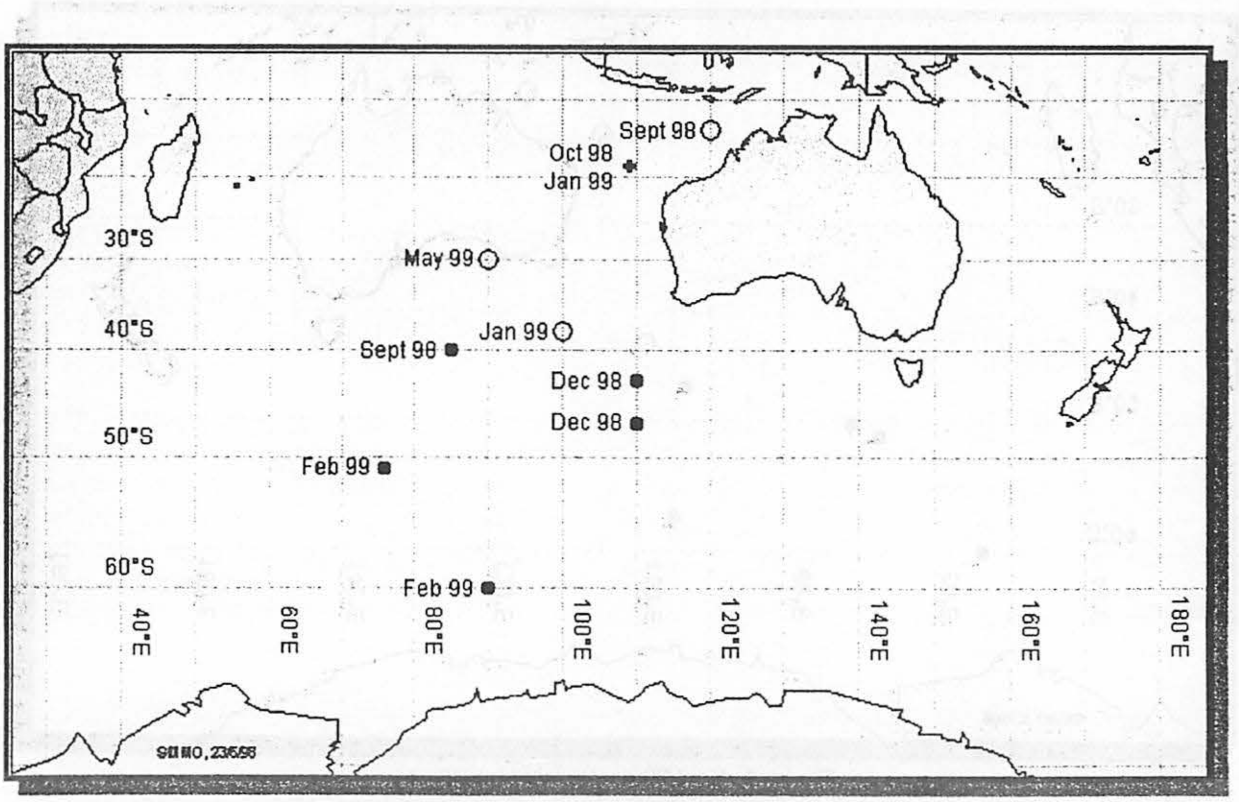


Figure 2. 1998/99 proposed buoy deployment locations

dot = std FGGE (AP,AT,SST), cross = std FGGE +WS/WD, circle = SVP (AP,SST)

Message reception at NMOC

9. Buoy messages are received at NMOC (Melbourne) on bulletin SSVX03 LFPW. Fig. 3, shows the delay in messages received during the period 0000 UTC 25 June 1998 - 0000 UTC 29 June 1998.

10. The survey included over 1000 GTS messages from 17 BoM owned buoys and showed that in excess of 80% of all buoy reports were received within 90 minutes of the observation. Of the remaining messages, most are received within 240 minutes but late messages are typically delayed by 6 - 8 hours. Overall, this represents a small improvement in the past twelve months.

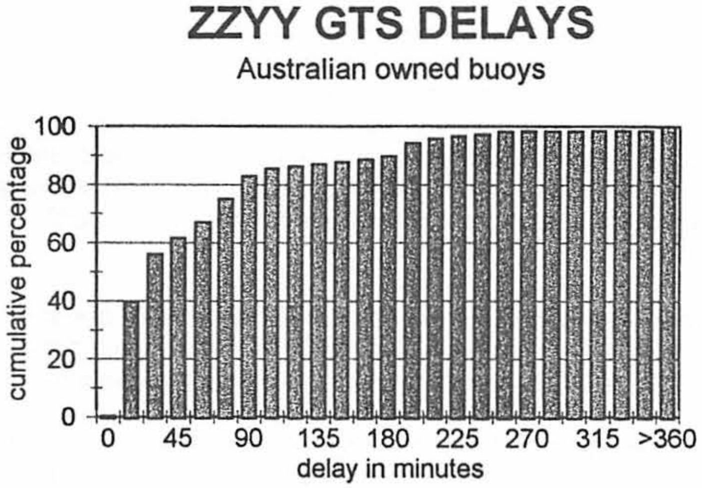


Figure 3. Delay in ZZYY GTS messages reaching NMOC Melbourne during the period 0000 UTC 25 June 1998 - 0000 UTC 29 June 1998. Increments are in 15 minute blocks commencing at the time shown.

11. The BoM also surveyed the content of GTS buoy messages from our own buoys in the Indian Ocean after detecting a sudden decrease in the number of buoy reports over a two day period to the south west of Australia, and noting that in many cases the transmitted messages were incomplete. Two problems were identified:

a) Two messages with the same UTC times. The first message was found to contain some of the parameters with the remaining parameters transmitted in the second message. Because of the identical time stamping, the Bureau recognises the second message as a duplicate message and overwrites the original message in the plotting routine and archival process.

The TC/DBCP advises that this situation arises when data received locally by the Melbourne LUT and forwarded to Toulouse by email for processing, often contains bit errors which prevents some groups from being reported on the GTS. If another data set is subsequently processed (i.e. satellite download to Toulouse) which contains no bit errors, a new message is generated for GTS distribution. The GTS Sub system by default *generates another GTS message containing only the new sensor data*, however another option is to *generate another GTS message containing all sensor data* which the BoM has now specified for all existing and future buoys.

b) Cyclic pattern of missing data groups. This was detected on SVP-B buoys with nearly every second message omitting pressure tendency and sea temperature.

TC/DBCP advises that some SVP-B buoys report the current pressure as well as the pressure three hours earlier. The GTS Sub system recognises the two pressure values and constructs two messages to coincide with the time of the two pressure values. Pressure tendency is calculated and included in the second message. The meteorological value of the first message would appear to be minimal since it is not received in real-time. The derivation of pressure tendency on SVP-B buoys will remove this problem

Buoy Status Reports

12. The BoM prepares a monthly status report of all buoys operating in the Australian Region which report on the GTS. The report, which is prepared in Adobe Acrobat (PDF) format, is sent as an email attachment to users outside to the BoM. Subscription to the BoM Buoy Report can be made by sending an email to **majordomo@bom.gov.au** with **subscribe buoyext_I** in the message.

Experience with SVP-B type buoys

13. The BoM has trialed SVP-B type buoys since 1993/94 with the early results less than satisfactory. More recent performances have been slightly more encouraging.

14. Of the first three SVP-B buoys supplied by Scripps, one suffered from a pressure port blockage whilst the other two failed prematurely. In 1994, SVP-B buoys were purchased from Metocean and Turo. The Turo buoys were unique in having a larger diameter hull (500 mm) compared to Metocean (400 mm) which provided a larger battery capacity and hence a longer lifetime (18 months compared to 12 months) The Turo buoys used the Scripps pressure port design and proved unreliable when frequently submerged. The smaller Metocean buoy (Argos 4870) continued to operate for about 14 months without pressure problems despite operating in a harsh environment (near 60°S) and subject to frequent submergence.

15. Two older style Turo SVP-B buoys (Argos 2934 and 4876) are still reporting on the GTS, although neither are reporting air pressure. Buoy 2934 is 3½ years old but air pressure failed after 6 months. Buoy 4876 is 18 months old but air pressure failed after one month.

16. Two of the newer designed Turo SVP-B buoys (Argos 4872 and 4873) were deployed during the 1996/97 season. Buoy 4873 is fully functional however air pressure failed on Buoy 4872 after 20 months.

17. Two Metocean SVP-B buoys (Argos 4877 and 4878) were deployed during the 1997/98 season. Buoy 4877 is still fully operational however Buoy 4878 buoy failed after 8 months.

18. Despite the lower cost and ease of handling, the SVP-B buoy does not yet have the desired reliability to consider it as a cost-effective alternative to the FGGE spar type buoy.

BRAZIL

NATIONAL BUOY PROGRAM

ANNUAL REPORT TO DBCP FOR
1998

(PROGRAMA NACIONAL DE BÓIAS)
(PNBOIA)

PNBOIA

REPORT OF THE BRAZILIAN BUOYS ACTIVITIES

General Information

During 1996 a special task group (with experts in meteorology and oceanography) was stabilished to prepare the guide lines of the brazilian buoy programme. In the begining of the 1997, the final document was presented at the National GOOS Committee like the National Bouy Programme – PNBOIA. This document was approved by the government during the 133rd Session of the Marine Resource Inter-Ministerial Committee at April/30/1997.

At May/09/1997, during the 2nd Extraordinary Session of the Executive Committee for the GOOD/Br, the PNBOIA became an activity of the GOOS Brazil Pilot Programme and it was created the Buoy Subcommittee to develop the buoy program.

The Diretoria de Hidrografia e Navegação (DHN) received the responsability by the Navy Ministry to coordinate all the actions for the **PNBOIA**'s development.

The PNBOIA is an instrument to collect meteorological and oceanographic data for support the national interest (scientific and operational requirements) at the Tropical Atlantic, the South Atlantic and the coastal waters of Brazil.

At the Tropical Atlantic, the PNBOIA supports the PIRATA/Brazil activities. The PIRATA (Pilot Research Moored Array in the Tropical Atlantic) is a project designed to study ocean-atmosphere interactions in the Tropical Atlantic that are relevant to regional climate variability on seasonal, interannual and longer time scales. By the way, the PIRATA has been producing meteorological data to support marine weather forecast in that area, and the meteorological observations are available on the GTS at the WMO Bulletin Head SSVX40 KARS. The data is transmitted to shore via satellite by Service Argos and is available in near real-time on the Internet (http://www.ifremer.fr/orstom/pirata/pirata.html or http://www.pmel.noaa.gov/pirata/pirata-site.html).

In the other hand, the PNBOIA supports the coastal mooring and drifting buoys. The purpose of the coastal moorings and drifters is to collect data to support the requirements of the national meteorological and oceanographic centers to sustain operational activities. The Coordinator of the Buoy Subcommittee received by WMO Ocean Affairs 40 numbers to use in the brazilian buoys and soon the meteorological data will be available on the GTS

Actions in the inter-sessional period 1997/1998

At January/1998, the DHN's Oceanographic Ship "ANTARES" deployed 03 ATLAS Buoys at the Tropical Atlantic to support the brazilian activities of the PIRATA Programme.

Name	LatitudeLongitude	Date1st deployment	#WMO
REGGAE	15°N/38°W	29/01/98	13008
LAMBADA	8°N/38°W	31/0198	13009
SAMBA	00°/35°W	23/01/98	31001

During July/97, it was started the deployment of the drifiting buoys (LCD - Low Cost Drifters) at the Coast Waters of Brazil. In this period 15 drifters were deployed. The deployment of the drifters took place during routine sails of the suplies at the oil ocean fields

This activity intend to colect oceanographic data to support monitoring program by PETROBRAS/INPE. The data will be transmitted to shore via satellite by Service Argos and will be available on the Internet by http://www.serp.atsme.inpe.br.

1997						1998					
JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
03	-	-	03	-	03	-	-	-	05	-	01

All the 15 buoys are manufactured by a Brazilian Co. (Neuron Eletronica Ltda). At this moment 07 drifters are still operating.

The PNBOIA Subcommittee decided during 1997 to buy 10 drifters manufactured by METOCEAN, 03 drifters and 01 coastal moored buoy manufactured by Neuron Eletronica . The METOCEAN buoys have already been shipped (not received). The NEURON's buoys are not ready yet.

Future Plans

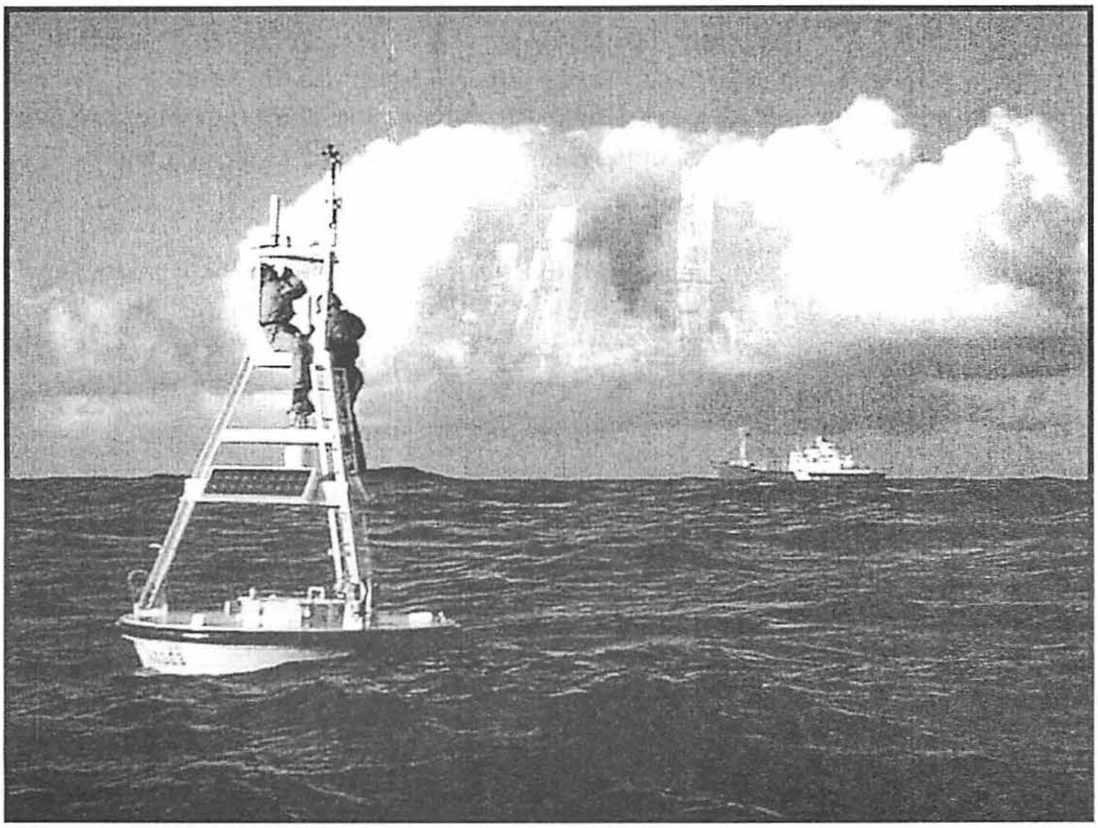
The PIRATA/Br will deploy more 03 Atlas Buoys during 1999 and wil substitute the three 1998 deployed buoys.

Name	LatitudeLongitude	Date1st deployment	Country
FORRO	11.5°N/38°W	03/99	Brazil
FREVO	4°N/38°W	03/99	Brazil
JAZZ	0°/20°W	03/99	Brazil

The PNBOIA will deploy one mooring buoy (nearby Arraial do Cabo/RJ) and thirteen barometric drifters untill the end of the next year (1999).

The PNBOIA plans to order more 02 coastal mooring buoys and 10 drifters to stabilish a buoy network at the METAREA V.

National Report on Buoy Activities 1997-1998



Three Metre Discus Buoy

By: Normand Michaud
National Marine Focal Point
September 15, 1998

Canada

ENVIRONMENT CANADA
ANNUAL REPORT 1997/98 - MOORED BUOYS

OVERVIEW

In the relatively short period of 11 years, the Environment Canada ODAS (Ocean Data Acquisition System) buoy program has expanded to become the second largest buoy program in the world. Marine tragedies in the early 80's on the Pacific and Atlantic coasts provided significant impetus for the improvement of marine weather services. To address this need, thirty five automated buoy stations now provide up to 250,000 hourly observations annually from previously unmonitored marine environments.

Each Region is responsible for maintaining their own buoy programs, using full time Buoy Specialists, part time assistance from Port Meteorological Officers and Meteorological Inspectors, and contractor support, generally provided by AXYS Environmental Systems. Equipped with solar and battery power systems, reliable sensors, low power electronics, and high quality coatings, Environment Canada buoys are designed to remain at sea for up to 5 years before refurbishing.

Pacific and Yukon Region has been designated as the Buoy Technical Center and provides general direction and technical assistance to the other Regions as in figure 1. In an effort to standardize and improve the overall quality of the buoy data, the buoy messages are now quality controlled and distributed from Vancouver using an interactive computer system known as Poseidon.

The Buoy Technical Centre is also managing the National Buoy Payload Replacement Project. The new electronic payloads will replace older systems dating from the mid 80's and will provide additional capacity for new sensor suites.

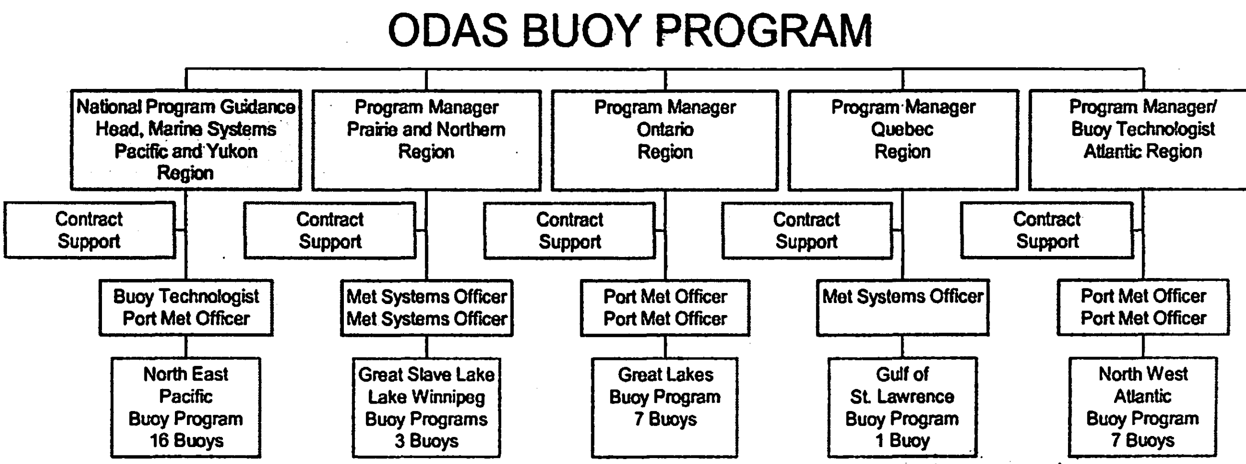
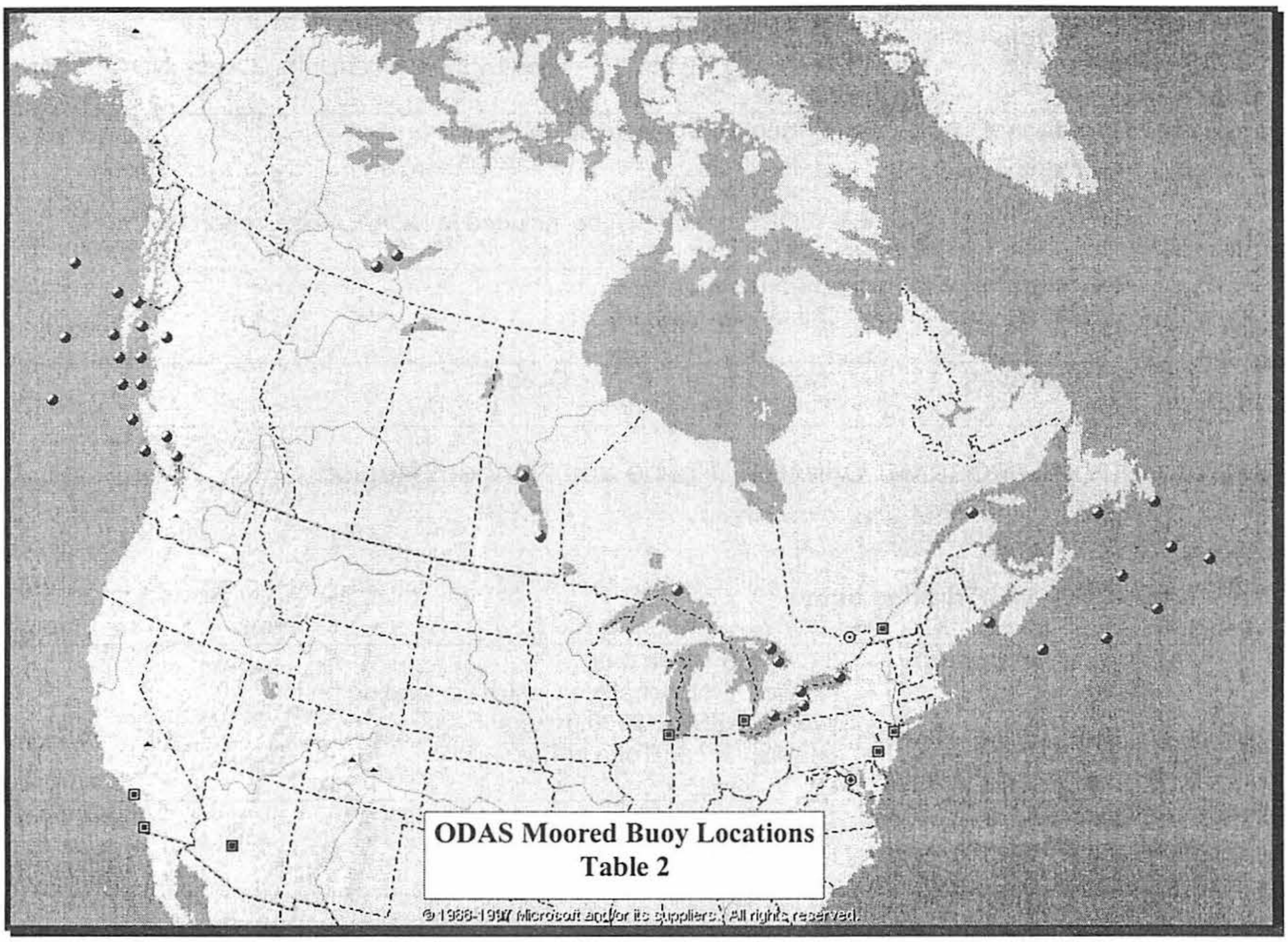


Figure 1

Canadian ODAS Buoy Locations



YEAR: 1997/98 (Sept. 1/97 - Aug. 31/98)

CURRENT PROGRAMS:

A AGENCY OR PROGRAM: CANADA - Pacific and Yukon Region - North East Pacific Ocean

Number and type of buoys:

a) Deployed during year:	• 2 Standard Metocean drifters • 4 WOCE drifters (provided by the Global Drifter Centre NOAA/AOML)
b) Operational (31/08/98):	• 3 moored Six meter NOMAD buoys • 13 moored Three meter Discus buoys • 3 standard drifters • WOCE drifters will be included in NOAA/AOML report
c) Reporting on GTS (31/08/98):	• 16 moored buoys • 2 standard drifters
Main deployment area:	• North Eastern Pacific Ocean

B AGENCY OR PROGRAM: CANADA - Prairie and Northern Region

Number and type of buoys:

Arctic Basin IABP drifting buoys

a) Deployed during year:	• 3 CALIBS via air drop • for the US National Ice Centre via landing on ice • two CES ZENO 3200 drifters • one MetOcean Toga drifter
b) Operational (31/08/98):	• 1 CALIB but position only • the 3 US National Ice Centre buoys
c) Reporting on GTS (31/08/98):	• the 3 US National Ice Centre buoys
Main deployment area:	• eastern / southeastern Arctic Basin ice: 2 to 5 drifters

Moored buoys in lakes

a) Deployed during year:	• 3 moored buoys, open water season, 2 Great Slave Lake, 1 Lake Winnipeg
b) Operational (31/08/98):	• all 3 moored buoys
c) Reporting on GTS (31/08/98):	• all 3 moored buoys
Main deployment area:	• Great Slave Lake open water season: one 3-meter buoy and one hexoid buoy deployed June or July and retrieved September or October (Note - Hexoid moved from Lake Winnipeg to Great Slave Lake for 1998 season) • Lake Winnipeg open water season: one moored buoy (MetOcean

	drifter) deployed South Basin of Lake Winnipeg late May or June and retrieved in October

C **AGENCY OR PROGRAM: CANADA -** Canadian Ice Services

Number and type of buoys:

a) Deployed during year:	• 1 Metocean Standard CALIB in NOW project area. • 1 Metocean CALIB with Lithium & Pressure in Northwestern Baffin bay. • 2 Metocean Standard CALIBs in Gulf of St.-Lawrence. • 1 Metocean Ice Beacon in North Open Water project area for Maurice Lamontagne Institute. • 3 Metocean Standard CALIBs in North Open Water project area for McGill University.
b) Operational (31/08/98):	• None
c) Reporting on GTS (31/08/98):	• None
Main deployment area:	• Arctic waters - Baffin Bay and North Open Water project area. • Gulf St.-Lawrence.

D **AGENCY OR PROGRAM: CANADA -** Atlantic region

Number and type of buoys:

a) Deployed during year:	• 2 6 meter NOMADS • 1 Datawell wave rider
b) Operational (31/08/98):	• 7 NOMAD • 1 DATAWELL
c) Reporting on GTS (31/08/98):	• 7 NOMADS
Main deployment area:	• North West Atlantic

E **AGENCY OR PROGRAM: CANADA -** Ontario region

Number and type of buoys:

a) Deployed during year:	• 5 three meter buoys • 2 twelve meter buoy
b) Operational (31/08/98):	• 7 buoys
c) Reporting on GTS (31/08/98):	• all
Main deployment area:	• Great Lakes

F **AGENCY OR PROGRAM: CANADA** - Quebec region

Number and type of buoys:

a) Deployed during year:	• 1 moored 3-meter discus buoy
b) Operational (31/08/98):	• 1 buoy
c) Reporting on GTS (31/08/98):	• 1
Main deployment area:	• Gulf of St. Lawrence

G **AGENCY OR PROGRAM: CANADA - Fisheries and Oceans (BIO)**

Number and type of buoys:

a) Deployed during year:	Extensive programs were carried out on the ice fields of the Labrador Shelf and Gulf of St. Lawrence using beacons measuring drift, pressure, stress and convergence/divergence. Data was provided to the Canadian Ice Centre for forecasting and to the Canadian Coast Guard to support icebreaking. Beacons were also used to validate the properties seen in the synthetic aperture radar images from RADARSAT, to track lobster larvae, and to validate contaminant dispersion models for salmon aquaculture sites. ALACE floats were used to measure deep flow in the Labrador Sea.
b) Operational (31/08/98):	•
c) Reporting on GTS (31/08/98):	•
Main deployment area:	• Labrador Shelf and Gulf of St. Lawrence

PLANNED PROGRAMS:

A AGENCY OR PROGRAM: CANADA - Pacific and Yukon Region - North East Pacific Ocean

Number and type of buoys planned for deployment in next 12 months:

Purpose of programme :

a) Operational:	• 0 moored buoys • 4 standard wind speed and direction drifters in co-operative project with NDBC.
b) Developmental:	• 1 Three meter discus buoy* - (Optical sensors for Biological monitoring).
c) Met/Ocean research:	• As above.
Main deployment area:	• Drifting buoys will be deployed in the North East Pacific Ocean. • The optical sensor buoy under development in 96/97 was deployed in a coastal location in Georgia Strait May/98. • *A new generation 3 meter developmental buoy with additional optical sensors will be deployed close to Victoria Aug./98. • The Severe Wave Study NOMAD buoy will be recovered from the Western Atlantic Ocean near the Hibernia Oil Platform, summer/98.

B. AGENCY OR PROGRAM: CANADA - Prairie and Northern Region

Purpose of program and number and type of buoys planned for deployment in next 12 months

Arctic Basin IABP drifting buoys

Purpose of program: To actively participate in the International Arctic Buoy Programme (IABP). Our focus is ensuring that there are buoys on ice to provide real-time meteorological data from the southeastern Arctic Ocean / the Beaufort section of the Arctic Basin and that the data is available on GTS.

a) Operational:	From 3 to 5 buoys depending on 'holes' in the buoy array across the southeastern Arctic Ocean / the Beaufort and deployment opportunities. The deployments will be comprised of: • air-drops of CALIB buoys and • landing on ice with a Twin Otter operating from Eureka or Tuktoyaktuk to deploy in-house assembled buoys or buoys on behalf of the U.S. National Ice Centre.
b) Developmental:	• Will continue to experiment with the assembly of buoys in house including making combination battery / solar panel power supplies
Met/Ocean research:	• Nil
a) Main deployment area:	• Arctic Basin ice east of 141W and south of about 83N

Moored buoys in lakes:

Purpose of program: To support operational marine forecasting program for Great Slave Lake and Lake Winnipeg

a) Operational:	• 3 buoys
b) Developmental:	• nil
c) Met/Ocean research:	• nil
Main deployment area:	• Great Slave Lake (3 meter buoy and hexoid buoy) • Lake Winnipeg (moored MetOcean drifter)

C **AGENCY OR PROGRAM: CANADA -** Canadian Ice Services

a) **Operational:**	• Up to 4 Metocean Standard CALIB. • 2 Metocean Lithium Battery with air Pressure sensor CALIB. • Up to 4 Ice Beacons.
b) **Developmental:**	• Nil.
c) **Met/Ocean research:**	• Up to 4 Ice Beacons for water current verification in Gulf region. • 2 standards CALIB for water current verification off Labrador coast.
Main deployment area:	• Eastern & Western Arctic. Gulf and Newfoundland/Labrador waters.

D **AGENCY OR PROGRAM: CANADA -** Atlantic region

Number and type of buoys planned for deployment in next 12 months:

Purpose of programme :

a) Operational:	• Nomad Grand Banks of Newfoundland
b) Developmental:	• none
c) Met/Ocean research:	• none
Main deployment area:	

E **AGENCY OR PROGRAM: CANADA -** Ontario region

Number and type of buoys planned for deployment in next 12 months:

Purpose of programme :

a) Operational:	• Two 12 meter Buoys and five 3 meter Buoys
b) Developmental:	• Light Weight Coastal Buoy

c) Met/Ocean research:	• One 12 meter buoy is equipped with a chemistry laboratory on board with several on going experiments (mass spec). The buoy is powered by two diesel (6kw) engines and solar power.
Main deployment area:	• Develop a lightweight meteorological buoy that can work in coastal conditions and can be handled by smaller ships. • Experiments to examine the air-lake exchange of gaseous pesticides, of CO, water vapour, momentum and heat fluxes and a biological study of the isotope fixation during primary productivity involving phytoplankton. • 12 meter buoys Lake Ontario • 3 meter buoys Lake Superior, Georgian Bay, Lake Erie • Lightweight Buoys, Lake Simcoe, North Channel Georgian Bay, Lake Nipigon, Lake of the Woods.

F **AGENCY OR PROGRAM: CANADA** - Quebec region

Number and type of buoys planned for deployment in next 12 months:

Purpose of programme :

a) Operational:	• n/a
b) Developmental:	• n/a
c) Met/Ocean research:	• n/a
Main deployment area:	• n/a

G **AGENCY OR PROGRAM: CANADA - Fisheries and Oceans (BIO)**

Number and type of buoys planned for deployment in next 12 months:

Purpose of programme : Research

a) Deployed during year:	Extensive programs will continue on the ice fields of the Labrador Shelf and Gulf of St. Lawrence using beacons measuring drift, pressure, stress and convergence/divergence. Data will be provided to the Canadian Ice Centre for forecasting and to the Canadian Coast Guard to support icebreaking. A directional wave buoy and a moored weather station will be used to study the shoaling of waves near Cape Hatteras. GPS beacons will be used to validate contaminant dispersion models for salmon aquaculture sites in the Bay of Fundy. ALACE floats will continue to be used to measure deep flow in the Labrador Sea.
b) Operational (31/08/98):	•
c) Reporting on GTS (31/08/98):	•
Main deployment area:	• Labrador Shelf and Gulf of St. Lawrence

TECHNICAL DEVELOPMENTS:

A Moored Buoy Systems : **CANADA** - Pacific and Yukon Region - North East Pacific

a) **Buoy design:**	• 7 solar powered buoys deployed during 97/98 using Siemens high output solar panels. • Improvements to wind mast design to simplify exchange of anemometers at sea.
b) **Instrumentation:**	• Global Positioning Systems installed on all moored buoys. • Seven new Watchman 100 buoy payloads installed in operational buoys during 97/98. • Ultrasonic anemometer continues on test at an operational buoy station.

Arctic Basin IABP drifting buoys: CANADA - Prairie and Northern Region

a) **Buoy design:**	Continue to try various buoy components and in-house assembly of components in pursuit of cost effective buoy packages that will: • provide the basics of reliable and accurate pressure and temperature readings through continuous real time operation in the Arctic Basin environment and • have a power system that will last 2 or 3 years
b) **Instrumentation:**	• air-deployed CALIBs: air pressure sensor/ data • surface-deployed buoys (in house and those deployed on behalf of US National Ice Centre): air pressure and air temperature sensors/ data
c) **Others** :	1) Buoy data is used operationally to provide air pressure and air temperature data to assist in real time analysis and forecasting across the Canadian sector of the Arctic Ocean by the Arctic Weather Centre, Canadian Meteorological Centre and other international forecast offices such as the UK Met Office. The data is also used operationally by Canadian Ice Service to provide general ice motion data. 2) The data contributes to the overall Arctic Basin data set which is used to provide data on ice motion, surface pressure pattern, and air temperatures across the Arctic Ocean for both the operational and research communities.

Moored buoys in lake: **CANADA** - Prairie and Northern Region

a) **Buoy design**:	nil
b) **Instrumentation:**	• **Great Slave Lake:** air pressure, air temperature, water surface temperature, wind speed and direction, and wave height sensors/ data. • **Lake Winnipeg South Basin buoy:** air pressure, water surface temperature, wind speed and direction sensors/data

C Drifting Buoy system : **CANADA** - Canadian Ice Services

a) **Beacon design**	• Using mostly Lithium batteries for northern beacon deployments. • Using Standard (alkaline) batteries for southern beacon deployments.
b) **Instrumentation:**	• Pressure and temperature sensors on 1 CALIB in Northwestern Baffin Bay (temperature sensor data is available on raw data only). Temperature data not included on GTS due to unreliability of data when beacon is insulated by increasing snow cover during fall / winter months.

D a) **Moored Buoy Systems : CANADA - ATLANTIC REGION**

a) **Buoy design:**	• forward masts shortened on 2 Nomads • Antifouling paint on 2 hulls for testing
b) **Instrumentation:**	• Watchman 100 Payloads installed in 6 Nomads

E Moored Buoy Systems : **CANADA** - Ontario Region

a) **Buoy design:**	• Presently developing a small lightweight buoy that can be used in the coastal waters or smaller lake environment that can be serviced using smaller vessels than are presently used with the 12 and 3 meter buoys. • 5 WATCHMAN payloads have been activated this season. • 6 Buoys are using the larger 40W solar panels and the new battery configuration. This winter the remaining two buoys will be converted to the WATCHMAN and have the 40W panels installed. • The Lightweight Buoys are in development stage ... three will be ready for deployment in the 1999 Marine Season and an additional three for the 2000 season.
b) **Instrumentation:**	• All buoys in the Buoy Program are being upgraded with the new Buoy Payload (WATCHMAN 100) with completing scheduled for the 1999 Marine Season.

F Moored Buoy Systems : **CANADA** - Quebec region

a) **Buoy design:**	• 3D
b) **Instrumentation:**	• VARIOUS

PUBLICATIONS:

A **CANADA** - Pacific and Yukon Region - North East Pacific

Monthly WMO Moored and Drifting Buoy Status Reports for all Canadian Buoys.
On line Moored Buoy Status Reports at: http://www.pwc.bc.doe.ca/~ftp/wbs/
Buoy data available at: http://www.weatheroffice.com/
Annual ODAS Buoy Service Reports - Pacific and Yukon Region (Internal distribution)

B **CANADA** - Prairie and Northern Region

Arctic Basin IABP Drifting buoys
Data from buoys deployed on the ice of the Arctic Basin as part of the International Arctic Buoy Programme is included in the annual International Arctic Buoy Programme Data Reports published by the Applied Physics Laboratory, University of Washington, Data is also available from the IABP web site http://iabp.apl.washington.edu.

Moored buoys in Lakes
None

C **CANADA** - Canadian Ice Services

Second internal CIS beacon report delivered on December 15th, 1997.

D **CANADA** - Atlantic Region
none

E **CANADA** - Ontario Region
none

F **CANADA** - Quebec region
none

SPECIAL COMMENTS:

A <u>**CANADA** - Pacific and Yukon Region - North East Pacific</u>

a) **Quality of buoy data:**	• Good
b) **Communication:**	• Good. Over 95% of all possible moored buoy data delivered to users
c) **Buoy Lifetimes:**	• Moored buoys - up to 3 years between battery changes. • New solar buoys should increase service interval for battery replacement up to 5 years. • Drifting buoys - Over 2 years
d) **Other.**	• Nil

B <u>**CANADA** - Prairie and Northern Region</u>

Arctic Basin IABP drifting buoys

a) Quality of buoy data:	• Good and reliable. Data is routinely evaluated and data deemed unreliable is not put on GTS.
b) Communication:	• Prairie and Northern Region, Environment Canada, continue to operate a Local Users Terminal at their Edmonton facility. Canadian and some U.S. National Ice Centre buoy data is accessed, processed and input to GTS directly from Edmonton.
c) Buoy Lifetimes:	• air-deployed CALIBs with lithium batteries have an expected life of about 1 year • surface deployed buoys have an expected life of about 2 years Summer melt of ice and the breakup of ice throughout the year factor into buoy lifetimes!
d) Other.	• Ice in the southern Beaufort is vulnerable to melt and breakup and also to moving quickly out of the region. Hence our use of air-deployable CALIBs which provide position and pressure but not temperature data. For surface deployments we target ice which we believe to be within but on the outer edge of the Beaufort gyre.

Moored buoys in lakes

a) Quality of buoy data:	• Good and reliable.
b) Communication:	• n/a
c) Buoy Lifetimes:	• n/a
d) Other.	• n/a

C **CANADA** - <u>Canadian Ice Services</u>

a) **Quality of buoy data:**	• Good and reliable.
b) **Communication:**	• Good and reliable.
c) **Buoy Lifetimes:**	• 3-4 months for Standard, up to 1 year for Lithium batteries.
d) **Other:**	• CALIB deployed last fall in Northwestern Baffin bay died upon deployment ...no data available. • 1 CALIB deployed for North Open Water project never reported data. • 2 of 3 CALIBs deployed for McGill University reported for only 1 week.

D **CANADA** - <u>Atlantic Region</u>

a) **Quality of buoy data:**	• 1 AIR TEMP U/S
b) **Communication:**	• 1 BUOY ON ARGOS BACKUP
c) **Buoy Lifetimes:**	• n/a
d) **Other:**	• n/a

E **CANADA** - <u>Ontario Region</u>

a) **Quality of buoy data:**	• Good
b) **Communication:**	• 90 % plus
c) **Buoy Lifetimes:**	• The three meter buoys are deployed and retrieved annually with the battery system being replaced every 5 years. The 12 meter buoys are year round platforms, with the power system being replaced every 5 years. The Lightweight buoys will follow the same cycle as the three meter buoys.
d) **Other:**	• n/a

D **CANADA** - Quebec Region

a) **Quality of buoy data:**	• 90%
b) **Communication:**	• GOES
c) **Buoy Lifetimes:**	• n/a
d) **Other:**	• position ARGOS

CONTACT POINTS

A CANADA - Pacific and Yukon Region - North East Pacific

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B CANADA - Prairie and Northern Region

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C **CANADA - Canadian Ice Services**

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D **CANADA - Atlantic Region**

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G **CANADA** - Marine Program

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Country: **FRANCE**

Year: **1 September 1997 - 31 August 1998**

PROGRAMMES

A. MÉTÉO-FRANCE

Number and type of buoys :

(a) 25 drifting buoys (most of them drogued) + one moored buoy[1] were deployed in last 12 months. Drifting buoys are :
- 4 Marisonde G (FGGE type with wind and air temperature measurements),
- 21 SVP barometer drifters (including 10 with wind measurement capabilities and one with salinity) ;

(b) 21 buoys[2] were operational at 31 August ;

(c) 21 buoys[2] were reporting on GTS at 31 August.

Purposes of programme :

(a) Operational : to provide oceanographical and meteorological observations in real time to Weather Forecast Centres (SIMBAD network, EGOS programme, French West Indies, IBPIO programme...) ;

(c) Technical : to improve present materials (tests of new buoys, new sensors (compasses and barometers)). To validate wind and bathythermal measurements.

Main deployment areas :

North Atlantic (Off France, Spain and Portugal - West Indies).
Indian Ocean.

Plans for the next 12 months :

The drifting buoy networks will be maintained. Meteo-France plans to implement 4 ocean weather stations (two in the Mediterranean Sea, two off West Indies). Three moored buoys similar to those operated by UKMO were ordered. At least, two of them will be deployed during the next 12 months.

B. LODYC (DYFAMED, CARIOCA, IMCORP programmes)

Number and type of buoys :

(a) 5 CARIOCA buoys (moored and drifting) and one prototype of Carbon buoy were deployed in last 12 months ;

(b) One Carbon buoy was operational at 31 August ;

(c) None was reporting on GTS at 31 August.

---

[1] UK/French moored buoy « Gascogne » deployed in July 1998.

[2] Including three DATAWELL waveriders in French West Indies and the two UK/French moored buoys.

Purposes of programmes :

(b) Research : to understand, quantify and monitor the CO2 fluxes exchanged at the air-sea interface ;

(c) Technical : to develop a buoy able to measure CO_2 concentrations at the ocean-atmosphere interface (Programme CARIOCA) and another one to measure the distribution of carbon compounds at the same interface (Programme IMCORP). Such buoys will be used in the frame of GOOS.

Deployment areas :

Greenland Sea and Norwegian coast (IMCORP programme) ;
North and Subtropical Atlantic ;
Equatorial Pacific and Atlantic (ESCOBA programme) ;
Western Mediterranean Sea (DYFAMED programme) ;
Peri-Antarctic.

C. **STNMTE** (Service Technique de la Navigation Maritime et des Transmissions)

Number and type of buoys :

(a) STNMTE operates a network of 4 omnidirectional wave moored buoys and two directional (DATAWELL). In addition, STNMTE implemented wave measurement systems on two Aid-to-Navigation moored buoys ;

(b) Eight buoys were operational at 31 August ;

(c) None was reporting on GTS at 31 August.

Purpose of programme :

(a) Operational : to maintain a long duration wave measurement network along the French coasts and centralize the French wave data.

Deployment area :

French coasts

Plans for the next 12 months :

The network will be maintained. STNMTE will complete it with two or three additional waveriders within a few weeks.

D. **ORSTOM** (French participation to PIRATA programme – co-operation with Meteo-France and CNRS)

Number and type of buoys :

(a) Three Atlas buoys were moored in last 12 months ;

(b) Two buoys were operational at 31 August ;

(c) Two were reporting on GTS at 31 August.

Purposes of programme :

(a) Operational : to provide oceanographical and meteorological observations in real time to Weather Forecast Centres ;

(b) Research : to describe and understand the evolution of SST, upper ocean thermal structure and air-sea fluxes of momentum, heat and fresh water in the Tropical Atlantic.

Deployment area :
Tropical Atlantic Ocean

Plans for the next 12 months :
Two buoys will be replaced in October 1998 ;
One new buoy station will be implemented in February 1999 and a old buoy will be replaced on another station ;
Two new stations will be implemented in June 1999.

E. **IFREMER** (MAREL programme)

Number and type of buoys :
(a) One buoy was moored in last 12 months ;
(b) One buoy was operational at 31 August ;
(c) None was reporting on GTS at 31 August.

Purposes of programme :
To provide coastal environmental data in order to study and monitor the direct or indirect effects of human activities on marine environment ;

Deployment area :
Tropical Atlantic Ocean

Plans for the next 12 months :
Two new buoy stations will be implemented within a few weeks.

TECHNICAL DEVELOPMENTS

(b) Instrumentation

(i) Meteo-France continues to participate in the evaluation of SVP pressure drifters developed by the Global Drifter Center (USA). Ten SVP-B drifters were deployed in the last 12 months. In parallel to the use of drifters, Meteo-France continuously surveys the performances of air pressure measurement for almost of the drifters of that kind deployed over the World Ocean.

(ii) Meteo-France is participating in the evaluation of the WOTAN technique (Wind Observation Through Ambient Noise) applied to SVP drifters. Ten SVP-BW drifters, owned by Meteo-France, were deployed during the 12 past months. In addition, Meteo-France participates in the Atlantic Hurricane Array with NOAA/AOML and Navoceano.

(iii) Meteo-France also evaluates SVP-B drifters fitted with conductivity sensors. One buoy was successfully tested in July 1998 off France. It was recovered and expertised. It will be re-deployed with 2 others in September 1998.

(iv) The project of CO_2 concentration measurements from drifting buoys, managed by LODYC is continuing. Five buoys, called CARIOCA (CARbon Interface OCéan Atmosphère) and one Carbon buoy were deployed in last 12 months. It is planned to deploy 7 new drifters in the oceanic areas listed on the previous page, except the Greenland Sea.

(v) The technological developments in physico-chemical sensors offer now the possibility to operate autonomous instrumented station networks able to collect environmental data with higher frequency than by manual techniques. The MAREL concept, developed by IFREMER and implemented on moored buoys and other platforms, is able to measure various parameters such as salinity, pH, turbidity, dissolved oxygen, chlorophyll and nitrate concentrations, in addition to more common meteorological and oceanographic ones. Data are available on the Internet at http://www.ifremer.fr/marel/.

PUBLICATIONS (programme plans, technical developments, QC reports...)

Baker D.C.E., J. Etcheto, J. Boutin, Y. Dandonneau and L. Merlivat, 1998. Variability of surface-water fCO2 during seasonal upwelling in the equatorial Atlantic Ocean as observed by a drifting buoy, *submitted to Tellus.*

Blouch P. and J. Rolland, 1997. Evolution of the performances of air pressure measurement on the SVP-B drifter. Developments in Buoy Technology and Data Application, *DBCP Technical Document,* 12, 39-42.

Blouch P. and J. Rolland, 1997. Promising results of the WOTAN technique to provide wind measurements on SVP-BW drifters. Developments in Buoy Technology and Data Application, *DBCP Technical Document*, 12, 75-80.

Hood E.M., L. Merlivat and T. Johannessen, 1998. pCO2 variations and air-sea flux of CO2 in the Greenland Sea using high-frequency time-series data from CARIOCA drift-buoys, *submitted to J. Geophys. Res.*

Merlivat L. and P. Brault, 1995. Multiple sensor autonomous system to monitor carbon dioxide concentration at the ocean sea-air interface. *Sea Technology*, 23-30.

McNeil C. and L. Merlivat, 1996. The warm oceanic surface layer : implications for enhanced asymmetric CO2 fluxes and surface gas measurements. *Geophys. Res. Let.* 23, (24) , 3575-3578.

Météo-France - Centre de Météorologie Marine, Monthly statistics on buoys data transmitted on GTS in BUOY and SHIP codes (Air pressure, SST, wind speed and direction, air temperature).

Woerther P. and A. Grouhel, 1997. MAREL : Automated Measurement Network for the Coastal Environment, *Hydro International*, 5, 37-39.

SPECIAL COMMENTS

(a) Buoy QC

(i) The Centre de Meteorologie Marine of Meteo-France continues to operate quality control procedures on drifting buoys data. Warning messages are sent to the *buoy-qc@vedur.is* mailing list of Internet when a problem appears (e.g. bad location detected) or when a modification seems needed (i.e. to recalibrate or to remove a sensor from GTS). Statistics on comparisons with analysis fields are set up for each buoy and each LUT (when several are used for transmitting the data of a buoy). Monthly statistics are sent to the *buoy-qc@vedur.is* mailing list too. French monthly statistics and those provided by other centres are available on Internet through anonymous ftp in the */meteo/qc-stats* directory of host *ftp.shom.fr*. They are also available on the World Wide Web thanks to an application software which allows to get those of a particular buoy or a list of buoys. The http address is *http://www.shom.fr/meteo/rechstat*.

(d) Other

Like in 1996 and 1997, Meteo-France funded 10 barometers to be added to SVP drifters. These will be deployed in the Indian Ocean in November 1998. The action will be renewed in 1999 if possible.

DATA BUOY CO-OPERATION PANEL

Format for national reports on current and planned programmes

Country: Iceland

Year: a) 1995, 1996, 1997, 1998 (1119, 1325, 8525)
b) 1998 (1844)

CURRENT PROGRAMMES

A. Agency or programme: 1119, 1325, 8525, 1844

Number and type of buoys:
(a) deployed during years: 120+6
(b) operational at 31 August: 17+4 (1844)
(c) reporting on GTS at 31 August: 9

Purpose of programme:
(a) operational:
(b) met/ocean research: X
(c) developmental:

Main deployment areas: Coastal waters south and west of Iceland. Deep waters south of Iceland in the Iceland Basin.

B. Agency or programme: MRI-1119, 1844
SIO - 1325, 8525
(as above, repeat as often as necessary)

PLANNED PROGRAMMES Still not decided.

A. Agency or programme:

Number and type of buoys planned for deployment in next 12 months:

Purpose of programme:
(a) operational:
(b) met/ocean research:
(c) developmental:

Main deployment areas:

B. Agency or programme:
(as above, repeat as often as necessary)

TECHNICAL DEVELOPMENTS

(a) Buoy design:

(b) Instrumentation:

(c) Others:

PUBLICATIONS (on programme plans, technical developments. QC reports, etc.)

1) Héðinn Valdimarsson 1998. Circulation in Icelandic Waters from satellite tracked drifters, Altimetry and ATSR. Master Thesis; Univ. Copenhagen.
2) Héðinn Valdimarsson, Svend-Aage Malmberg, Mark Bushnell 1998. SVP drifters in Icelandic waters 1995-1997. 1998. DBCP-IOC/WMO - Technical Document.
3) Héðinn Valdimarsson and Svend-Aage Malmberg. 1998. Near-surface circulation in Icelandic waters derived from satellite tracked drifters. (Submitted to Rit Fiskideildar).

SPECIAL COMMENTS (if any)

(a) Quality of buoy data: OK

(b) Communications. OK

(c) Buoy lifetimes: Weeks, months, years.
Failures mainly due to drift-ice.

(d) Others:

Svend-Aage Malmberg and Héðinn Valdimarsson

Long distance drift from Icelandic waters into the Labrador and Norwegin Seas 1995-1998

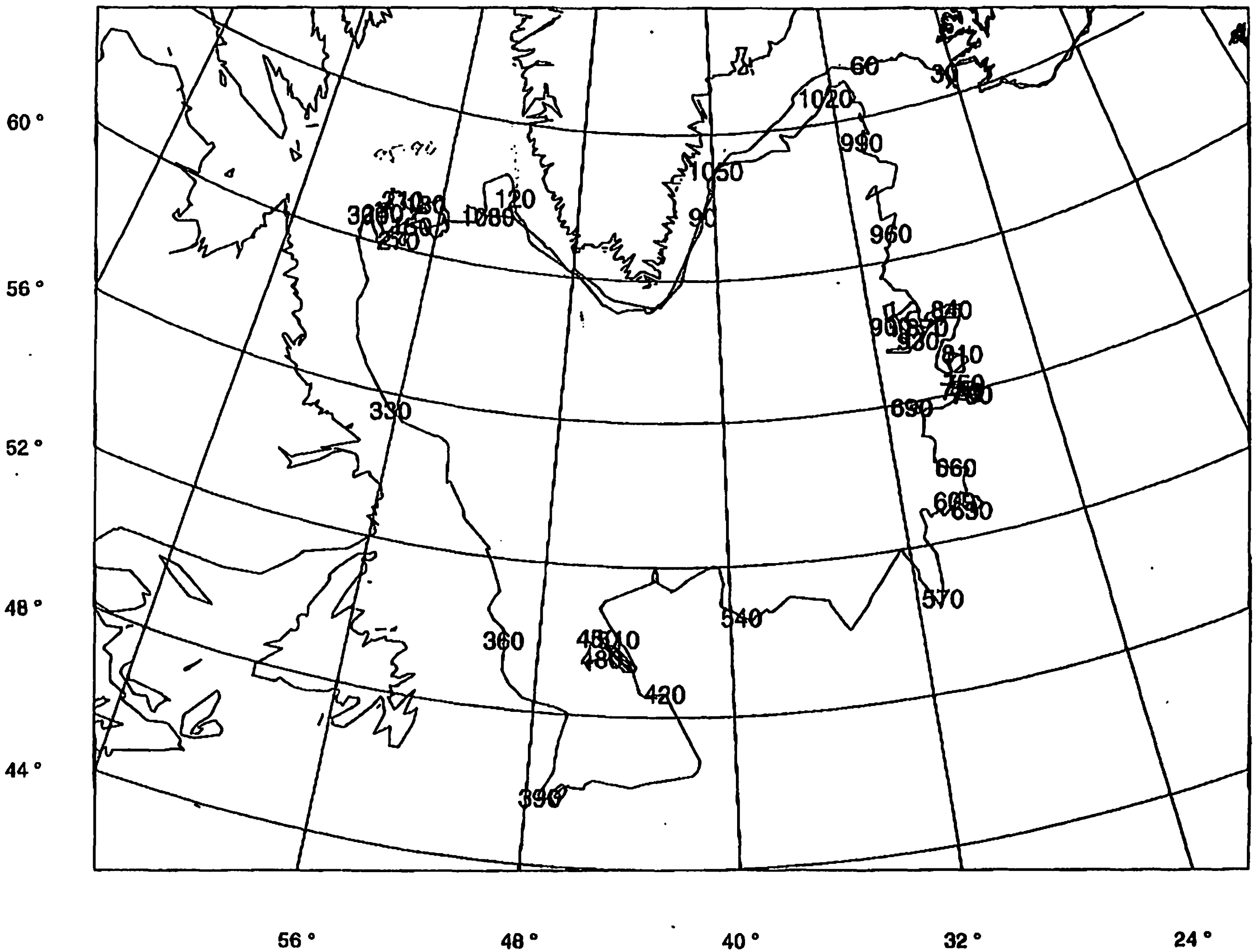
The drift of three selected SVP WOCE drifters is described, all deployed in Icelandic waters in August/September 1995 and still operating in late August 1998. These drifters are Clearwater drifters made available by prof. Peter Niiler and Mark Bushnell through the 1325 Scripps Institution of Oceanography (SIO), La Jolla programme which was carried out in co-operation with the 1119 Marine Research Institute, Reykjavík (MRI-R) programme. All together 120 drifters were deployed seasonally in Icelandic waters during the years 1995-1998, 60 Clearwater drifters and 60 Technocean drifters. Just a few drifters had a lifetime exceeding one year not to speak about three years as those described in the present report.

First, a drifter deployed in August 1995 off West-Iceland is considered (23508 Fig. 1). It drifted westwards to Greenland and followed the East and West Greenland Currents along Greenland and around Cap Farwell during 90 days. From there it drifted after some eddy drift in the Labrador Sea southwards to 46°N off Newfoundland where it in August 1997 after 360 days drift bent eastwards again. It crossed the Mid-Atlantic Ridge 1998 after 600 days just south of the Charlis-Gibbs Fracture Zone at about 52°N and continued northwards in the Iceland Basin up to 58°N; 28°W after 870 days, i.e. on the eastern side of the Reykjanes Ridge, there trapped in eddy circulation for a while. From there it crossed the Reykjanes Ridge and continued northwards on the western side of the ridge to 65°N (June 1998) closing the loop of the "Sub Polar Gyre". There it turned again southwards with the East Greenland Current and around Cap Farwell into the West Greenland Current (August 1998) just along the same paths as almost 1000 days or 32 months before, which corresponds to about 6 km per day or 6-7 cm/sec. in overall average. The East and West Greenland Currents and the Labrador Current show the highest velocities or 20-30 cm/sec.

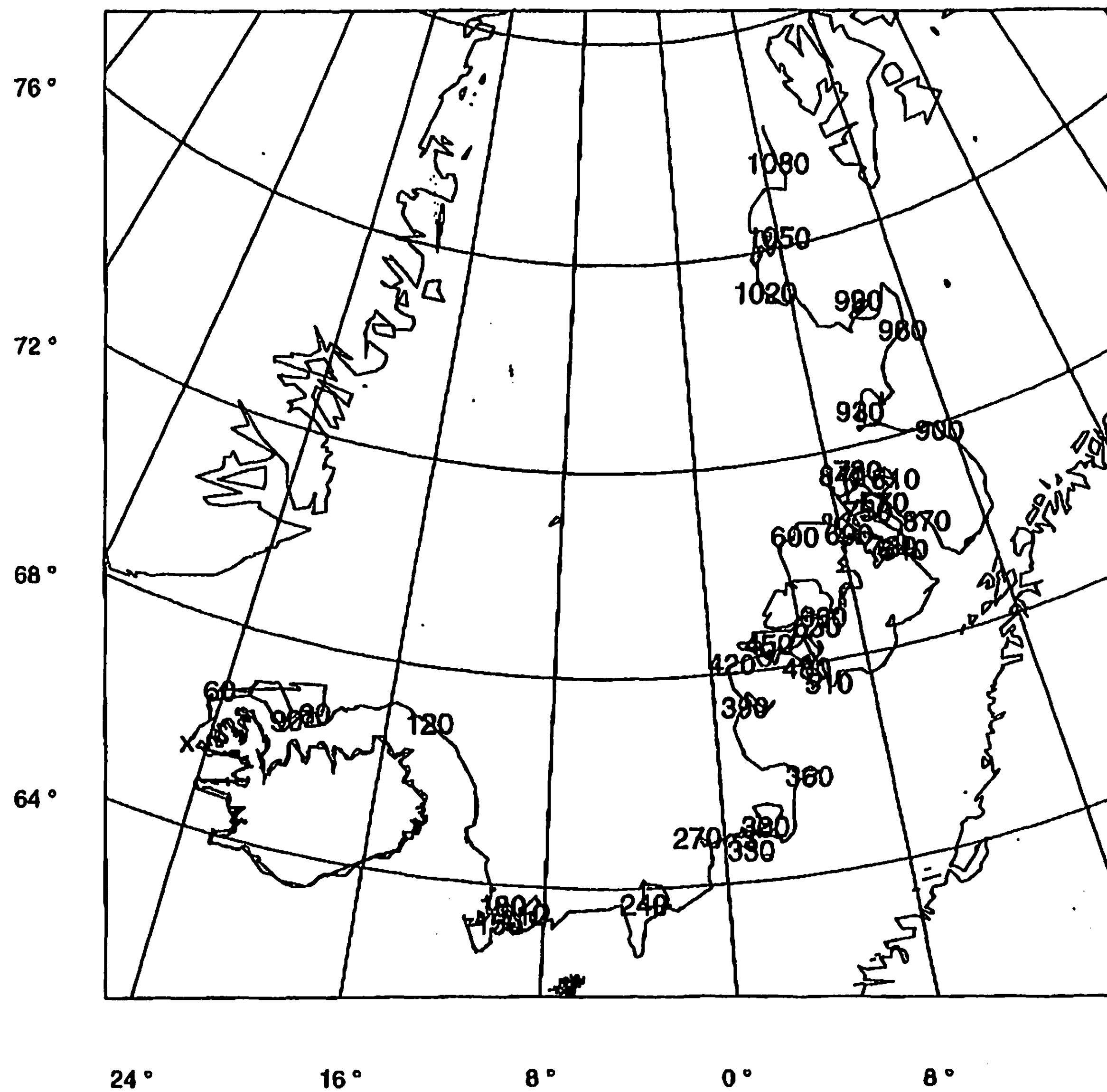
Secondly, two other long distance drifters considered in this report drifted eastwards into the Norwegian Sea and Norwegian waters (Fig. 2). They (23525, 23577) were deployed in the waters west of Iceland in August/September 1995 and drifted with the North Icelandic Irminger Current into North Icelandic waters in three to six months. From there they continued eastwards and southwards with the East Icelandic Current into the Faroe Current north of the Faroes (1996-1997) and further eastwards into Norwegian waters at 63-64°N. They continued northwards along Norway with the Norwegian Atlantic Current and further into the waters west of Spitzbergen after 1000-1100 days (August 1998). One of these drifters was for a time captured by eddies in the Lofot Basin. The overall mean drift speed corresponds to 3.6 km per day or 4.0 cm/sec., but the highest velocities were obtained in the East Icelandic Current north of the Faroes and in the Norwegian Atlantic Current or up to 15 cm/sec.

These results of drifters deployed in Icelandic waters in August/September 1995 reveal at least two exiting items, i.e. a long lifetime and a drift around the Sub-Polar Gyre in the Irminger and Labrador Seas in about 1000 days as well as into the Norwegin Sea northwards to Spitsbergen, also in about 1000 days. This drift was along known pathways of ocean circulation in the area. The steering by the bottom topography is also very evident.

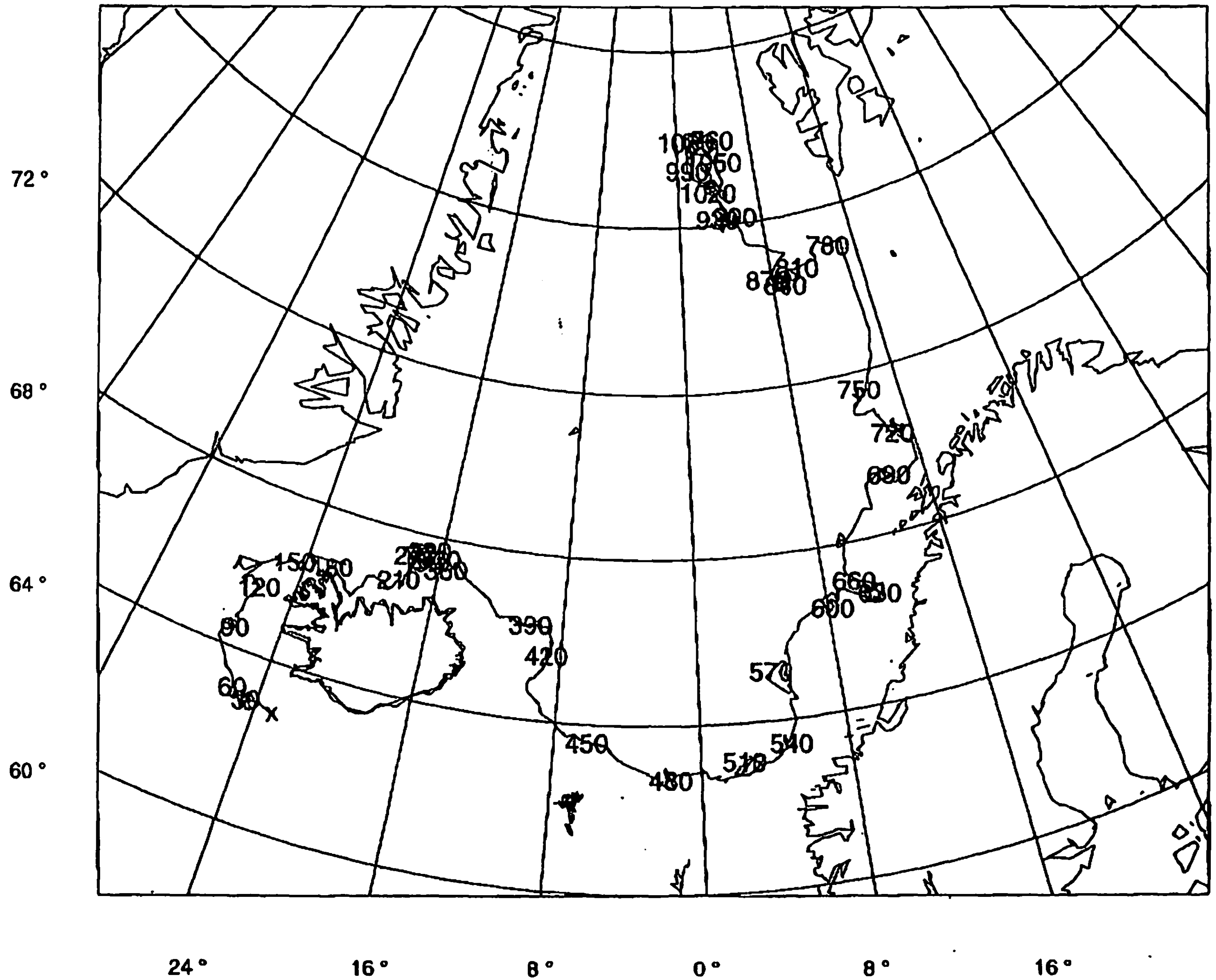
Drifter 23508 (aug 95), 18 Aug 1998



Drifter 23525 (aug 95), 18 Aug 1998



Drifter 23577 (sep 95), 18 Aug 1998



Heðinn Valdimarsson and Svend-Aage Malmberg:

Title: Surface drifters in Icelandic Waters 1997-1998.

Abstract: In 1997-1998 deployment of SVP drifters was continued in Icelandic waters. May 1997 to February 1998 was the last year of a 3 years co-operation program between Marine Research Inst. and Scripps Inst. of Oceanography. A brief description of the drifter results is given. In 1998 a new experiment started with surface drifters in coastal waters. Results of this experiment will be discussed and a comparison of GPS positions and Argos full-cycle positions will be described.

DATA BUOY CO-OPERATION PANEL

Format for national reports on current and planned programmes

Country: India

Year: 1997-1998

CURRENT PROGRAMMES

A. **Agency or programme**: National Data Buoy Programme (NDBP) - National Institute of Ocean Technology - Department of Ocean Development

Number and type of buoys:
- (a) deployed during year: 7 in 1997 (5 wavescan, 2 seawatch); 5 in 1998 (2 wavescan, 3 seawatch)
- (b) operational at 31 August: 10
- (c) reporting on GTS at 31 August: under process

Purpose of programme:
- (a) operational: yes
- (b) met/ocean research: yes
- (c) developmental:

Main deployment areas: Indian waters - Arabian sea & Bay of Bengal

B. **Agency or programme:**
(as above, repeat as often as necessary)

PLANNED PROGRAMMES

A. **Agency or programme:** NDBP

Number and type of buoys planned for deployment in next 12 months: To ensure all 12 buoys operational

Purpose of programme:
- (a) operational: yes
- (b) met/ocean research: yes
- (c) developmental:

Main deployment areas: Indian waters

B. **Agency or programme:**
(as above, repeat as often as necessary)

TECHNICAL DEVELOPMENTS Will begin from 1999

(a) Buoy design:

(b) Instrumentation:

(c) Others:

PUBLICATIONS (on programme plans, technical developments, QC reports, etc.)

1. NDBP experience in buoy deployment, retrieval and operations

2. A preliminary analysis of meteorological and oceanographic observations during the passage of a tropical cyclone in September 1997 in the Bay of Bengal

[*All above documents would be presented during the session*]

SPECIAL COMMENTS (if any)

(a) Quality of buoy data: Good

(b) Communications: Good

(c) Buoy lifetimes: -

(d) Others: -

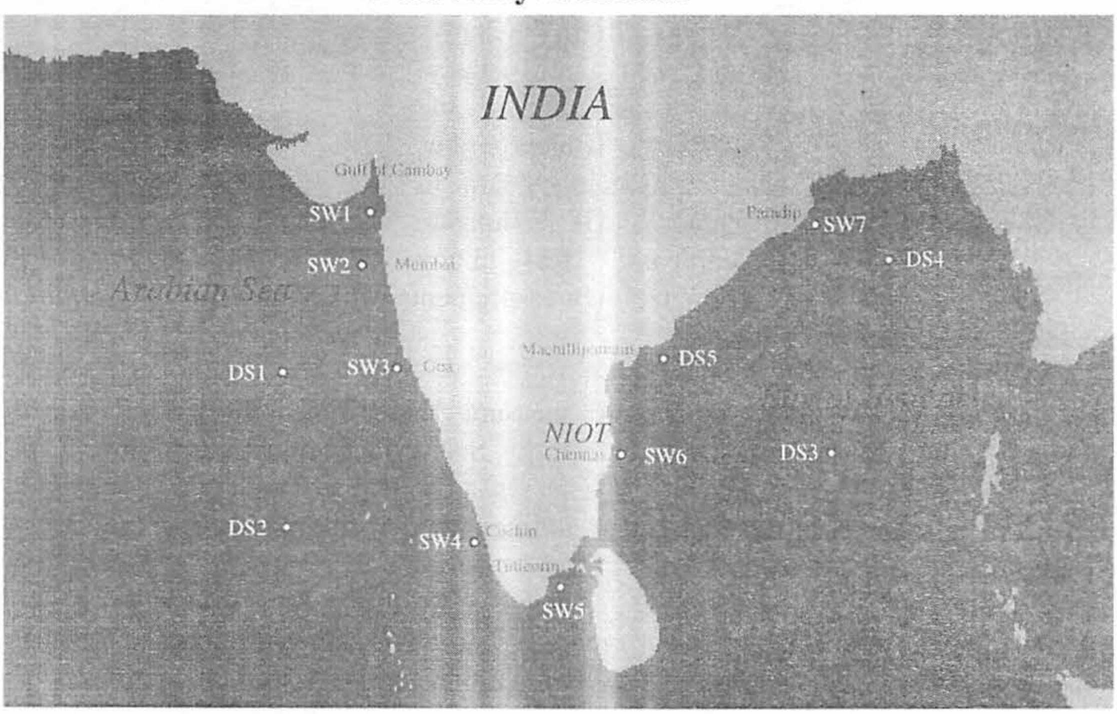
NATIONAL DATA BUOY PROGRAMME
NATIONAL INSTITUTE OF OCEAN TECHNOLOGY
(Department of Ocean Development, Government of India)

1. PROGRAMME OBJECTIVES :

The Department of Ocean Development, Government of India has established a National Data Buoy Programme (NDBP) with partial financial assistance from NORAD at National Institute of Ocean Technology (NIOT), Chennai, with the following main objectives:

- To collect met-ocean parameters in Indian seas
- To monitor the marine environment
- To generate and supply data products
- To improve the weather and ocean state prediction
- To validate satellite data
- Indigenization of buoys and software
- To form as GOOS India component

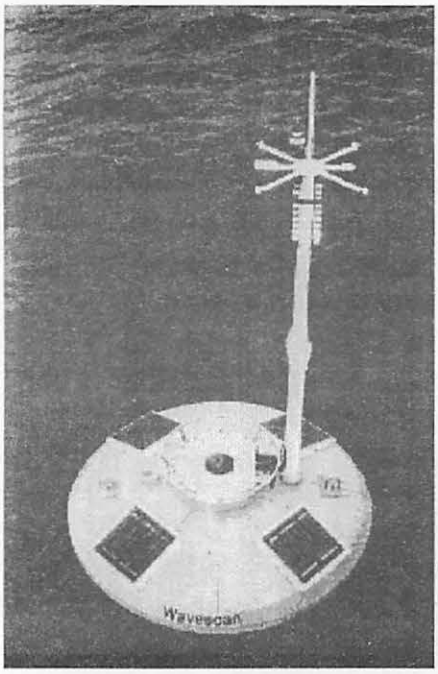
Data Buoy Locations



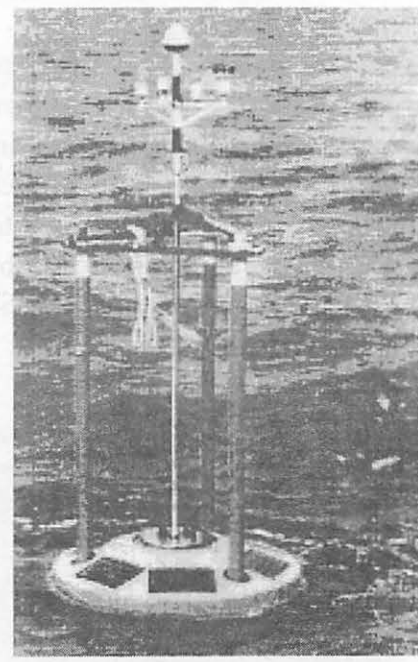
2. DATA BUOYS FEATURES:

OCEANOR - The Oceanographic Company of Norway has bagged the order to supply, instal and maintain the data buoys. The Project is effected from December'96.

OCEANOR have supplied two types of buoys namely WAVESCAN buoy and SEAWATCH buoy. WAVESCAN is a discus shaped wave directional buoy. SEAWATCH is a vertically stabilized buoy, based on a transparent framework, surrounding the central buoyancy.



Wavescan



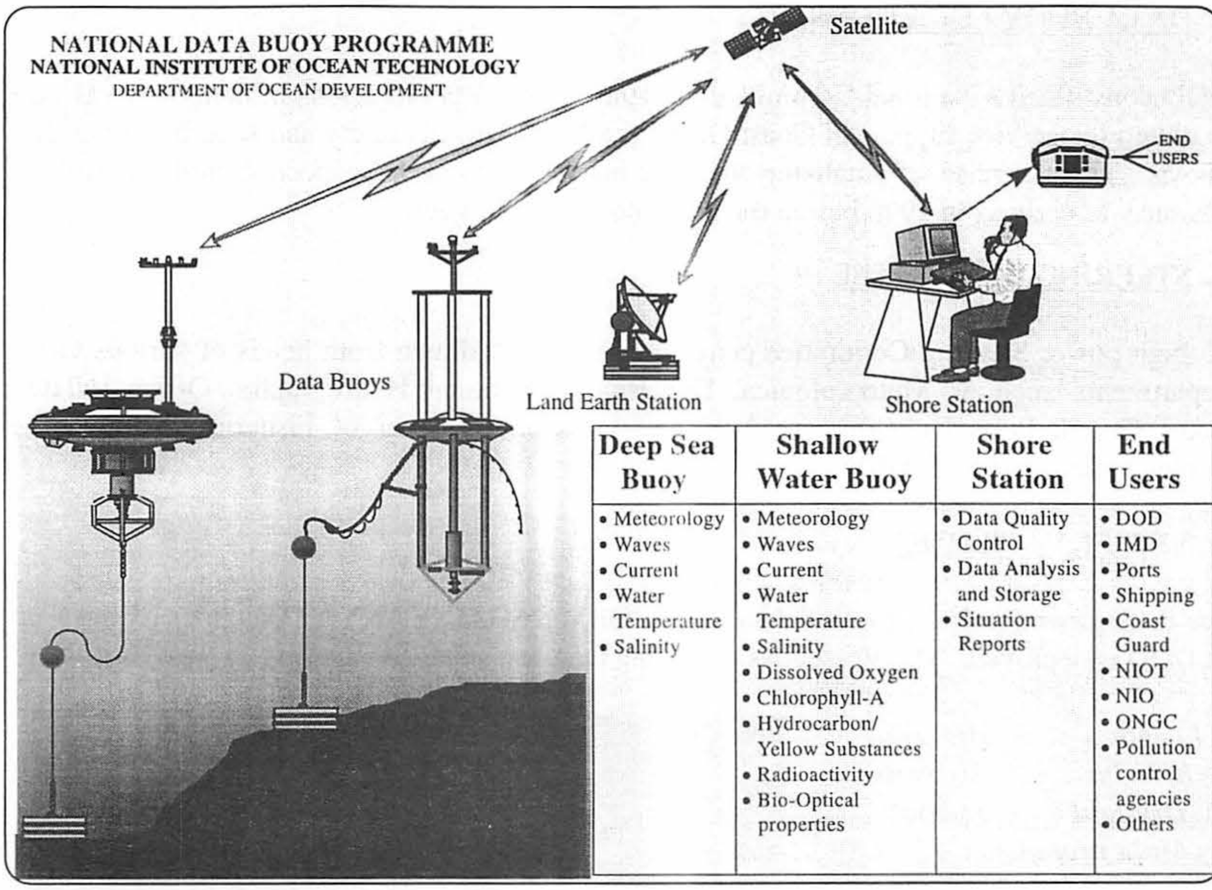
Seawatch

The choice on the right type of buoy used normally depends upon its intended deployment and measurement requirements. The optimum performance of the specific mooring design is provided based on the type of buoy, location and water depth. Both the buoys are equipped with a unique wave sensor, the MRU-6. It incorporates a high accuracy built-in three axis fluxgate compass for buoy orientation measurements which are specially important for wind and wave directional data.

Both the data buoys carry the sensors to measure Wind speed and Wind direction, Atmospheric pressure, Air temperature, Conductivity, Sea surface temperature, Current speed current direction and Wave parameters. The buoys are equipped with global positioning system, beacon light and satellite transceiver and are fitted with solar panels to charge the battery pack.

The SEAWATCH buoy is designed to carry more sensors to measure additional parameters like Radioactivity, Turbidity, Chlorophyll-A, Hydrocarbon and Dissolved Oxygen.

Both the buoys are equipped with powerful data acquisition unit that gives instant, accurate data collection and processing. The data collected from the buoys are transmitted through INMARSAT-C (two way communication satellite) to the shore station.



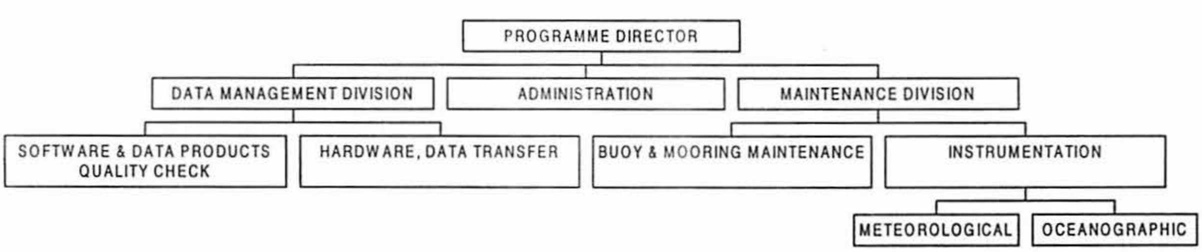
Deep Sea Buoy	Shallow Water Buoy	Shore Station	End Users
• Meteorology • Waves • Current • Water Temperature • Salinity	• Meteorology • Waves • Current • Water Temperature • Salinity • Dissolved Oxygen • Chlorophyll-A • Hydrocarbon/ Yellow Substances • Radioactivity • Bio-Optical properties	• Data Quality Control • Data Analysis and Storage • Situation Reports	• DOD • IMD • Ports • Shipping • Coast Guard • NIOT • NIO • ONGC • Pollution control agencies • Others

3. NDBP SET UP :

National Institute of Ocean Technology, an autonomous body of Department of Ocean Development has been entrusted with execution of the National Data Buoy Programme.

The NDBP at NIOT is headed by a Programme Director who is assisted by 15 complements and they are grouped in the organisation structure as given below:

ORGANISATION STRUCTURE OF NDBP



NDBP has a versatile team comprising of experts drawn up from the fields of Project and System Management, Physical Oceanography, Digital Electronics & Software, Material Science and Mooring, Meteorological and Oceanographic instrumentation, etc. They complement each other in case any gap exists in their operational approach.

4. DATA BUOY LOCATIONS :

DOD constituted a National Committee to identify the correct locations of data buoys as well to obtain the service support of Coast Guard and Navy towards safety and security of the data buoys. This exercise of finalising the data buoys locations have been completed well in advance, as early as in 1996 before the launching of the Project.

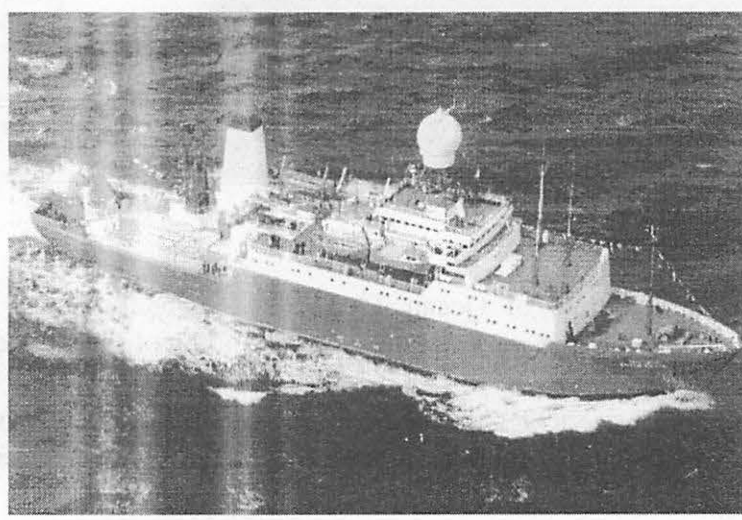
5. STEERING COMMITTEE :

A high power Steering Committee constituted by DOD, drawn from heads of various Govt. departments such as Meteorological Department, National Hydrographic Office (NHO), Coast Guard, Ports Development Advisor and Commissioner of Fisheries monitors the implementation of the NDBP.

6. VESSEL FACILITIES:

For deployment and retrieval of data buoys, ORV SAGAR KANYA (Daughter of the Sea) of DOD is deployed. The Vessel has following features:

i) ***Length*** - 100.34 m
ii) ***Breadth*** - 16.39 m
iii) ***Draught*** - 5.60 m
iv) ***Main propulsion*** - Electric twins screw - 1230 Kw per shaft
v) ***Endurance*** - 10000 NM
vi) ***GRT*** - 4209
vii) ***Crane facilities*** - 2 nos. 4 ton Atlas crane and and 1 no. 15 ton NMF crane.



7. TRAINING :

Prior to launching of the Data Buoy Programme, Indian counterparts have undergone training at M/s.OCEANOR, Norway for a period of three weeks in various aspects of data buoy system viz., assembly, deployment, operation, maintenance of buoys, calibration of sensors and data management.

8. TIME SCHEDULE :

The Programme has two years implementation phase commencing from December'96. During this period, it has been envisaged to receive progressively the data buoys, shore station and to deploy all the buoys within February'98. This tight time schedule has been achieved with the close cooperation of OCEANOR and support by various Indian Government agencies.

9. <u>PROJECT MANAGEMENT</u> :

With the close co-ordination of all concerned, NIOT launched the first data buoy on 21st August'97 at Chennai Port in the presence of the Secretary, Department of Ocean Development and Chairman, Chennai Port Trust.

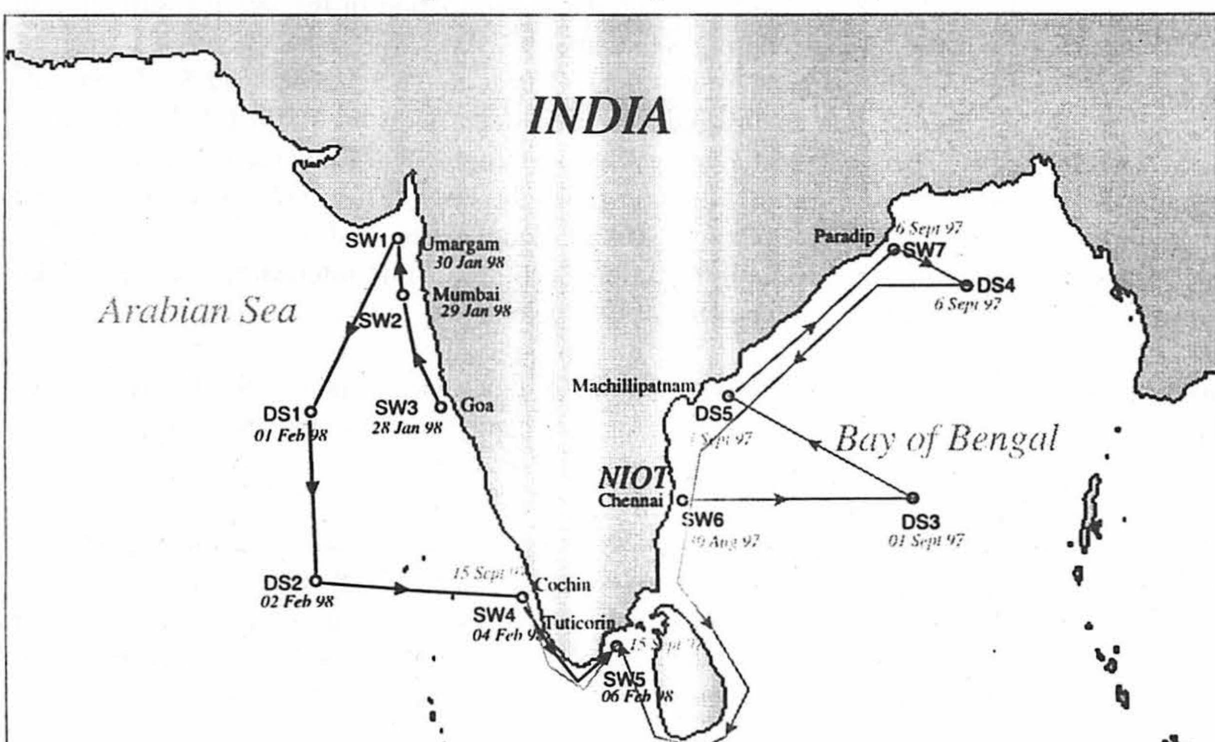
NIOT and OCEANOR team sailed onboard DOD's vessel ORV SAGAR KANYA nearly 9000 miles for 30 days in two legs of operation for the deployment of 12 data buoys in Indian waters.

In the first leg of operation between 30th August'97 to 16th September'97, six data buoys have been deployed in Bay of Bengal and at South West of India. The second leg of operation began on the auspicious date, 26th January, the Republic Day of India. The operation continued till 6th February'98 in the Arabian Sea, for deployment of five data buoys. The data buoys have been installed from a water depth of 20m to 4500m and 10 miles to 200 miles away from the shore / Indian land.

Deployment of Data Buoys

First leg - Bay of Bengal (Cruise SK-126)

Second leg - Arabian Sea (Cruise SK-132)



10. BUOY MAINTANANCE:

In total 20 deployment, 9 retrieval and 6 servicing of data buoys have been completed within 12 months of launching of the programme since 21st Aug 1997.

11. PERFORMANCE OF DATA BUOYS:

It is the first experience in India to have such buoys in shallow as well as deeper water. Our experience from the buoys are quite interesting.

These data buoys, in fact, have stood the rough weather both in the Bay of Bengal and the Arabian Sea and happen to record the severe conditions like :

(a) Significant wave height	- 7 m
(b) Swell height	- 6 m
(c) Wind Speed	- 20m/sec.

There happened to be a mooring failure at one location off Gulf of Cambay, where the current speed experienced by the buoy happened to be 2m/sec.

The data buoys in the Bay of Bengal have captured the formation of the low pressure system and its attaining cyclonic strength during September'97. A low pressure system was formed to the south east of Machilipatnam by 00.00 UTC near to 15.5 ° N and 82.5 ° E on 23rd September 1997. It was further intensified into deep depression by 12.00 UTC and started moving northwards. The system attained cyclonic strength by 24th September and moved towards north, north eastward almost in along-shore direction. This cyclonic storm attained the strength of severe cyclonic storm before striking Bangladesh coast on 27th September. The data buoys in the visinity of cyclonic track have captured some interesting features of the low pressure developments and movements of the cyclone.

Similarly, the cyclonic storm hit Gujarat in June'98 have been captured by the data buoys deployed in Arabian sea. Some of the interesting data captured during the above two cyclones are enclosed herewith.

There were difficulties in the buoy operation and maintenance as one of the major problems happened to be fouling in shallow water buoys within few weeks of deployment. The anti-fouling paint provided for this purpose is ineffective. The current speed, salinity, water temperature data and that of all other water quality parameters become totally unreliable after six weeks. As such, all oceanographic instruments call for frequent maintenance.

There were damages to the data buoys. Through media, Government agencies and Coast Guard, we are endeavouring our best to protect the data buoys.

12. DATA QUALITY:

The sensors prior to installation on data buoys are checked individually for its performance against their operational limits and accuracy. The sensors after installation to the buoy are verified with buoy system. The buoy, complete with sensors are again tested prior to deployment. Whenever the buoy is taken for maintenance, the sensor status is verified against their performance standard and accuracy. In case the sensor is not within its performance standards and accuracy limits, the same is replaced with correct one. Only tested sensors are installed on the buoy before deployment.

A range of quality checks are employed to ensure the data to be of good quality. Random cross checks are carried out with the information available from other data sources and general climate of the region. The data are checked manually every day and suspected data are flagged.

13. DATA DISSEMINATION :

Data thus collected are now being sent on daily basis to India Meteorological Department for their weather forecasting and to Coast Guard for the rescue operation. Besides data are being disseminated to various scientific and research communities for development and research purposes against their demand

The data will be utilised for
- Monitoring of marine environment and Environmental impact assessments
- Improved weather forecasting
- Ocean state - present and forecasting - for shipping industry and research purposes.
- For the design of coastal and offshore structures.
- Validation of satellite data.

14. SAFETY AND SECURITY OF DATA BUOYS:

Prior to launching of the Programme, action has been initiated to create awareness to the fishermen through newspaper and local State Fisheries Department about the importance of the Data Buoy and their usefulness for the country in improving the weather prediction, monitoring of marine environment and Environmental impact assessments, fisheries etc. and the necessity to protect the buoy and not to damage by carryingout fishing operation closer to the buoy site. Besides, after each deployment, the mariners notification has been promulgated through the Chief Hydrographic Office of the Govt. of India.

15. USEFULNESS OF BUOY DATA :

Any satellite data suffers from interference done to atmosphere and clouds, apart from the errors introduced by sensor characteristics itself. To retrieve oceanographic parameters accurately one needs to validate the satellite data with in-situ data. There are a host of methods to collect in-situ data, significant among them being with research vessels and data buoys. Ships are an expensive platform for collection of in-situ data, primarily, ship time. Clouds can add to the woes during observation time and this means longer observation periods for the clouds to clear (OCM) leading to more ship time. Data buoys on the other hand are ideal platform - less expensive, long term observations and can be left unmanned saving manpower.

An array of data buoys cannot be matched with ships moving to catch a satellite pass.

16. STATUS OF THE BUOYS AS ON 31ST AUG 1998

- At present 10 data buoys are in their position.
- The data buoy deployed off Umargaom (SW1) drifted and has been retrieved by us in April 1998. A buoy would be re-deployed at this location at the earliest opportunity.
- The buoy deployed off vizag Port (SW7) has been severely damaged by a vessel on 11th Aug 1998 and found unserviceable.
- The buoy deployed off Lakshadweep (DS2) and Off Bombay (SW2) stopped data transmission from 3rd Aug 1998 and 29th Aug 1998 respectively. The buoys would be taken up for maintenance in Sept 1998 and shall be put in to operation.

17. NDBP CAPABILITY :

Having carried out about 20 deployment operations both in shallow water and deeper water, the present NDBP set up is interested to provide support in deployment and recovery of data buoys in Asian region.

18. NEAR FUTURE TASK AHEAD:

- To establish Dial-up facility for the various end users for the data retrieval.
- Surface data dissemination through GTS format.
- Data quality management as per established norms.
- To develop buoy technology locally in progressive manner.

National Institute of Oceanography

REPORT ON DRIFTING BUOY PROGRAMME
(sponsored by Dept. of Ocean Development)

Buoy deployments during 1997:

A total of 10 drifting buoys have been deployed in the north Indian Ocean by National Institute of Oceanography (NIO) under the National Drifting Buoy Programme funded by Department of Ocean Development, Govt. of India. Most of the deployments were from the research vessel ORV Sagar Kanya. Table I gives the summary of deployment locations and data return from the sensors. All of them were SVP-B buoys fitted with drogues and pressure sensors. The buoys with WMO ID indicate that the data are available over GTS. Fig. 1 shows the buoy tracks since August 1991 to December 1996 and Fig. 2 from Jan 1997 to May 1998.

Buoy deployments during 1998:

Five TOGA type buoys fitted with additional sensors for air temperature, wind speed and wind direction and one SVP-B buoy have been deployed in the northern and equatorial Indian Ocean till to date and their data are being distributed on GTS. Table II summarizes the deployments made during 1998. Thirteen SVP-B buoys are ready for deployment during this year. In addition, it is planned to procure six to twelve SVP-B buoys during 1998.

Eight drifters are being assembled/fabricated at NIO (using hulls/drogues provided by Global Drifter Centre at AOML) and they would be available for deployment soon.

It is planned to deploy 15 to 20 drifters (including a few with wind sensors) in the north Indian Ocean during 1999.

Buoy deployments under the Co-operative Programme with the Global Drifter Centre:

Under this programme, 9 SVP buoys supplied by NOAA/AOML were deployed during the research cruises of NIO in the equatorial and central Indian Ocean.

Data Analysis and Results:

A monthly surface current climatology was prepared using all the drifter data available from the Indian Ocean for the period 1987 to 1997 at different sources (AOML, MEDS, NIO and Prof. Molinari). Data from about 400 buoys were used for the preparation of monthly mean surface current vectors over a 2^0x2^0 grid. The distribution of data on a 2^0x2^0 grid is still inadequate to analyze the details of surface currents on a monthly scale. However, the data is useful to infer the large-scale features. Figure 3 presents the mean surface current vectors for April and November when the Equatorial Jet (Wyrtki Jet) is fully developed. The winter jet in November appears to be stronger than the spring jet in April. Majority of the buoys moved towards east with the EJ traveled towards south along the

Indonesian islands and joined the westward flowing South Equatorial Current (with its axis around 10 to 15^0S). A cyclonic gyre develops in Bay of Bengal in November and an anti-cyclonic gyre in April. The North Equatorial Current is conspicuously absent during both the months.

Surface velocities derived from the drifters were also used to study inertial currents in the Indian Ocean. In the Indian Ocean, the inertial currents are highly intermittent lasting only for few cycles; mostly four to five cycles. Figure 4 shows a typical lagrangian spectrum for the Indian Ocean. The inertial currents contribute towards significant amount of energy in the spectrum; mostly higher than the energy contributed by tidal currents. During the passage of weather disturbances, the inertial current speeds exceed the magnitude of mean currents. In the Bay of Bengal, during the passage of a cyclonic storm in November 1995, the inertial current speeds were as high as 120 cm s^{-1}

Table I. Summary of drifter deployment and data return during 1997

NIO ID	ARGOS ID	WMO ID	Make	Sensors	Date of deployment	Date of landing	Drifter days	Sensor life in days					Drogue lose	REMARKS
								SST	A.P.	A.T	W.S.	W.D.		
970001	15705	23913	Met Ocean	SST,P	15.05.97	24.05.97	10	10	10	-	-	-	-	
970002	15702	23924	"	SST,P	17.05.97	Somalia 10.03.98	298	298	298	-	-	-	-	
970003	15709	23912	"	SST,P	04.06.97	Madagascar 23.04.98	324	324	324	-	-	-	19.11.97	
970004	15703	23911	"	SST,P	09.06.97	*	*	*	*	-	-	-	-	
970005	11087	23925	"	SST,P	30.07.97	Africa 01.05.98	274	274	274	-	-	-	-	
970006	11086	23926	"	SST,P	23.08.97	Sri Lanka 08.10.97	47	47	47	-	-	-	06.10.97	
970007	11089	23927	"	SST,P	05.10.97	Gujarat 10.11.97	35	35	35	-	-	-	-	
970008	11090	23928	"	SST,P	01.12.97	*	*	*	*	-	-	-	-	
970009	11091	23929	"	SST,P	03.12.97	03.04.98	121	0	121	-	-	-	-	
970010	11088	23920	"	SST,P	15.12.97	Lakshdweep 06.01.98	23	23	23	-	-	-	-	

Table II . Summary of drifter deployment and data return during 1998

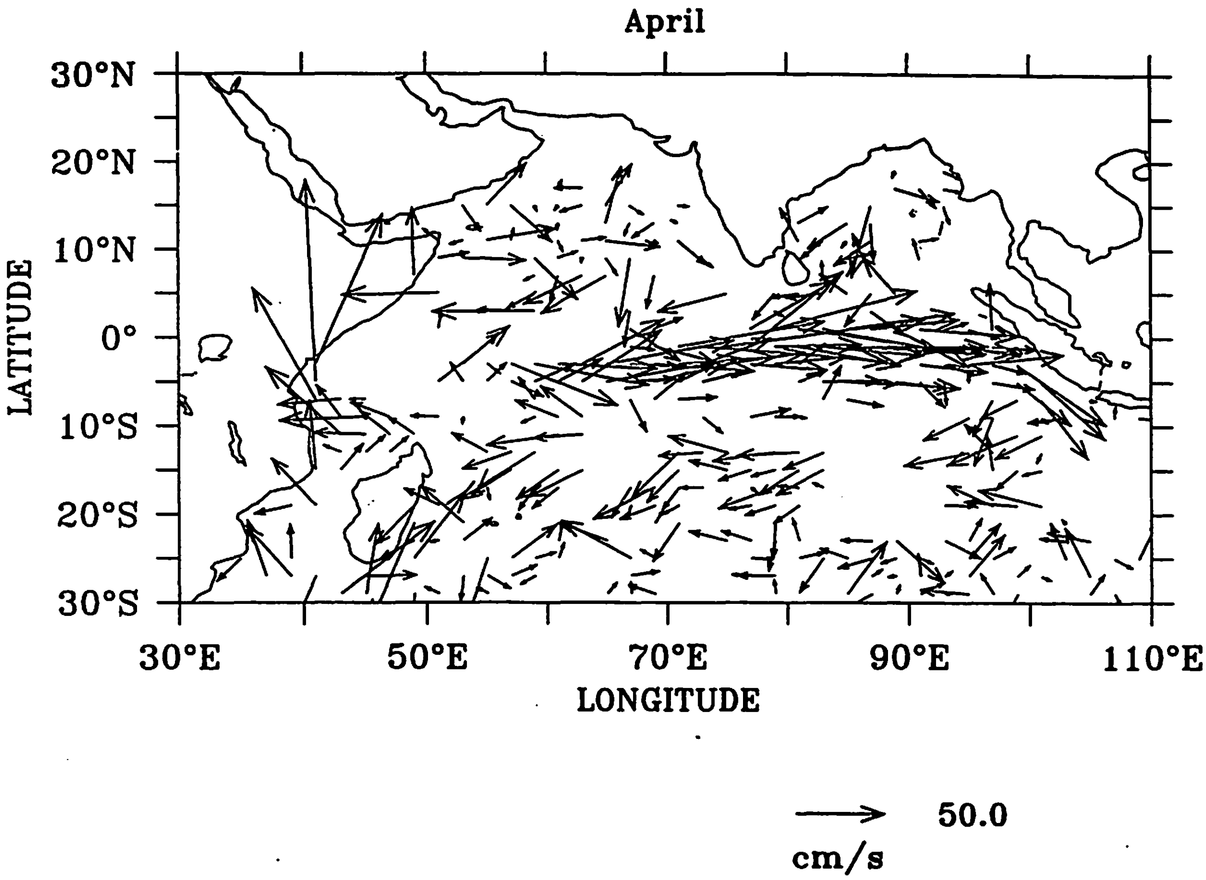
NIO ID	ARGOS ID	WMO ID	Make	Sensors	Date of deployment	Date of landing	Drifter days	Sensor life in days					Drogue lose	REMARKS
								SST	A.P.	A.T	W.S.	W.D.		
980001	11354	23931	CTA (TOGA)	SST,AT,P, WS,WD	03.01.98	Somalia 06.03.98	62	62	62	62	62	62	No drogue	
980002	11352	23946	"	SST,AT,P, WS,WD	04.01.98	11.03.98	67	67	67	67	67	67	No drogue	
980003	11353	23947	"	SST,AT,P, WS,WD	05.01.98	20.01.98	14	14	14	14	14	14	No drogue	
980004	15704	23949	Met ocean (TOGA)	SST,AT,P	06.01.98	*	*	*	*	*	-	-	*	
980005	11355	--	"	SST,AT,P, WS,WD	03.03.98	*	*	*	*	*	*	*	*	
980006	11351	--	CTA (TOGA)	SST,AT,P, WS,WD	24.03.98									No data.

Indian Ocean
Drifting Buoy Programme
(Buoys deployed during Aug 1991 - Dec 1996)

FIG. 1

Indian Ocean
Drifting Buoy Programme
(Buoys deployed during Jan 1997- May 1998)

FIG. 2


April
30°N
20°N
10°N
0°
10°S
20°S
30°S
LATITUDE
30°E
50°E
70°E
90°E
110°E
LONGITUDE
50.0
cm/s

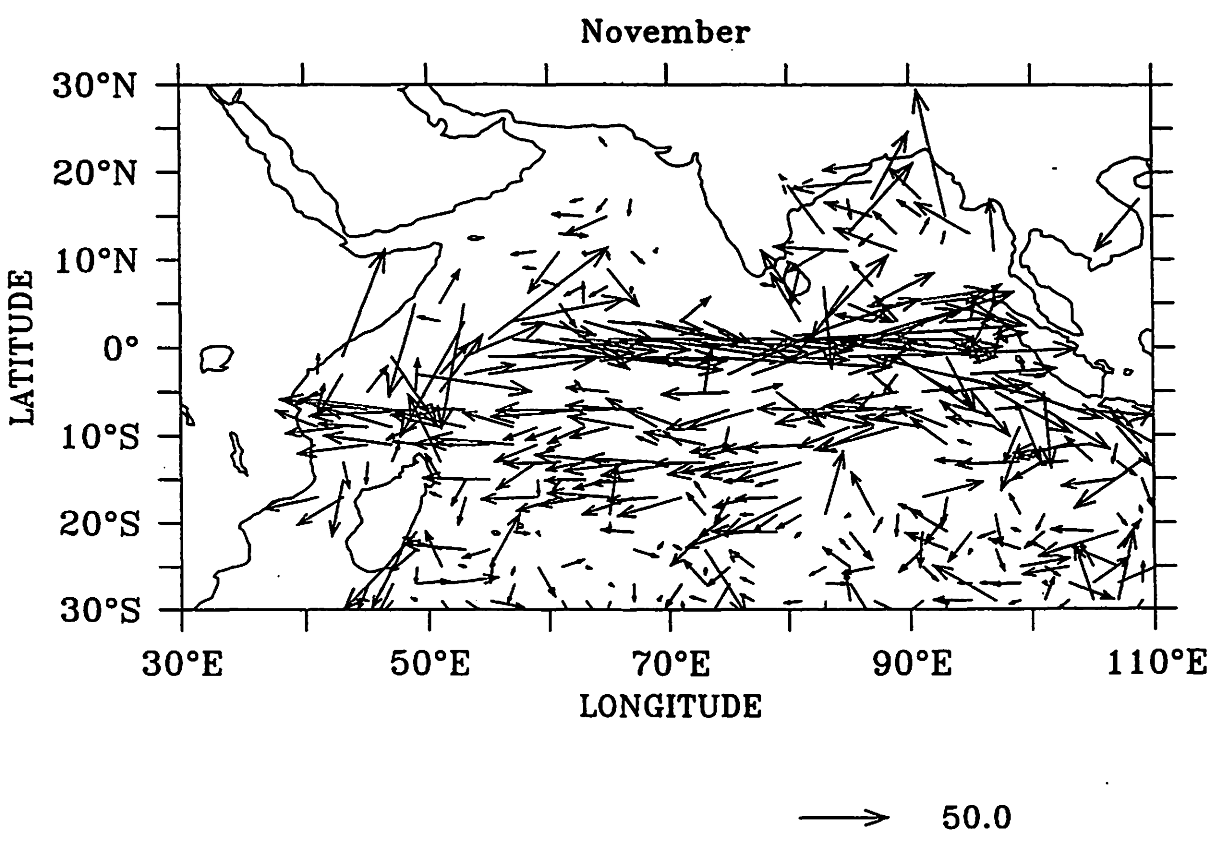

November
30°N
20°N
10°N
0°
10°S
20°S
30°S
LATITUDE
30°E
50°E
70°E
90°E
110°E
LONGITUDE
50.0

FIG. 3

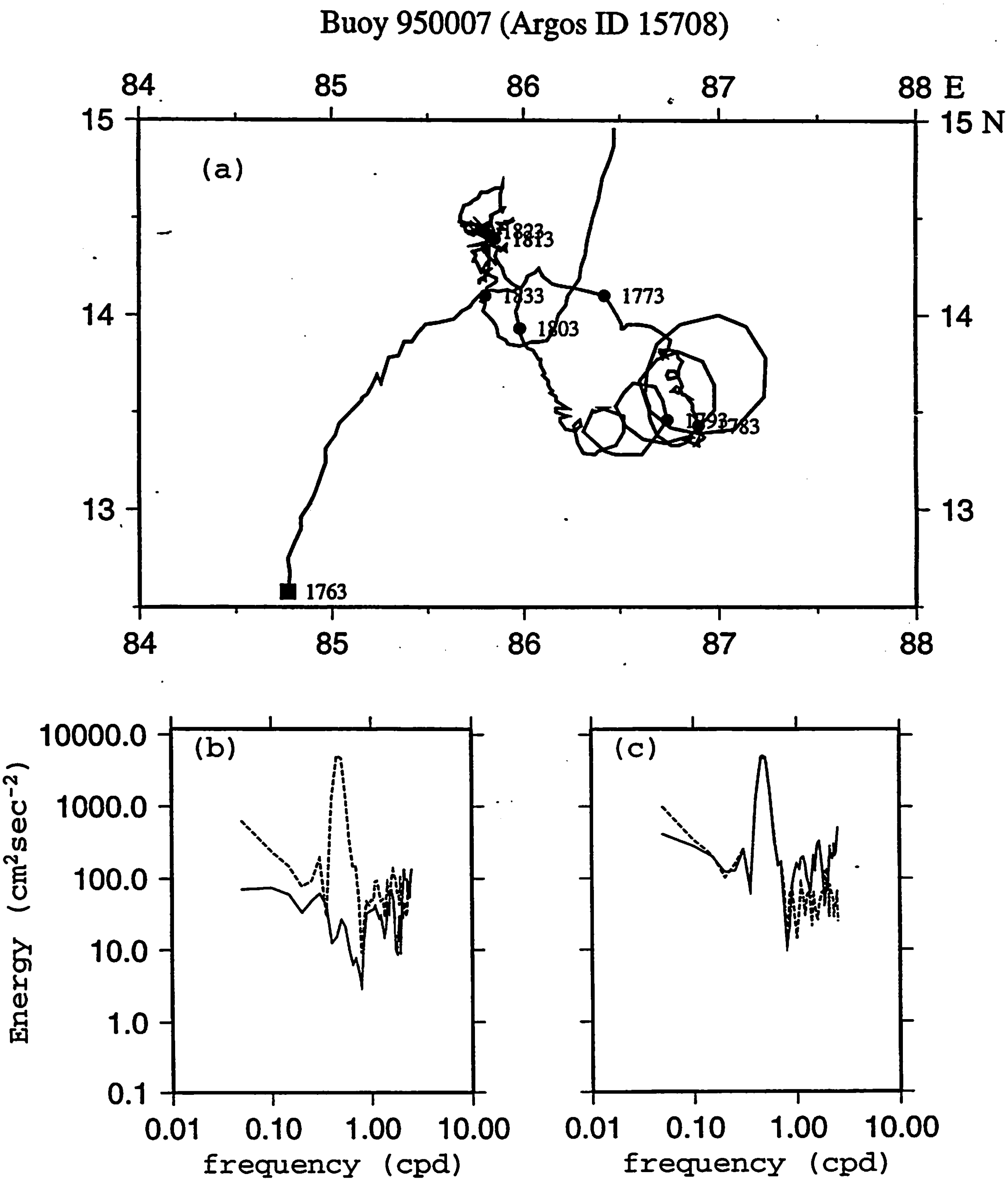


Fig.4 : (a) Track. Squre is the starting and dots for 10 day interval
(b) Rotory spctra. Solid line for anticlockwise rotation and dashed line for clockwise
(c) Energy spctra of u&v components. Solid line for u and dashed line for v

Country: **JAPAN**

Year: **1998**

CURRENT PROGRAMMES

A. Japan Meteorological Agency

Number and type of buoys:
- (a) deployed during the year: 3 moored buoys with 11 maritime meteorological and oceanographic sensors
- (b) operational as of 31 August: 3
- (c) reporting on GTS at 31 August: 3

Purpose of programme: operational meteorological and oceanographic observation

Main deployment areas: Sea of Japan, western North Pacific

B. Maritime Safety Agency

Number and type of buoys:
- (a) deployed during the year: 24 surface drifters with holey sock drogues and SST sensors
- (b) operational as of 31 August: 20
- (c) reporting on GTS at 31 August: None

Purpose of programme: ocean research (ocean circulation)

Main deployment areas: North Pacific, Indian and Antarctic Oceans

C. Japan Marine Science and Technology Center

Number and type of buoys:

(a) deployed during the year:

(Type 1)	2 drifters (Ice-Ocean Environmental Buoy)
(Type 2)	2 subsurface ADCP moorings
(Type 3)	2 subsurface current meter moorings
(Type 4)	1 subsurface current meter mooring
(Type 5)	1 subsurface current meter mooring
(Type 6)	7 subsurface ADCP moorings
(Type 7)	5 acoustic tomography moorings (400Hz type)
(Type 8)	4 meteorological and subsurface oceanographic surface moorings (TRITON buoys)

(b) operational as of 31 August:

(Type 1)	2
(Type 2)	2
(Type 3)	2
(Type 4)	0

(Type 5)	1
(Type 6)	7
(Type 7)	0
(Type 8)	0
(c) reporting on GTS at 31 August:	None

Purpose of programme:

(Type 1)	met/sea-ice/ocean research
(Type 2)	ocean research
(Type 3)	ocean research
(Type 4)	ocean research
(Type 5)	ocean research
(Type 6)	ocean research
(Type 7)	ocean research
(Type 8)	met/ocean research

Main deployment area:

(Type 1)	Arctic Ocean (Beaufort Gyre)
(Type 2)	Arctic Ocean (Beaufort Gyre) and the Sea of Okhotsk
(Type 3)	Arctic Ocean (Beaufort Gyre) and southeast of Hokkaido (Oyashio region)
(Type 4)	south of Japan (Izu Ridge)
(Type 5)	east of Japan (37.5N, 152.5E)
(Type 6)	western tropical Pacific
(Type 7)	south of Japan
(Type 8)	western tropical Pacific

D. University of Tokyo

Number and type of buoys:

(a) deployed during the year:	7 compact surface drifters with drogues
(b) operational as of 31 August:	1
(c) reporting on GTS at 31 August:	None

Purpose of programme: ocean research (Kuroshio warm water and transport process of fish larvae)

Main deployment areas: Kuroshio Extension region and tropical western North Pacific

E. Tokai University

Number and type of buoys:

(a) deployed during the year:	None
(b) operational as of 31 August:	1 surface drifter with SST sensors, without drogue
(c) reporting on GTS at 31 August:	None

Purpose of programme: research on ocean environment

Main deployment areas: North Pacific

F. National Research Institute of Far Seas Fisheries, Fisheries Agency

Number and type of buoys:
(a) deployed during the year: 1 surface drifter
(b) operational as of 31 August: 1
(c) reporting on GTS at 31 August: None

Purpose of programme: tracking fish eggs and larvae

Main deployment areas: Bering Sea

G. Hokkaido National Fisheries Research Institute, Fisheries Agency

Number and type of buoys:
(a) deployed during the year: 3 moored buoys
(b) operational as of 31 August: 3
(c) reporting on GTS at 31 August: None

Purpose of programme: ocean research

Main deployment areas: Oyashio region

H. Tohoku National Fisheries Research Institute, Fisheries Agency

Number and type of buoys:
(a) deployed during the year: 1 subsurface ADCP mooring
(b) operational as of 31 August: 1
(c) reporting on GTS at 31 August: None

Purpose of programme: ocean research (ocean circulation)

Main deployment areas: Oyashio region

PLANNED PROGRAMMES

A. Japan Meteorological Agency

Number and type of buoys planned for deployment in next 12 months: 3 moored buoys with 11 maritime meteorological and oceanographic sensors. All the buoys are operated round the year.

Purpose of programme: operational meteorological and oceanographic observation

Main deployment areas: seas around Japan

B. Maritime Safety Agency

Number and type of buoys planned for deployment in next 12 months:	16 surface drifters with holey sock drogues and SST sensors
Purpose of programme:	ocean research (ocean circulation)
Main deployment areas:	North Pacific, Indian and Antarctic Oceans

C. Japan Marine Science and Technology Center

Number and type of buoys planned for deployment in next 12 months:

(Type 1)	2 drifters (Ice-Ocean Environmental Buoy)
(Type 2)	2 subsurface ADCP moorings
(Type 3)	2 subsurface current meter moorings
(Type 5)	1 subsurface current meter mooring
(Type 6)	6 subsurface ADCP moorings
(Type 8)	9 meteorological and subsurface oceanographic surface moorings (TRITON buoys)
(Type 9)	1 subsurface current meter mooring
(Type 10)	5 acoustic tomography moorings (200Hz type)

Purpose of programme:

(Type 1)	met/sea-ice/ocean research
(Type 2)	ocean research
(Type 3)	ocean research
(Type 5)	ocean research
(Type 6)	ocean research
(Type 8)	met/ocean research
(Type 9)	ocean research
(Type 10)	ocean research

Main deployment area:

(Type 1)	Arctic Ocean (Beaufort Gyre)
(Type 2)	Arctic Ocean (Beaufort Gyre) and the Sea of Okhotsk
(Type 3)	Arctic Ocean (Beaufort Gyre) and southeast of Hokkaido (Oyashio region)
(Type 5)	east of Japan (37.5N, 152.5E)
(Type 6)	western tropical Pacific
(Type 8)	western tropical Pacific
(Type 9)	western tropical Pacific (south of Mindanao)
(Type 10)	central tropical Pacific

D. University of Tokyo

Number and types of buoys planned for deployment in next 12 months:	6 compact surface drifters with drogues

Purpose of programme: ocean research (Kuroshio warm water)

Main deployment areas: Kuroshio Extension region

E. Tokai University

Number and types of buoys planned for deployment in next 12 months: 4 surface drifters with holey sock drogues and SST sensors

Purpose of programme: research on ocean environment

Main deployment areas: North Pacific

F. National Research Institute of Far Seas Fisheries, Fisheries Agency

Number and types of buoys planned for deployment in next 12 months: 1 surface drifter

Purpose of programme: tracking fish eggs and larvae

Main deployment areas: Bering Sea

G. Hokkaido National Fisheries Research Institute, Fisheries Agency

Number and types of buoys planned for deployment in next 12 months: 3 moored buoys

Purpose of programme: ocean research

Main deployment areas: Oyashio region

H. Tohoku National Fisheries Research Institute, Fisheries Agency

Number and types of buoys planned for deployment in next 12 months: 1 subsurface ADCP mooring
1 subsurface current meter mooring

Purpose of programme: ocean research (ocean circulation)

Main deployment areas: Oyashio region

TECHNICAL DEVELOPMENT

(b) Instrumentation:

The Japan Meteorological Agency (JMA) developed a new automated system to measure the concentrations of atmospheric and oceanic carbon dioxide (CO_2). The system was mounted on the JMA buoy in the East China Sea and had observed CO_2 from 30 June 1997 through 6 January 1998. During the period, the concentrations of both atmospheric and oceanic CO_2 were continuously well determined.

SPECIAL COMMENTS

(b) Communications:

The all data of the three moored buoys of Japan Meteorological Agency are transmitted through Geostationary Meteorological Satellite (GMS) and are inserted onto the GTS. Data from the rest of Japanese buoys are collected via the ARGOS system.

(d) Others:

The Japan Meteorological Agency (JMA) deployed a PALACE float east of Japan in May 1998, and has been inserting its temperature profile data onto GTS in the form of the BUOY message since July 1998. JMA is encoding BUOY messages from the original data sent from the Service ARGOS via INTERNET. The Service ARGOS is expected to prepare BUOY messages from the PALACE type data for the insertion onto the GTS.

THE NETHERLANDS

Year: 1998

CURRENT PROGRAMMES

A	**Agency or programme**	Royal Netherlands Meteorological Institute (KNMI)	
	Number and type of buoys	(a) deployed during year	3 (CS)
		(b) operational at 31 August	3
		(c) reporting on GTS at 31 August	3
	Purpose of programme	Participating in the EGOS drifting buoy programme for operational meteorology and oceanography	
	Main deployment areas	North Atlantic	
B	**Agency or programme**	Netherlands Institute for Sea Research (NIOZ)	
	Number and type of buoys	(a) deployed during year	5
		(b) operational at 31 August	1
		(c) reporting on GTS at 31 August	1
	Purpose of programme	Study of the North Atlantic surface circulation under the terms of the WOCE and CLIVAR programmes. For that reason the kinematics of the surface flow near the European ocean margin, especially in the Bay of Biscay, are monitored in order to identify the mean flow and seasonal and eddy characteristics of the Eastern Boundary Current along the continental slope. In a previous phase the attention was focused on the surface circulation in the north-eastern North Atlantic (Iceland Basin and Rockall Channel) and the exchange of surface water between the North Atlantic Ocean and the Norwegian Sea.	
	Main deployment areas	North Atlantic	

PLANNED PROGRAMMES

A **Agency or programme** KNMI

Number and type of buoys planned for deployment in next 12 months: 2

Purpose of programme	EGOS
Main deployment areas	North Atlantic

B **Agency or Programme** NIOZ

Number and type of buoys planned for deployment in next 12 months: none

Purpose of programme N/A.

Main deployment areas N/A.

TECHNICAL DEVELOPMENTS

(a) Buoy design

(b) Instrumentation 1 buoy in test situation with GPS receiver

(c) Others

PUBLICATIONS (on programme plans, technical developments, QC reports etc.)

1. Statistics of buoy data from buoys within EGOS programme are published in quarterly reports (UKMO) and monthly statistics (Météo-France); Monthly Report by the Technical Secretariat of EGOS.

2. Otto, L. and H.M. van Aken (1996) Surface circulation in the north-east Atlantic as observed with drifters. deep-sea Research I, 43, 467-499.

3. Van Aken, H.M. and G. Becker (1996) Hydrography and through-flow in the north-eastern North Atlantic Ocean; the Nansen Project. Progress in Oceanography, 38, 279-346.

SPECIAL COMMENTS (if any)

(a) Quality of buoy data see under Publications

(b) Communications all buoys are tracked by Argos System

(c) Buoy lifetimes see relevant EGOS documents

(d) Others

DATA BUOY CO-OPERATION PANEL ANNUAL REPORT

Country **NEW ZEALAND**
Year **1998**

CURRENT PROGRAMMES
A. Agency : **Meteorological Service of New Zealand Ltd (MSNZ)**

Number and type of buoys:
(a) deployed during the year : 5 Drifters - 4 FGGE, 1 WSD
(b) operational at 31 August : 7 Drifters
(c) reporting on GTS as at 31 August : 7 Drifters

Purpose of programme: Real-time buoy data for weather forecasting

Main deployment areas: Tasman Sea

PLANNED PROGRAMMES
A. Agency : **Meteorological Service of New Zealand Ltd (MSNZ)**

Number and type of buoys planned for deployment in next 12 months: 5 drifters, or as many as required to maximise 7.0 PTT years.

Purpose of programme: Real-time buoy data for weather forecasting

Main deployment areas: Tasman Sea

PUBLICATIONS Nil

SPECIAL COMMENTS

A. Quality of buoy data: see recovered buoys below

B. Communications: All buoys are tracked by the Argos system.

C. **Buoy Lifetimes:** MSNZ Buoys give long operational service. This is because of MetService's active Buoy Recovery policy where buoy positions are monitored as they near the NZ coast so they can be recovered where possible. This has resulted in buoys being recovered, refurbished and redeployed two, three and four times. All buoys are deployed in the Tasman Sea, where the prevailing westerly currents eventually carry buoys back towards New Zealand, enabling around 80% of buoys to be recovered.

Over the last ten years, twenty one buoys have been recycled through 43 deployments, to keep an optimum network of seven buoys operating. Of the six buoys operational as at 1 October 1998, two are on their first deployment, three are on their second deployment and one is on its third deployment. Another buoy is about to be deployed for the fourth time.

The high number of recoveries shortens individual buoy lifetimes. In MetService's case it is more representative to look at cumulative lifetimes achieved by buoys over several deployments. Lifetime is counted until barometer failure, transmission failure or recovery. The Average Cumulative Lifetime of the twenty one buoys, including the six operational at 1 October 1998 is 34 months. Looking at individual buoys, #8586, #7179 and #6439 have each been deployed and recovered three times, achieving cumulative lifetimes of 52, 62 and 80 months each respectively.

D. **Recovered Buoys:**
In the twelve months to 1 October 1998, three buoys (#8586, #22189 and #2948) were successfully recovered from the NZ coast. All three buoys were still fully operational and providing good data until recovery. Buoy 8586 was recovered after beaching in Northland, after eighteen months at sea on its third deployment. Unfortunately MetService has been unable to persuade the finder of this buoy to surrender it. Buoy 22189 beached after fifteen months on its second deployment and was returned in good order to MetService. Buoy 2948 owned by the Bureau of Meteorology was recovered from close to the Maui Oil field by a support vessel supplied with the latest Argos buoy position.

The sensors of all recovered buoys are calibrated and compared with pre-deployment calibrations to find out how they performed during their time at sea. Particular attention is paid to any sensors flagged as defective during operational data monitoring.
Pressure Sensors : Post recovery calibrations on Buoy 2948 found the barometer (Vaisala) to be within 0.1hPa over the pressure range 900 to 1050 hPa. Buoy 22189 has yet to be lab tested, but a spot check at ambient pressure showed the barometer (Paroscientific) to be 0.25hPa low.
Temperature Sensors : The air and sea temperature sensors on Buoy 2948 were checked and found to be satisfactory, while a spot check of Buoy 22189 looked good.

The recovered buoys will be fitted with new batteries and drogue lines and after a complete calibration of all sensors, will be redeployed. The refurbishment and redeployment of Buoy 2948 will be done in consultation with the Bureau of Meteorology.

DATA BUOY CO-OPERATION PANEL

Format for national reports on current and planned programmes

Country: Portugal

Year: 1998

CURRENT PROGRAMMES

A. **Agency or programme**: O Tempo e o Clima em Portugal

Number and type of buoys:	(a)	deployed during year:	1 SVP-B	
	(b)	operational at 31 August:	1 SVP-B	
	(c)	reporting on GTS at 31 August:	1 SVP-B	
Purpose of programme:	(a)	operational:		
	(b)	met/ocean research:	yes	
	(c)	developmental:		
Main deployment areas:	Atlantic Ocean, near Portugese coast.			

B. **Agency or programme:**
(as above, repeat as often as necessary)

A participation driven action group of the Data Buoy Co-operation Panel

ISABP-5
DOC 7

SOUTH AFRICAN WEATHER BUREAU: PRESENT ACTIVITIES AND FUTURE PLANS

South Africa started the year (inter-sessional period Sept 1997- July 1998) with 25 drifters operational. The South African Weather (SAWB) drifter programme is maintained mainly to supply data for use in operational forecasting. The deployments are thus done in areas where data is required from, but also where these positions would compliment deployments by other agencies.
The vast majority of deployments done by the SAWB are a mixture of SAWB and AOML SVP-B drifters.

1997				1998						
Sept	Oct	Nov	Dec	Jan	Feb	March	Apr	May	Jun	Jul
16	1	nil	3	17	2	nil	nil	1	nil	nil

DEPLOYMENT TEMPO OF 40 DRIFTERS

The deployment during September 1997 was under taken by ships of opportunity enroute from Cape Town to Buenos Aires or St Helena and Ascension due to a delay in the departure of the SA Agulhas to Gough Island. The remainder was deployed during routine voyages to Antarctica, Gough and Marion Islands.

Two drifters failed on deployment and another after 8 days. A further 10 drifters failed after an average of 116days. Three(3) drifters were sent to Reunion Met service and two of these have been deployed in the Indian Ocean. The third is still awaiting a suitable deployment opportunity.

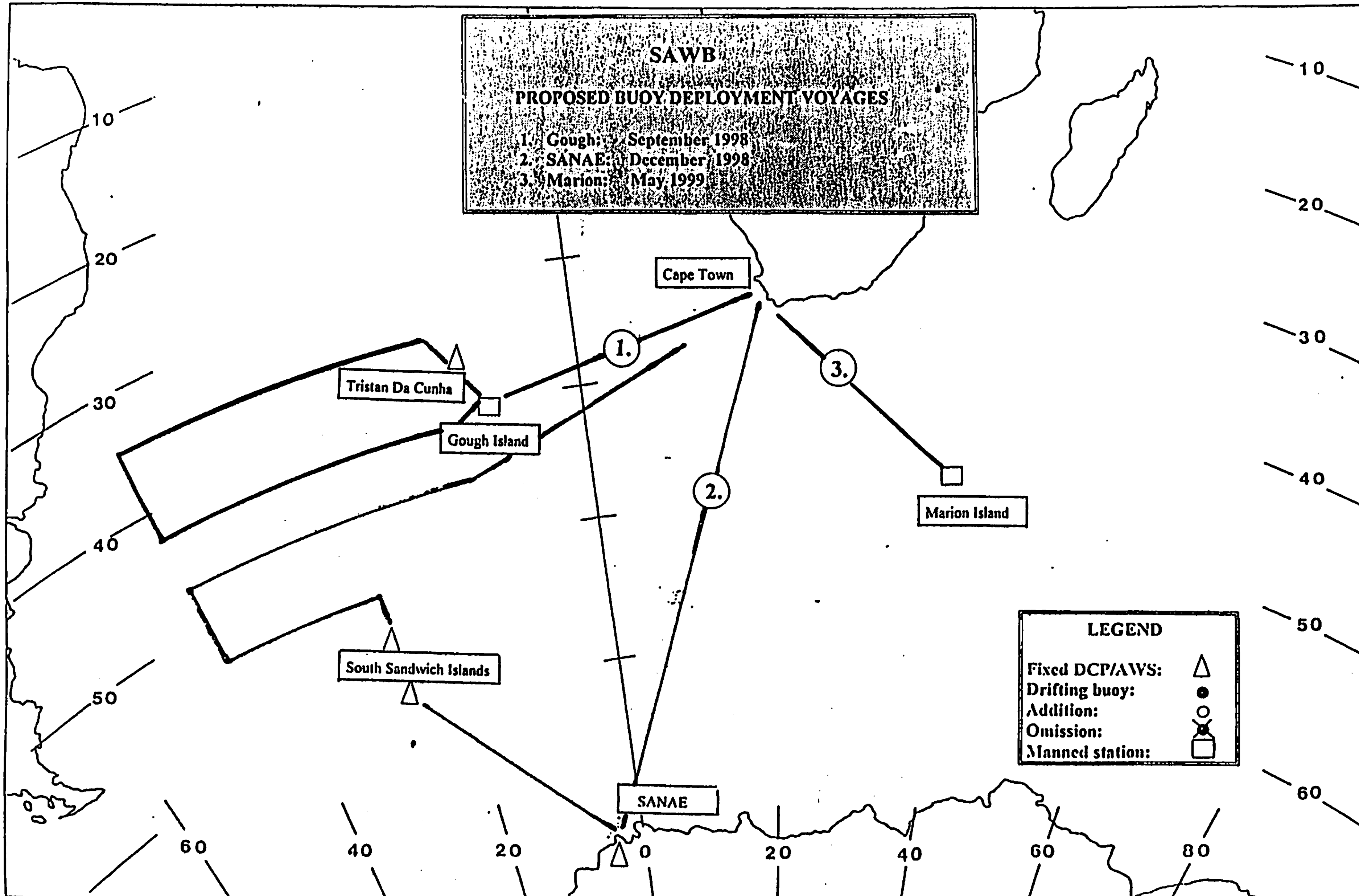
Three(3) drifters were received from the Marine Hydrophysical Institute of the National Academy of Science of Ukraine. Two have been deployed. One stopped transmitting after 48 days. The remaining buoy will be deployed on the Gough voyage. A TOGA drifter with wind sensor was deployed close to Cape Town and is now moving up the west coast of Africa. Good wind reports are received from the drifter. Good satisfying results are received from METOCEAN drifters and 21 of the present operational drifters was deployed before June 1997 with 9 of these drifters deployed in Jan/Feb 1997.

FUTURE PLANS

AOML are sending us 10 Technocean drifters with certain modifications. We are planning to deploy 30 drifters during the forthcoming inter-sessional period. These drifters will mainly be used to maintain the existing network of drifters in the South Atlantic.

Approximately 13 drifters will be deployed during the routine voyage to Gough Island in September 1998. Included are three SVP-B wind drifters. The remainder will be deployed during the routine voyages to Antarctica in Dec 1998 and Marion Island in May 1999. See the attached proposed buoy deployment opportunity voyages.

The SAWB will continue, as in the past, to provide support by means of the Port Meteorological Officer in Durban and Cape Town.



SAWB
PROPOSED BUOY DEPLOYMENT VOYAGES
1. Gough: September 1998
2. SANAE: December 1998
3. Marion: May 1999
Cape Town
Tristan Da Cunha
Gough Island
South Sandwich Islands
SANAE
Marion Island
1.
2.
3.
LEGEND
Fixed DCP/AWS:
Drifting buoy:
Addition:
Omission:
Manned station:
10
20
30
40
50
60
60
40
20
0
20
40
60
80

DATA BUOY CO-OPERATION PANEL

UK NATIONAL REPORT - 1998

CURRENT PROGRAMMES

Institute: Meteorological Office
Programme: EGOS
Number & type of buoys:
- a) deployed during year: 23 drifters (15 WOCE + 8 TOGA), 1 moored*
- b) operational at 31 August: 20 drifters (8 WOCE + 12 TOGA), 14 moored
- c) reporting on GTS at 31 August: 20 drifters (8 WOCE + 12 TOGA), 14 moored

Note: Two of the 14 moored buoys are joint projects between the UK Meteorological Office and Météo-France. The Gascogne buoy was deployed in July 1998

Purpose of programme: Operational meteorology, oceanography and climate research
Main deployment areas: North Atlantic, Bay of Biscay and North Sea

Institute: Meteorological Office
Programme: IABP
Number & type of buoys:
- a) deployed during year: 2 ice buoys (air-dropped)
- b) operational at 31 August: 3
- c) reporting on GTS at 31 August: 3

Purpose of programme: Operational meteorology, oceanography and climate research
Main deployment areas: Arctic Ocean

Institute: Meteorological Office
Programme: ISABP
Number & type of buoys:
- a) deployed during year: 1 TOGA WSD drifter
- b) operational at 31 August: 1
- c) reporting on GTS at 31 August: 1

Purpose of programme: Operational meteorology and oceanography
Main deployment areas: South Atlantic Ocean

Institute: CCMS Dunstaffnage Marine Laboratory and Defence Evaluation and Research Agency
Programme: Adaptive sampling buoys
Number & type of buoys:
- a) deployed during year: 2 ASBs
- b) operational at 31 August:
- c) reporting on GTS at 31 August:

Purpose of programme: Physical oceanography
Main deployment areas: Coastal seas

PLANNED PROGRAMMES

Institute: CCMS Plymouth Marine Laboratory
Programme: SOIREE / CARUSO
Number & type of buoys planned for deployment in the next 12 months: 2 drifters

Purpose of programme: Physical oceanography
Main deployment areas: Southern Ocean and North Sea

TECHNICAL DEVELOPMENTS

Trials of alternative satellite communications systems (Dunstaffnage Marine Laboratory).

Development of adaptive sampling drifters incorporating on board intelligence and GPS (Dunstaffnage Marine Laboratory and Defence Evaluation and Research Agency).

NATIONAL DATA BUOY REPORT 1999

UNITED STATES OF AMERICA

In support of marine weather forecasts, ocean, coastal and climate studies, and other scientific studies, the United States had a total of 4,137 Argos platforms for the 12 month period ending September 1998. Of this total, 2,336 were drifting buoys, 1,038 of which reported on the GTS. 228 of the drifting buoys were air deployed in the Atlantic and Pacific Oceans by the U.S. Navy for scientific and operational ocean and marine weather applications. The United States also maintains a network of 137 moored data buoys located in waters around the continental United States, Alaska, Hawaii, Guam and the tropical Pacific. All of the moored buoys are reported on the GTS. Of the moored buoys, 70 transmitted through Argos and 67 transmitted through GOES. The United States agencies which sponsor the programs supporting these data buoys include the National Oceanic and Atmospheric Administration, the Department of Transportation, the National Science Foundation, the Department of Defense, the Department of the Interior, and numerous state institutions.

For 1999, as shown below, over 2000 drifting buoys are planned for deployment. The distribution of these buoys by ocean basin is: 607 - Pacific; 815 - Atlantic; 353 - Indian; 21 - Arctic; 43 - Gulf of Mexico; 33 - Great Lakes; and 118 at coastal locations to be determined. In addition, about 195 moored buoys are slated for deployment as follows: 113 - Pacific; 12 - Atlantic: 5 - Arctic; 13 - Gulf of Mexico; and 66 in coastal waters.

A. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

1. National Data Buoy Center

Purpose: To provide operational meteorological and oceanographic data.
Location and No.: (a) Drifters: Emergency Response - 9
(b) Moorings: Coastal U.S. - 57

2. Oceanic & Atmospheric Research - Environmental Research Labs

Purpose: To study biological and physical oceanographic processes and to study surface wave and currents in the Great Lakes.
Location and No.: (a) Drifters: Pacific - 259
Atlantic - 112
Indian - 70
Antarctic - 79
Great Lakes - 33
(b) Moorings: Pacific - 93

3. **Office of Global Programs**
Purpose: To provide meteorological and oceanographic observations for the monitoring and prediction of climate change and circulation studies.
Location and No.: (a) Drifters: Atlantic - 40
Pacific - 82
(b) Moorings: Coastal - 3

4. **National Environmental Satellite and Data Information Service (Includes the Navy/NOAA Joint Ice Center)**
Purpose: To provide meteorological and oceanographic observations for Arctic analysis and forecasting and ocean optical properties.
Location and No.: (a) Drifters: Arctic - 20

5. **National Weather Service**
Purpose: To provide meteorological observations for weather analysis and forecasting.
Location and No.: (a) Drifters: Pacific - 71

6. **National Ocean Service**
Purpose: Oil spill response
Location and No.: (a) Drifters: Coastal - 3

7. **Coastal Ocean Program**
Purpose: To study marine ecological systems for GLOBEC.
Location and No.: (a) Drifters: Pacific - 38

B. **DEPARTMENT OF TRANSPORTATION - U.S. COAST GUARD**
Purpose: To collect current and sea surface temperature data for ice berg movement and deterioration and search and rescue operations.
Location and No.: (a) Drifters: Atlantic - 45

C. **NATIONAL SCIENCE FOUNDATION (Funding for several Universities and Institutions)**

Purpose: To provide meteorological and oceanographic observations for the WOCE Surface Velocity Program, circulation studies, and biological and chemical oceanography programs.
Location and No.: (a) Drifters: Atlantic - 470
Pacific - 106
Indian - 208
(b) Moorings: Atlantic - 10
Pacific - 2

D. DEPARTMENT OF DEFENSE

1. Naval Oceanographic Office

Purpose: Collection of real-time data for operational analysis and forecasting.

Location and No.: (a) Drifters: Atlantic - 95
Pacific - 130
Indian - 75

2. Office of Naval Research

Purpose: Physical oceanography studies.

Location and No.: (a) Drifters: Atlantic - 115
Pacific - 50
(b) Moorings: Atlantic - 7
Pacific - 8

E. DEPARTMENT OF INTERIOR - MINERALS MANAGEMENT SERVICE

Purpose: To study circulation patterns in the continental shelf areas.

Location and No.: (a) Drifters: Gulf of Mexico - 24

F. NON-PROFIT INSTITUTIONS/ORGANIZATIONS

Purpose: Near shore biological studies; shallow water oceanographic studies; and meteorological and oceanographic observations in the Arctic.

Location and No.: (a) Drifters: Caribbean - 6
Coastal - 3
(b) Moorings: Atlantic - 5
Arctic - 5
Gulf of Mexico - 13

ANNEX II

REPORTS FROM THE DBCP ACTION GROUPS

At its tenth session (La Jolla, November 1994), the Panel adopted the following guidelines regarding its action groups:

1. An action group of the DBC is an independent self-funded body that maintains, as a significant element of its responsibilities, an observational buoy programme providing meteorological and oceanographic data for real-time and/or research purposes in support of the World Weather watch, the World Climate Research Programme, the Global Climate Observing System, the Global Ocean Observing System and other relevant WMO and IOC programmes.

2. Action groups of the DBCP shall support the aims and objectives of the DBCP as set out in the terms of reference of the DBCP in particular with respect to:

(a) provision of good quality and timely data to users;

(b) insertion of real-time (or near real-time) data into the GTS;

(c) exchange of information on data buoy activities and development and transfer of appropriate technology.

3. An action group may be regional or national in nature provided that its programme benefits a regional or international community.

4. To be adopted as an action group of the DBCP the terms of reference or operating principles of the body or programme shall be submitted to a session of the DBCP for formal approval. Once approved these shall be lodged with the Secretariats of WMO and IOC.

5. On its part the DBCP shall support the activities of its adopted action groups and especially through the assistance of the officers of the DBCP, its technical co-ordinator and the Secretariats of WMO and IOC as far as resources allow.

6. Action groups of the DBCP shall submit annual reports of their activities to the chairman of the DBCP.

The Panel has at present seven action groups, the reports of which follow:

ACTION GROUPS page

EGOS Technical Document. No. 183

EUROPEAN GROUP ON OCEAN STATIONS

EGOS

REAL TIME BUOY OBSERVATIONS

INTERSESSIONAL REPORT OF THE EUROPEAN GROUP ON OCEAN STATIONS
September 1997 - September 1998

Issued by

The EGOS Technical Secretariat

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EXECUTIVE SUMMARY

The European Group on Ocean Stations (EGOS) was established in 1988, with the objective of maintaining a network of operational ocean stations for observation of oceanographic and meteorological data on a near real-time basis.

Météo-France joined EGOS in 1997, increasing the number of members to 9. The operational costs of the programme are borne by the members. Financial contributions to a common fund are made on a voluntary basis. The programme activities are co-ordinated through the Technical Secretariat and managed by the Management Committee, composed of one representative from each of the participating states.

Reports on the status of the EGOS buoy programmes are issued by the EGOS Technical Secretariat on a monthly basis in the EGOS Technical Document series.

The number of drifting buoys operating in the EGOS programme at the end of each month in the intersessional period varied between 34 and 50. A total of 62 buoys were deployed and 49 buoys ceased to operate in the intersessional period. The average operational lifetime of the EGOS drifting buoys that ceased to operate in the period was 291 days. In 1996 this number was 336 days, and in 1997 252 days. The average age of the EGOS operational buoys was 182 days on Sept 30. 1998.

In addition to the drifting buoys 6 moored buoys west of the British Isles belonging to the UK Met. Office and two moored buoys operated jointly by France and UK were part of EGOS.

All EGOS drifting buoys observe air pressure and sea surface temperature. About half of the buoys also observe air temperature. The observation programme for the moored buoys is more comprehensive, and includes data such as waves and humidity. The calculated air pressure tendency and housekeeping data are also in the routine reports, which include the last asynoptic observation together with stored (synoptic) observations.

The data are transmitted via the NOAA/Argos satellite system and received by three Local User Terminals, located in Søndre Strømfjord, Oslo and Toulouse, respectively. The data are further disseminated via the GTS on a near real-time basis.

Data quality and data regularity are controlled and monitored on a quasi real-time basis. On average the data are received at the meteorological centres about 20-30 minutes after the observations are made. In 1997 a very high proportion of the operational air pressure data from the North Atlantic north of the main shipping lanes was provided through the EGOS drifting buoy programme.

THE EGOS brochure that was issued in 1996 has continued to help stimulate relations with other data buoy groups and organisations. The brochure will be updated in 1998. EGOS is on the World Wide Web as one of the DBCP Action Groups (*http://www.shom.fr/meteo/egos)*.

1. INTRODUCTION

The European Group on Ocean Stations (EGOS), an Action Group of the DBCP, was formally established on December 1, 1988. The main objective of the group is to maintain a network of operational stations for observation of meteorological and oceanographic data from the North Atlantic on near real-time basis.

The project is managed by the EGOS Management Committee, composed of one representative from each of the participating states. The costs of the operation of the group are borne by the participants. Financial contributions to a common fund are made on a voluntary basis.

Participation in the EGOS is based on Letters of Agreement signed by the directors of the respective participating institutions. The Summary of Agreements and the Rules of Procedures have been deposited with the Secretary-General of WMO and the Secretary of IOC.

The EGOS Technical Document No. 77 ('EGOS Basic Documents') contains relevant background information on formal issues such as the 'Summary of Arrangements', the EGOS Project and the Joint Programmes maintained and co-ordinated by EGOS.

2. THE MANAGEMENT COMMITTEE OF EGOS

The Management Committee met twice during the reporting period:

- The winter meeting was held at the IOC headquarters in Paris, December 2-3, 1997. At this meeting the Management committee elected Mr. Wynn Jones (UKMO) as Chairman, and elected Mr. Wil C. M. van Dijk (KNMI) as Vice-Chairman. Iceland offered to host the 1998 summer meetings of EGOS. A report on the conclusions and recommendations of the December meeting is in EGOS Techn. Doc. No. 169.
- The summer meeting was held at the Icelandic Meteorological Office in Reykjavik, Iceland, June 18-19, 1998.

3. THE TECHNICAL SUBGROUP OF EGOS

The Technical Subgroup met twice during the reporting period, in combination with the Management Committee meetings (see above):

- At the IOC headquarters in Paris on December 2-3, 1997. At this meeting the Technical Subgroup Committee unanimously elected Mr. Pierre Blouch as Chairman, to hold office until the end of the next December session of the Technical Subgroup. The recommendations from the meeting have been issued as EGOS Technical Doc. No. 168.

- The summer meeting was held at the Icelandic Meteorological Office in Reykjavik, Iceland, June 18-19, 1998.

4. MEMBERSHIP OF EGOS

In 1997 the members of EGOS were:

• Denmark	Danish Meteorological Institute
• Germany	German Weather Service
• Iceland	The Icelandic Meteorological Office
• Ireland	Irish Meteorological Service
• France	Météo-France

• The Netherlands	Royal Netherlands Meteorological Institute
• Norway	The Norwegian Meteorological Institute
• Sweden	Swedish Meteorological and Hydrological Institute
• United Kingdom	United Kingdom Meteorological Office

France became a full member in 1997. This was agreed upon at the meeting of the Management Committee in December 1996. At the winter meetings in Paris, December 2-3, 1997, Spain was represented by observers from 2 institutions: Servicio de Observacion, Madrid, and Puerto del Estado, Madrid. Spain has expressed a wish to become a member of EGOS in 1998.

5. THE EGOS TECHNICAL SECRETARIAT

The Technical Secretariat has continued its functions according to the Terms of Reference and the instructions given by the Management Committee and on the basis of the contract.

The contract for the Technical Secretariat is between WMO and CMR, and all main secretariat functions lie with Christian Michelsen Research, Norway. Mr. Torleif Lothe succeeded Mr. Lars Golmen as EGOS Technical Secretary in January 1998.

The Technical Secretary has continued to co-ordinate the EGOS drifting buoy programme, following the established routines. The status of the operating buoys has been closely monitored in close co-operation with Mr. Flosi H. Sigurdsson in Iceland and Mr. Pierre Blouch at CMM in Brest.
Other routine actions have included:

To co-ordinate information to CLS Argos and the LUT operators whenever
- a new buoy is deployed, for insertion on GTS,
- an operating buoy has failed or run ashore, for removal from GTS,
- the status of a buoy or one of its sensors has changed.

To co-ordinate information to respective owners of buoys whenever
- a new buoy is deployed
- an operational buoy has failed or its operative status has changed
- a buoy has run ashore
- a buoy has been reported recovered by e.g. local fishermen.

To update the database at CMR on the history and status of each EGOS buoy.

To maintain the list of WMO numbers and PTT numbers relevant to EGOS.

Activities at the Secretariat had increased significantly in the intersessional period, as the number of buoys deployed had almost doubled since 1996, and also that the EGOS membership had increased. Discussions have continued on the possibilities of sharing work task between CMR and EGOS member institutes such as CMM. Task sharing has already taken place on an informal basis.

6. LIAISON WITH INTERNATIONAL ORGANISATIONS

In 1997 EGOS maintained a close co-operation with international organisations working in the same field.

WMO and IOC
WMO manages the EGOS Common Fund and financial matters on behalf of the EGOS Management Committee.

WMO and IOC were represented at the EGOS meetings in June and December 1997 by Mr. Yves Tréglos, Assistant Secretary of the IOC.

DBCP

Mr. Yves Tréglos, Assistant Secretary of the IOC, represented DBCP on the summer meetings of EGOS in Sweden. The Technical Co-ordinator of the DBCP, Mr. Etienne Charpentier, attended the December meetings in Paris.

The day-to-day control for the EGOS drifting buoys at the Technical Secretariat was maintained and supported by the Technical Co-ordinator of the DBCP. The mail distribution list for data quality control *buoy-qc@vedur.is* was used at an increased level for communication and information exchange.

The DBCP Internet server address for GTS buoy dataflow control:

http://dbcp.nos.noaa.gov/dataflow.html

had frequently been used by the Technical Secretary to inspect if a certain buoy was transmitting or not on GTS, and also active sensors. The service provides overview (not true data or positions) for the previous 7 days.

Mr. Wynn Jones represented EGOS at the DBCP-XIII meeting in La Reunion in October 1997. Mr. Flosi H. Sigurdsson represented EGOS at the CGC meeting in Oslo, in August 1997. Reports on EGOS were presented at these meetings by the EGOS representatives.

7. EGOS DRIFTING BUOYS

7.1 Development of the operational programme

The annual average for the number of operational EGOS drifting buoys in each month has shown a slow but steady increase during the previous years. Operational means transmitting at least air pressure. The number for each month varied between 34 and 50 buoys in the intersessional period.

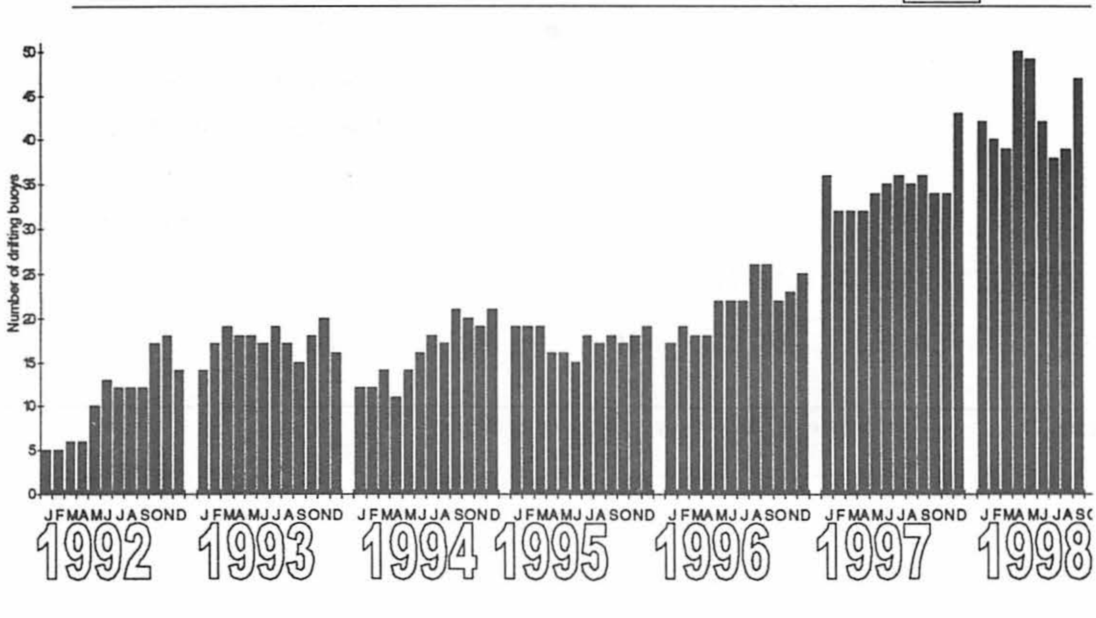


Figure. 1. Number of operational drifting buoys in EGOS at the end of each month, for the years 1992-1998.

As at October 1st, 1998, a total of 47 drifting buoys were operating in EGOS, 29 in EGOS North and 18 in EGOS South area. (Figure 2) 8 of these were ConMar buoys, of which 4 have GPS receiver, 13 were Metocean TOGA type, of which two had wind sensors, 5 were Marisonde buoys and 21 were of SVP-B type. 4 of the SVP-Bs had wind sensors and two had salinity sensors.

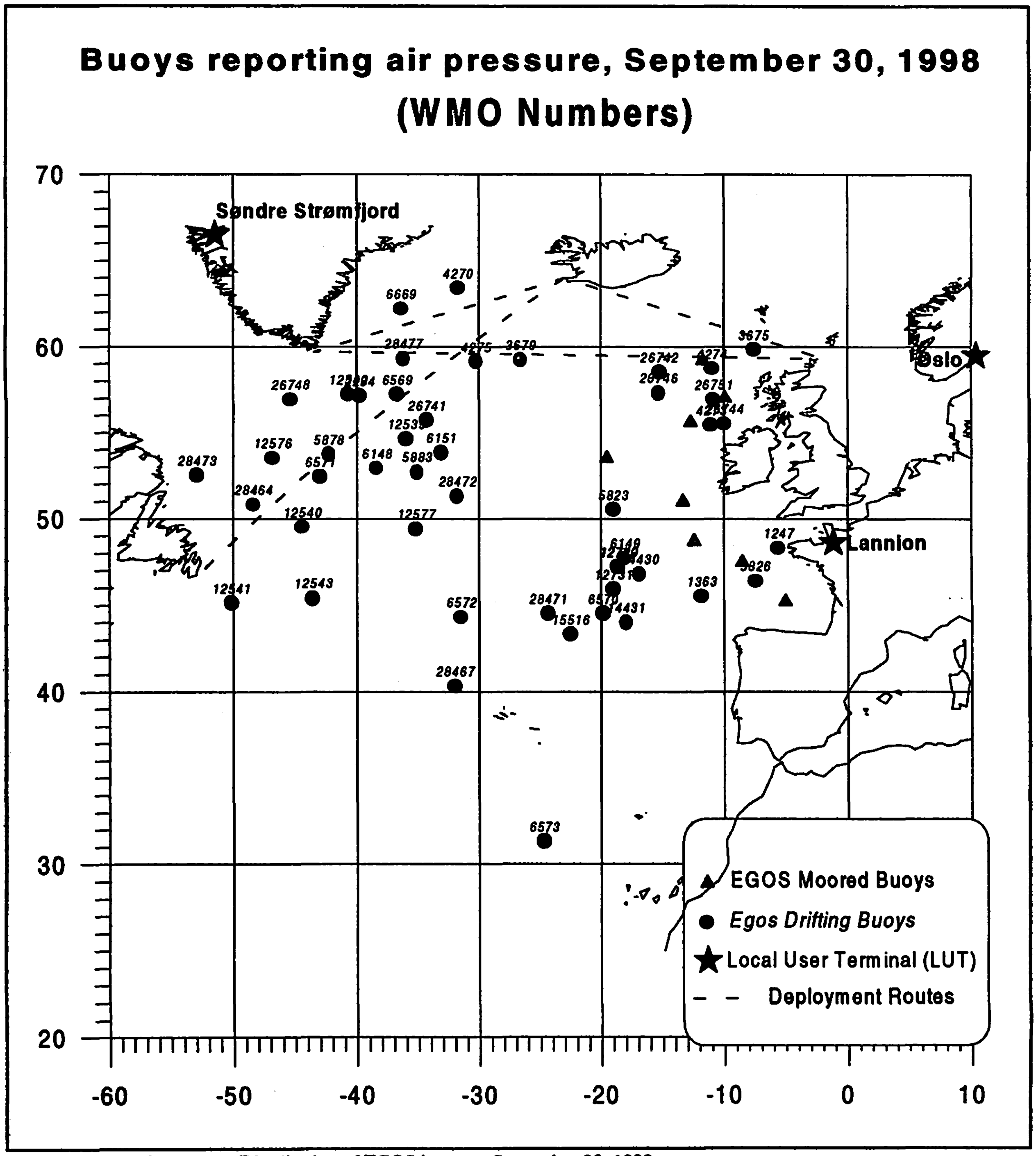


Figure. 2. Distribution of EGOS buoys at September 30, 1998.

7.2 Deployment of new buoys

Drifting buoys are supplied by most EGOS members. Most members supply 1 or 2 buoys per year. UKMO and Météo- France has so far been the biggest contributors in 1997, with about 30 and 15 deployments per year, respectively.

Pre-deployment testing and deployment of buoys in EGOS is organised through UKMO, the Icelandic Meteorological Office in Reykjavik, CMR in Bergen, and Météo- France in Brest, depending of which buoy is being deployed.
A total number of 62 drifting buoys were deployed in EGOS in the intersessional period. These were either ConMar C/S buoys (5), Metocean FGGE type buoys (11), Marisonde buoys (7) or SVP-B type buoys (39). 6 of the SVP-Bs had wind sensors. Four of the ConMar buoys had a GPS receiver. See Table 1 and Fig. 4 for other details.

Table. 1. EGOS drifting buoys deployed September 30. 1997- September 30. 1998

WMO	ARGOS	Owner	Buoy	DepDate	CF	Deployed from	Comment
65562	3675	N	C/S	01.02.98		Bergen-RAL	
65562	4270	G	C/B-GPS	23.11.97		Bergen-RAL	
62519	5250	FR	SVP-B	01.01.98	Faded	France	
65571	4275	IR	C/B-GPS	26.04.98		Bergen-RAL	
62506	5826	FR	MS-Gi	26.03.98		France	
44601	5878	FR	SVP-BW	14.04.98		Iceland	
44609	5879	FR	SVP-BW	08.12.97	Faded	Iceland	
44610	5881	FR	SVP-B	09.12.97	Faded	Iceland	
44602	5883	FR	SVP-BW	13.04.98		Iceland	
44606	6148	FR	SVP-BW	18.04.98		Air Depl.	
41596	6216	FR	SVP-BW	02.04.98	Failed	France	
44603	6571	FR	SVP-B	14.04.98		Iceland	
44604	6572	FR	SVP-B	15.04.98		Iceland	
41597	6573	FR	SVP-B	31.03.98		France	
64529	6669	G	C/B-GPS	25.04.98		Bergen-RAL	
44726	12539	UK	SVP-B	13.05.98		Iceland	
44776	12540	UK	SVP-B	12.05.98		Iceland	
44743	12541	UK	SVP-B	17.04.98		Air Depl.	
44779	12543	UK	SVP-B	18.04.98		Air Depl.	
64552	12658	UK	SVP-B	06.12.97	Faded	Iceland	
44761	12660	UK	SVP-B	07.12.97	Faded	Iceland	
44616	12661	UK	SVP-B	17.10.97	Faded	Iceland	
44765	12662	UK	SVP-B	02.10.97	Faded	Iceland	
44763	12663	UK	SVP-B	17.10.97	Faded	Iceland	
44614	12665	UK	SVP-B	21.12.97	Faded	Iceland	
64530	12666	UK	SVP-B	04.12.97	Faded	Iceland	
44766	12667	UK	SVP-B	22.12.97	Faded	Iceland	
62751	15503	FR	SVP-B	01.02.98	Faded	France	
62755	15510	FR	MS-GT	01.02.98	Faded	France	
62758	15516	FR	MS-GT	01.02.98		France	
62501	15534	FR	MS-GT	27.03.98	Faded	France	
44775	26741	UK	MO	08.06.98		Iceland	Redeployed
44780	26742	UK	MO	11.11.97		Iceland	
44617	26744	UK	MO	10.11.97		Iceland	
44772	26747	UK	MO	12.12.97	Failed	Iceland	
65591	26748	UK	MO	03.12.97		Iceland	
62551	27939	FR	SVP-B	31.01.98	Faded	France	
44613	28467	UK	MO	17.04.98		Air Depl.	
44742	28471	UK	MO	17.04.98		Air Depl.	
44774	28472	UK	MO	18.04.98		Air Depl.	

44778	28473	UK	MO	18.04.98		Air Depl.	
	12575	UK	SVP-B	17.08.98	Failed	Air Depl	
44772	12577	UK	SVP-B	17.08.98		Air Depl	
	12579	UK	SVP-B	17.08.98	Failed	Air Depl.	
	12578	UK	SVP-B	17.08.98	Failed	Air Dep.	
62514	6151	Fr	SVP-B	17.08.98		Air Depl.	
62515	6569	Fr	SVP-B	17.08.98		Air Depl.	
65599	28477	UK	MO-W	27.09.98		Iceland	
62516	1363	FR	SVP-B	17.09.98	Failed	France	Prototype
62519	6570	FR	SVP-B	18.09.98		France	
62511	12729	FR	SVP-BS	19.09.98		France	
44764	28464	UK	MO	29.09.98		Iceland	
44777	12593	UK	SVP-BW	18.04.98	Failed	Air Depl.	
44770	12542	UK	SVP-B	08.06.98		Iceland	
44767	12576	UK	SVP-B	09.06.98		Iceland	
62512	12730	FR	SVP-BS	19.09.98		France	
62513	12731	FR	SVP-BS	18.09.98		France	
62520	14431	FR	MS-B	18.09.98		France	
62518	6149	FR	SVP-B	19.09.98		France	
62517	5823	FR	MS-Gi	18.09.98		France	
62554	14430	FR	MS-B	19.09.98		France	
65581	2294	G	CB-GPS	08.07.98		Bergen-RAL	

7.3 Operational lifetime in the intersessional period

49 EGOS buoys ceased to operate in the intersessional period Oct-1997 – Oct 1998. Details are found in Table 2. This includes buoys that completely failed to transmit due to technical failure or battery exhaustion, buoys with air pressure sensor failure and buoys that ran ashore. Of the total 49 buoys ceased to operate, 6 failed shortly after deployment, 36 faded, and 7 ran ashore.

The average lifetime for the drifting buoys that ceased to operate in 1997 was 252 days, in comparison to 336 days the previous year, which was the highest average since EGOS, was established. For the intersessional period, the average is 291 days. Fig. 6 shows the development of annual average lifetimes for EGOS drifting buoys for the last 9 years.

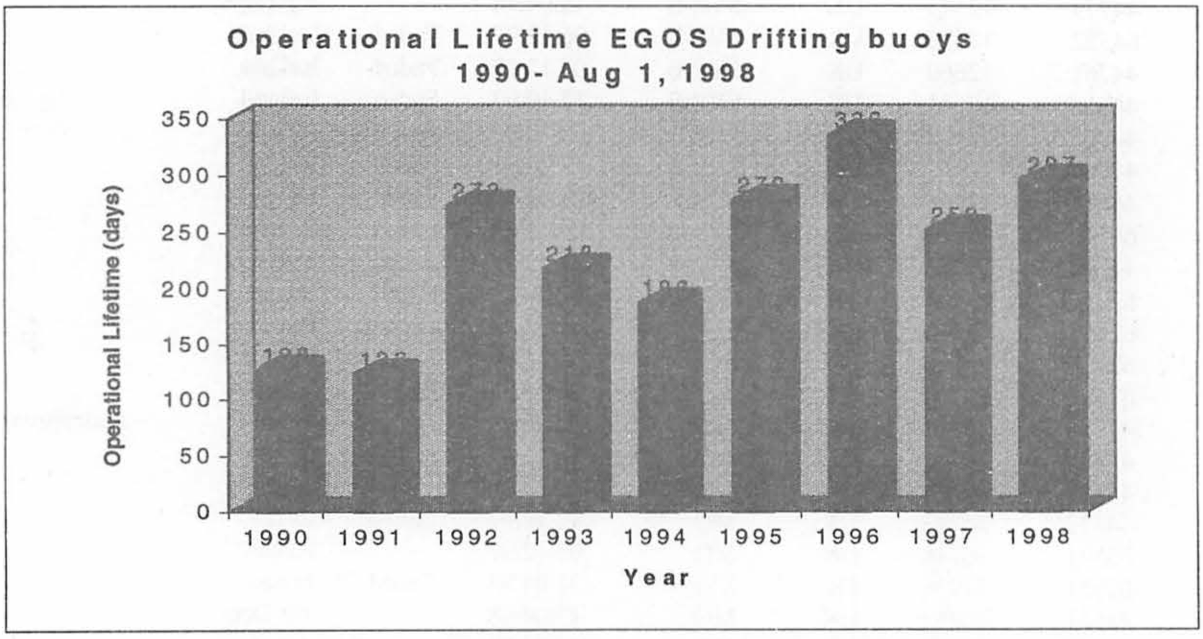


Fig. 6. Average operational lifetimes of EGOS drifting buoys, 1990-1998.

The decline in the average lifetime in 1997 may be a combination of many buoys running aground (14), and the fact that many of the SVP-B drifters had very short lifetime. The average lifetime for the 11 SVP-Bs that failed in 1997 was 145 days, in comparison to 303 days for the other types of buoys. The failure of 1 (of 11) SVP-B can be attributed to running aground, in comparison to 14 (of 23) for the other types. Most of the SVP-B's deployed later in the year seemed to operate for 7-8 months, and the average lifetime for the SVP-B's excluding failures within 30 days is 227 days. The reasons for the many failures of SVP-B drifters are subject to further investigation. The average lifetime for the SVP-Bs improved to 185 days during the intersessional period, and the number of early failures was to 7 (of 39).

Table 2 List of all EGOS buoys that ceased to operate September 30,1997 –September 30, 1998

WMO	ARGOS	Owner	Buoy Type	DepDate	Stopped	Cause of Failure	Op. Days	Comment
44726	2955	UK	MO	31.10.96	01.10.97	Faded	335	
65593	3039	IR	C/S-GPS	01.01.97	05.10.97	faded	277	
44605	27933	FR	SVP-B	16.02.97	07.10.97	Faded	233	
62712	3188	UK	SVP-B	24.01.97	15.10.97	faded	264	
44613	3306	UK	MO	03.03.97	15.10.97	Faded	226	
62804	26743	UK	MO	03.01.97	22.10.97	ashore	292	
44608	27938	FR	SVP-B	13.02.97	17.11.97	Faded	277	
44772	26747	UK	MO	12.12.97	01.01.98	Failed	20	
44743	1248	UK	MO	21.08.96	05.01.98	Ashore	502	
62556	27935	FR	SVP-B	11.04.97	28.01.98	Faded	292	
62555	27932	FR	SVP-B	11.04.97	02.02.98	Faded	297	
62519	5250	FR	SVP-B	01.01.98	05.02.98	Faded	35	
44742	26753	UK	MO-W	05.01.97	05.02.98	ashore	396	
62552	3008	FR	CFW	12.04.97	11.02.98	Faded	305	
65596	3036	NL	C/S-GPS	01.12.96	14.02.98	faded	440	
44610	5881	FR	SVP-B	09.12.97	22.02.98	Faded	75	
44769	26749	UK	MO	15.04.97	03.03.98	faded	322	
44728	1254	UK	MO	23.12.96	10.03.98	Faded	442	
44760	2947	UK	MO	07.07.95	17.03.98	Faded	984	
62554	14430	FR	SVP-B	11.04.97	18.03.98	Faded	341	
41596	6216	FR	SVP-BW	02.04.98	04.04.98	Failed	2	
44762	26754	UK	MO-W	06.01.97	04.04.98	Ashore	453	
62697	2959	UK	MO-W	06.01.97	16.04.98	Ashore	465	Re-depl
44777	12593	UK	SVP-BW	18.04.98	19.04.98	Failed	1	
44761	12660	UK	SVP-B	07.12.97	08.05.98	Faded	152	
62755	15510	FR	MS-GT	01.02.98	14.05.98	Faded	102	
44624	2958	UK	MO-W	25.12.96	27.05.98	Faded	518	
44766	12667	UK	SVP-B	22.12.97	01.06.98	Faded	161	
64552	12658	UK	SVP-B	06.12.97	02.06.98	Faded	178	
62558	27931	FR	SVP-B	14.09.97	03.06.98	Faded	262	
62751	15503	FR	SVP-B	01.02.98	08.06.98	Faded	127	
44614	12665	UK	SVP-B	21.12.97	10.06.98	Faded	171	
44763	12663	UK	SVP-B	17.10.97	12.06.98	Faded	238	
62501	15534	FR	MS-GT	27.03.98	12.06.98	Faded	77	
65594	1252	UK	MO	09.07.95	25.06.98	Faded	1082	
62803	3209	UK	MO	06.01.97	29.06.98	Ashore	539	
44771	12659	UK	SVP-B	03.09.97	04.07.98	Faded	304	
64530	12666	UK	SVP-B	04.12.97	09.07.98	Faded	217	
62551	27939	FR	SVP-B	31.01.98	15.07.98	Faded	165	
44616	12661	UK	SVP-B	17.10.97	31.07.98	Faded	287	
62557	27930	FR	SVP-B	12.09.97	03.08.98	Faded	325	

	12575	UK	SVP-B	17.08.98	18.08.98	Failed	1	
	12579	UK	SVP-B	17.08.98	18.08.98	Failed	1	
	12578	UK	SVP-B	17.08.98	18.08.98	Failed	1	
44765	12662	UK	SVP-B	02.10.97	21.08.98	Faded	323	
62553	3009	FR	CFW	11.04.97	26.08.98	Faded	502	Rec.
44621	26752	UK	MO-W	10.06.97	08.09.98	Ashore	455	
44609	5879	FR	SVP-BW	08.12.97	18.09.98	Faded	284	
44727	3098	UK	MO	14.04.97	28.09.98	Faded	532	

7.5 Data reception and dissemination

The data from the buoys in the EGOS North are received by CLS-Argos in Toulouse and by the LUTs in Oslo and Søndre Strømfjord which are operated by the Norwegian and Danish Met. services, respectively. Data are further disseminated from these centres on the GTS on a near real-time basis.

The EGOS south region (south of 50°N) can only be adequately served by CLS-Argos in Toulouse, and the data are therefore disseminated on the GTS mainly by Météo- France in Toulouse (LFPW).

Studies have been carried out at the Icelandic Meteorological Office on the mean number of useful reports from the EGOS North drifting buoys received in Reykjavik per day via LFPW (Toulouse), ENMI (Oslo) and BGSF (Søndre Strømfjord). These investigations include studies on the effect of data reception from three LUTs, on the data recovery rate and on the data reception via the GTS as a function of the hour of the day, with "cut-off" times of 90 and 210 minutes respectively

7.6 Data Quality and Data Quality Control

The data quality control for the EGOS buoys is based on the quasi-real-time control carried out at the Meteorological Office in Iceland and on the weekly and monthly statistics produced by the UK Meteorological Office, and on the quarterly reports on drifting buoys in the North Atlantic made by the UK Met Office.

Dubious or erroneous data are reported to the Technical Secretary who instructs the CLS Argos and the other LUT operators to delete the erroneous information from the GTS messages.

The data quality control information is available on the INTERNET through the mailing list, which is operated by the Icelandic Meteorological Office.

Météo- France in Brest provides regularly data quality information for the EGOS buoys. Monthly statistics are shared according to the origin of the reports on GTS. The statistics are available on http://www.shom.fr/meteo/rechstat

8. TECHNICAL DEVELOPMENTS

8.1 Air pressure sensors

A comparison made by the UKMO between SOLATRON and PAROSCIENTIFIC barometers had shown that the differences in measurements between the two sensors were insignificant. In 1997 the UK installed SOLARTRON barometers on all of their TOGA (FGGE) style EGOS buoys. Also CMR in Bergen made their electronics unit adaptable to the SOLARTRON barometer in 1997.

8.2 GPS Navigation Receiver in Drifting Buoys

In December 1994 the first EGOS drifting buoy (Dutch C/S buoy, Argos Id. No. 3036) with a GPS receiver installed was deployed in EGOS North, as a test on equipment performance and data output. The objectives of introducing the GPS option were to improve position accuracy and to increase data reception from areas or time periods with poorer Argos satellite coverage. Also by using the buoy's own GPS position Argos positioning might become superfluous; the transmission rate could be reduced from 90 sec to 200 sec. with a consequential saving in Argos cost. The GPS also ensures that the real time clock on the buoy is updated and correct.

The test in 1994 was only partially successful, as the buoy suffered an early failure. However, it was recovered, refurbished and redeployed in November 1996, now modified to transmit at the 200 sec repetition rate. The buoy was still in operation by the end of 1997. A new C/S (Irish, Argos Id. No 3039) with GPS was deployed in January 1997. Although the lifetime of buoy 3039 was acceptable (275 days) the reception remained poor relative to 3036 and other buoys. Buoy 3039 had a slight change in the antenna fixture (bracket) relative to 3036, and the poor reception could be attributed to this. A total of 4 GPS positioned ConMar Drifters (C/S and C/B) are now operational. The Technical Secretary presented a study of the performance of the GPS at the EGOS summer meeting in Reykjavik. It was concluded that the GPS is now nearly 100% effective.

8.3 Checksum

Checksum encoding and comparison is one option offered by CLS and the LUTs as part of the automatic data quality control before data are inserted on GTS. Data transmission errors may thus be eliminated. From 1996, all new C/S and METOCEAN drifting buoys operated in EGOS compute and transmit a data checksum as part of the data format. Checksums are also incorporated in the SVP-B drifter messages.

8.4 SVP-BW Drifters

During the winter 1996-97, Météo--France tested a Metocean SVP-BW drifter able to report wind observations. Wind speed is obtained acoustically using an hydrophone assembly suspended approximatively 10 metres below the surface unit. As for FGGE type buoys, wind direction is obtained

using a fixed vane in combination with a compass located in the surface unit. No significant differences in measurements were found when compared to other buoys. Since this test, other drifters of that kind have been deployed in various areas inclusing in the tropics.

9. EGOS MOORED BUOYS

The United Kingdom has continued to operate a network of 6 moored buoys in the Atlantic west of the British Isles (K1-K5 and RARH). The UK also has established a moored buoy station at about N 47.3°, W 9° (the 'Brittany' buoy). In July 1998, a new station, the 'Gascoine' station in N45.23°, W005° was established in co-operation with Météo-France. All these eight buoys are part of EGOS. See Fig 2 for locations.

11. PARTICIPATION IN INTERNATIONAL MEETINGS

In 1997 EGOS has been represented at the following international meetings:

- DBCP-XIII meeting in La Reunion, on October 13. - 17. 1997. The EGOS was formally represented by Mr. Wynn Jones, UKMO.

- CGC meeting held in Copenhagen on 26-28 August 1998. EGOS was formally represented by Mr. Hreinn Hjartarson, Iceland
- A summary report on the EGOS activities was prepared and presented at both these meetings.

WMO-IOC
DATA BUOY COOPERATION PANEL

INTERNATIONAL ARCTIC BUOY PROGRAM

DAVID A. BENNER
U.S. NATIONAL ICE CENTER
(http://www.natice.noaa.gov)

INTERNATIONAL ARCTIC BUOY PROGRAM OBJECTIVES

- ESTABLISH AND MAINTAIN OBSERVATIONAL BUOY NETWORK IN THE ARCTIC OCEAN
- DISTRIBUTE DATA IN REAL-TIME VIA GTS
- MAINTAIN INDEPENDENT QUALITY-CONTROLLED DATA ARCHIVE
- PROMOTE COOPERATION WITH OTHER RELATED PROGRAMS

INTERNATIONAL ARCTIC BUOY PROGRAM REQUIREMENTS

- APPROXIMATELY 40 BUOYS SPACED OVER 400 KM SQUARE GRID
- MEASURE ENVIRONMENTAL PARAMETERS
  - SURFACE ATMOSPHERIC PRESSURE
  - SURFACE AIR TEMPERATURE
  - SEA ICE DRIFT
- DATA MANAGEMENT AND ARCHIVAL
- STANDARDIZATION OF BUOY DESIGN FOR AERIAL AND SURFACE DEPLOYABLE BUOYS

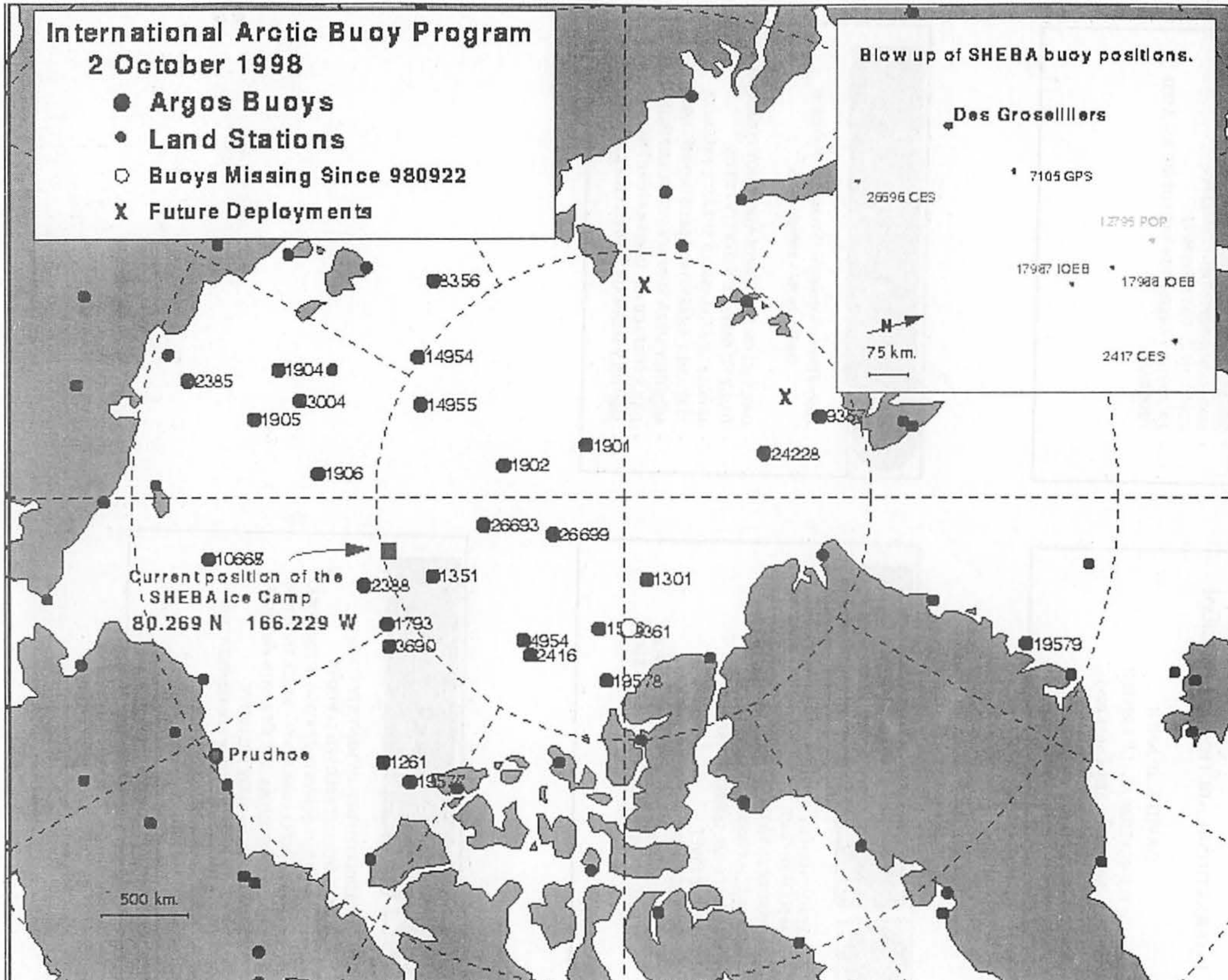
INTERNATIONAL ARCTIC BUOY PROGRAM DATA MANAGEMENT AND ARCHIVAL

Applied Physics Laboratory/ University of Washington
(http://iabp.apl.washington.edu)

- DAILY (12 GMT) INTERPOLATED BUOY POSITIONS
- DAILY 912 GMT) ICE VELOCITY FIELDS
- 12 HOURLY ANALYSIS OF SURFACE PRESSURE
- 12 HOURLY ANALYSIS OF GEOSTROPHIC WINDS
- MONTHLY MEAN SURFACE PRESSURE FIELDS
- DAILY SURFACE AIR TEMPERATURE FIELDS*
- MONTHLY MEAN AIR TEMPERATURE FIELDS*

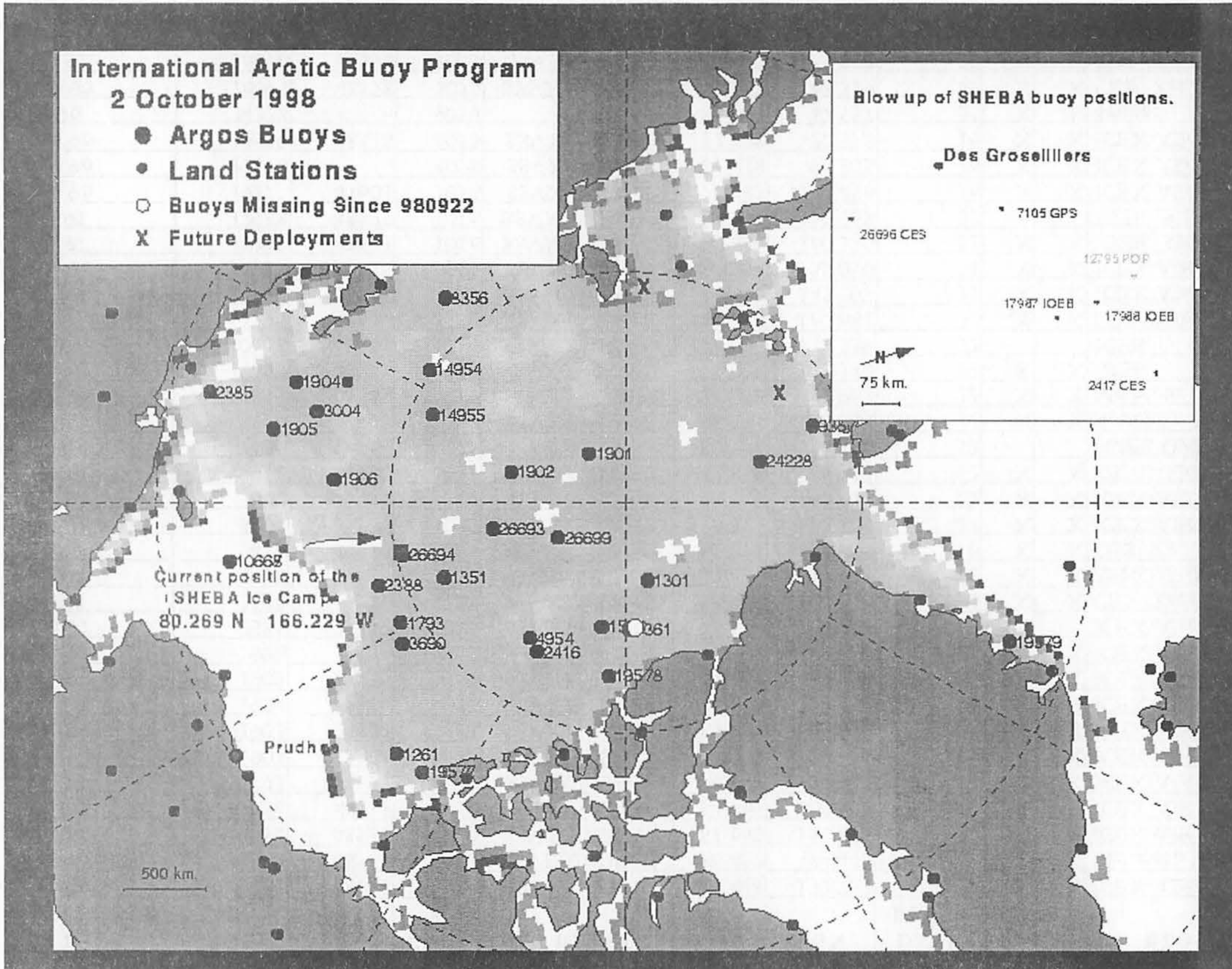
INTERNATIONAL ARCTIC BUOY PROGRAM 1998 ACCOMPLISHMENTS

- COORDINATED DEPLOYMENT STRATEGY
- SUCCESSFULLY DEPLOYED 14 BUOYS
- PRESENTLY 34 BUOYS OPERATING IN NETWORK
- PARTICIPANT COOPERATION - WHITE TRIDENT-98
- SUPPORT FOR SHEBA, SCICEX & NOW PROJECTS
- NICOP RUSSIAN BUOY INITIATIVE
- GENERATION OF ROUTINE AIR TEMPERATURE FIELDS


International Arctic Buoy Program
2 October 1998
Argos Buoys
Land Stations
Buoys Missing Since 980922
X Future Deployments
Blow up of SHEBA buoy positions.
Des Groseilliers
7105 GPS
26696 CES
17987 IOEB
17988 IOEB
2417 CES
75 km.
N
8356
14954
1904
2385
3004
14955
1905
1901
24228
1902
1906
26693
26699
10668
Current position of the SHEBA Ice Camp
80.269 N 166.229 W
2388
1351
1301
1793
3690
4954
2416
19578
19579
Prudhoe
1261
500 km.

2 October 1998

DATE DEPLOYED	ARGOS ID	WMO ID	EXPR #	GTS HEADER	LAT	LON	DATA BYTES	P	T	BUOY DESCRIPTION
Aug 96	1261	48102	484	SSVX01-LFPW	75.418	-131.763	17	X	X	ICEX-AIR
Apr 98	1301	48581	1053	SSVX02-CWEO	86.450	-74.447	16	X	X	Metocean TOGA
Aug 98	1351	48532	484	SSVX01-LFPW	81.640	-156.813	17	X	X	ICEX-AIR
Aug 96	1556	48111	314	SSVX01-LFPW	84.465	-100.276	17	X	X	ICEX-AIR
Aug 98	1793	48533	29	SSVX01-LFPW	79.109	-151.227	17	X	X	ICEX-AIR
Aug 97	1901	25521	557	SSVX12-KARS	87.369	125.450	21	X	X	ICEX-AIR
Aug 97	1902	25522	557	SSVX12-KARS	84.983	164.690	21	X	X	ICEX-AIR
Aug 98	1904	25524	557	SSVX12-KARS	75.079	159.420	21	X	X	ICEX-AIR
Aug 98	1905	25525	557	SSVX12-KARS	74.718	167.860	21	X	X	ICEX-AIR
Aug 98	1906	25526	557	SSVX12-KARS	77.597	175.430	21	X	X	ICEX-AIR
Aug 97	2385	25549	1053	SSVX12-KARS	71.698	164.767	17	X		ICEX-AIR
Sep 98	2388	25557	1053	SSVX12-KARS	78.910	-160.848	32	X	X	CES / Zeno Ice Buoy
Apr 98	2416	47523	1053	SSVX02-CWEO	82.496	-119.994	32	X	X	ZENO-3200
Sep 97	2417	48572	1053	SSVX02-CWEO	81.075	-157.124	16	X	X	CES / Zeno Ice Buoy (SHEBA)
Aug 98	3004	25535	1053	SSVX12-KARS	76.321	163.128	17	X	X	ICEX-AIR
Aug 98	3690	25011	314	SSVX01-LFPW	78.718	-146.930	21	X	X	ICEX-AIR
Apr 98	4954	48580	1053	SSVX02-CWEO	82.838	-124.223	32	X	X	ZENO-3200
Sep 97	7105		695		80.544	-164.289	32			PMEL GPS Buoy (SHEBA)
Jul 98	8356	12345	282	SSVX06-KARS	78.295	130.984	12	X	X	AARI Air Drop
Aug 96	9357	63663	919	SSVX07-LFPW	81.419	22.967	22	X	X	Metocean
May 92	10667	48531	1016	SSVX02-CWEO	73.008	-171.344	32	X	X	IOEB
May 92	10668	48531	1016	SSVX02-CWEO	73.006	-171.339	32			IOEB
Sep 97	12795	48519	282	SSVX16-KARS	81.137	-160.681	20	X	X	POP (SHEBA)
Aug 98	14954	25573	919	SSVX01-LFPW	79.880	145.297	21	X	X	ICEX-AIR
Aug 98	14955	25574	919	SSVX01-LFPW	80.954	155.050	21	X	X	ICEX-AIR
Sep 97	17987	48522	1016	SSVX02-CWEO	80.656	-160.175	32	X	X	IOEB (SHEBA)
Sep 97	17988	48522	1016	SSVX02-CWEO	80.899	-160.268	32			IOEB (SHEBA)
Aug 96	19577	47601	1053	SSVX12-KARS	75.495	-126.456	16	X	X	ICEX-AIR
Aug 96	19578		1053	SSVX12-KARS	82.418	-95.205	16	X	X	ICEX-AIR
Aug 96	19579	48518	1053	SSVX12-KARS	72.638	-20.375	16	X	X	ICEX-AIR
Jul 96	24228		9053		84.042	17.557	32	X	X	Seimac
Mar 96	26693	48578	1053	SSVX02-CWEO	84.251	-168.319	32	X	X	CES / Zeno Ice Buoy
Sep 97	26696	48576	1053	SSVX12-KARS	79.717	-165.289	32	X	X	CES / Zeno Ice Buoy (SHEBA)
Jul 96	26699	48573	1053	SSVX02-CWEO	86.766	-151.443	32			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500 km.

Polar Science Center
International Arctic Buoy Program (IABP)

IABP Participants

The International Arctic Buoy Program (IABP) is funded and managed by its participants. Representing eight countries, participants include operational and research agencies, meteorological and oceanographic institutes, and nongovernmental organizations. Participant contributions include equipment, services, and program coordination as well as funding.

- Alfred-Wegener Institute for Polar and Marine Research, Germany
- Arctic and Antarctic Research Institute, Russia
- Arctic Centre, University of Lapland, Finland
- Environment Canada, Canada
- Canadian Coast Guard, Canada
- Chr. Michelsen Research Institute, Norway
- Institute of Ocean Sciences, Canada
- Institute of Oceanology, China Academy of Sciences, China
- Japan Marine Science and Technology Center, Japan
- Marine Environmental Data Service, Canada
- Nansen Environmental and Remote Sensing Centre, Norway
- National Ice Center*, U.S.
- Norsk Polarinstitutt , Norway
- Norwegian Meteorological Institute, Norway
- Pacific Marine Environmental Laboratory, NOAA, U.S.
- Polar Science Center, Applied Physics Laboratory, University of Washington, U.S.
- Russian Federal Service of Hydrometeorology and Environmental Monitoring, Russia
- Scott Polar Research Institute, U.K.
- Service Argos, France, U.S.
- Woods Hole Oceanographic Institution, U.S.
- U.K. Meteorological Office, U.K.
- Naval Oceanographic Office, U.S.
- Naval Meteorology and Oceanography Command, U.S.
- World Climate Research Programme (WCRP) of the World Meteorological Organization (WMO)/Intergovernmental Oceanographic Commision (IOC) / International Council of Scientific Unions (ICSU).

*Representing the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), the Office of Naval Research (ONR), and the U.S. Coast Guard.

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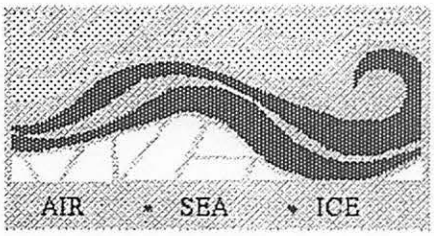


Polar Science Center
International Arctic Buoy Program (IABP)

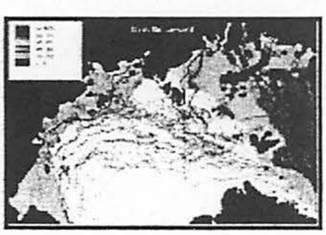
Some Research Highlights Using IABP datasets

This section is under construction.

- Backwards Trajectory Analysis

  Using the IABP data, "backwards" trajectories can be analyzed to determine the origin of a piece of ice, given its current location and time.

  In this example, Pfirman S.L., etal. (soon to be published), have studied the origin of smectite samples taken in the Arctic Basin. The location and concentration of each sample is shown by small colored dots. The squigley lines, color coded by percent concentration of smectite in the sample, show the backwards trajecties of each sample. These trajectories have been "stopped" at the mean fastice edge shown by the thick black line. Concentrations of smectite in sea floor samples are indicated by colored octagons. The smectite concentrations of the sea ice samples are shown to generally, match the characteristics of the source area. On this map, the perennial ice pack is shown in white, marginal ice zone is shown in light grey, the open water area is shown in dark gray, and land is shown in black.

IABP Data Animations

The IABP mean surface pressure field analysis supports the classical analysis of Prik, Namias, and Gorshkov. Mean monthly pressure fields reveal large interannual variability in the polar regions.

When the pattern of daily ice motion is overlaid on the pressure fields, the ice clearly follows the isobars.

- 12-hourly Pressure Fields and Buoy Motions, April 1 to May 31, 1993.

Pressure fields are contoured over a map of the arctic basin. The vectors emanate from the current buoy positions. A length of 1 cm on the screen roughly corresponds to a buoy velocity of 2 cm/s.

WARNING: This demo takes 3M of disk space.

- Seasonal Mean Pressure Fields and Ice Motion.

  Seasonal mean ice motion shown using red arrows, follow the contours of the seasonal mean pressure fields shown in yellow. The blue shading indicates an area of high pressure and the white shading, areas of low pressure. The green indicates openwater.

  WARNING: This demo is not small either.

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Comments to webmaster

Last Revised: February 6, 1996

An article for the WCRP Newsletter No. 3

The International Arctic Buoy Programme

The perennial ice cover of the Arctic Ocean is an ideal platform for automatic meteorological stations. Typical Arctic ice floes are 1-2 km in diameter, 2-4 m in thickness, move 1-200 km in a month, and are remarkably resistant to fracture. In the early 1950's, scientists of the Arctic and Antarctic Research Institute (AARI, St. Petersburg, Russian Federation) designed a Drifting Automatic Radio-Meteorological Station (DARMS), which became the workhorse of an extensive meteorological network in the Siberian Sector of the Arctic Ocean (1953-1972). Station location was determined by HF radiowave triangulation from a number of coastal stations; basic meteorological data were reported and available in near-real time.

In the early 1970's, a number of satellite-linked automatic data buoy systems were developed by USA scientists and tested in the Arctic Ocean. The technology for satellite navigation and data transmission evolved quickly, and, by the mid 1970's, the possibility of a basin-wide meteorological network for the Arctic Ocean was recognized. In 1978, the US National Science Foundation granted funds to the University of Washington to acquire and air deploy 20 buoys throughout the Arctic Basin. This programme was seen as a contribution to the Global Weather Experiment (1978-79) and as the initiation of a multi-year monitoring programme in support of the second GARP objective, which later evolved into the World Climate Research Programme. Within the first months of 1979, a basin-wide network was in place, reporting surface air pressure, air temperature, and station location. After termination of the Global Weather Experiment, the buoy programme was primarily supported by US National Oceanographic and Atmospheric Administration (NOAA), with contributions from a coalition of other agencies (1980-1989). In 1979, Norway began its own regional buoy programme to support research and weather forecasting near Svalbard; Canada was also planning a buoy programme to support Arctic forecast centres.

In 1990, the feasibility of establishing an international data buoy programme for the Arctic was studied by WCRP and in the next year the International Arctic Buoy Programme (IABP) was established and accepted as an Action Group of the WMO/IOC Data Buoy Co-operation Panel. The IABP is managed by its Participants, those operational agencies, meteorological and oceanographic institutes, research agencies, and non-governmental organizations that are interested in the Arctic Ocean studies and contribute actively to the programme. Presently there are 24 Participants in the IABP. The objectives of the IABP are "*to establish and maintain a network of drifting buoys in the Arctic Ocean to provide meteorological and oceanographic data for real-time operational requirements and research purposes including support to the World Climate Research Programme and the World Weather Watch Programme*".

The Marine Environmental Data Service, Canada, has responsibility for archiving the IABP data flowing daily through the Global Telecommunications System, and they maintain the operational archive. The Polar Science Center, University of Washington, Seattle, WA, USA maintains and distributes a research quality archive and many derived products from the IABP data. The IABP Web Site is: http://iabp.apl.washington.edu/.

The network of 15-25 buoys, with a nominal separation of 500 km, is combined with coastal meteorological stations to define the synoptic pressure patterns north of 70°N. The available record of quality surface pressure data define the basic statistics (e.g., mean annual cycle, synoptic variability, and interannual variability). Results on decadal scale variability show the Arctic Basin to be a centre for extraordinarily large change. Walsh et al (1996) compared two eight-year records, 1979-86 and 1989-94, and found a 4 mb difference between the means of these two periods. A seasonal analysis revealed an even larger change for the early winter season (November-January).

Surface pressure is a key meteorological variable over the Arctic Ocean because of its connection to the surface wind and surface wind stress. Co-variance studies between the geostrophic wind, which is proportional to the horizontal gradient of pressure, and 12-hourly averaged surface wind shows typical correlations of 0.97. Further studies suggest simple relationships between surface wind and the tractional forces exerted on the ice cover. Meteorological data from the IABP can resolve the 12-hourly surface winds to within 1-2 m/sec and explain about 90% of the variance of the surface air stress. In this sense, the Arctic Ocean may be one of the best observed regions of the World Ocean.

In the beginning years of the Arctic drifting buoy programmes, surface air temperature was considered to be a secondary variable. There was little demand from the operational community for quality 2-m air temperature data because such data were not routinely assimilated into weather forecasts. The sea-ice research community was focused on studies of the mechanical response of pack ice to the wind stress and the seasonal cycle of air temperature was adequate for much of the large-scale Arctic Ocean thermodynamics research. The absence of a pressing requirement for synoptic temperature data was complemented by technical issues. Because many of the buoys were designed for parachute deployment, incorporation of a shielded and ventilated thermistor was difficult. Temperature data from the early Arctic buoy programmes should be used with care, because many of the thermistors were contained inside the buoy hull. The lack of ventilation and the tendency for the buoys to be covered with snow, combined to produce an underestimate short-term variability and to introduce a warm bias.

In the mid 1980's, the climate community began the call for quality surface air temperature from the ice covered oceans. The call was in response to early GCM simulations suggesting a high latitude amplification of greenhouse warming, under which the wintertime Arctic may warm by 15-20°C. Note, modern simulations place the wintertime warming in the 6-12°C range; still the largest surface change on the globe. New estimates of natural interannual surface air temperature variability in the Arctic gives a standard deviation of 3°C for wintertime monthly means. Thus, the ice-covered Arctic Ocean has a most favourable signal to noise ratio for greenhouse related global change. In 1985, the Arctic Buoy Programmes began the design and preferential installation of stations having ventilated and shielded thermistors at 2 m. Many of the IABP buoys now report temperatures with RMS error less than 0.5°C.

Locations of the meteorological stations are determined by the Argos positioning system. The Argos circular RMS value of 500 m in the 1980's has now been improved to 100 m. More recently, many of the buoy positions are located by the Global Positioning System with typical errors of 100 m. The time series of positions is analyzed to determine buoy velocity. As the typical daily average, ice velocity is 7 cm/sec, the buoy data captures more than 99% of the daily variance.

The basic kinematics and statistics of ice motion are well documented by analyses of the individual buoy trajectories. Daily, monthly, and annual fields of sea-ice motion have been prepared since 1979 and define the means and variances of sea-ice motion and deformation throughout the Arctic Basin (see the Figure). More recently, the buoy data have been combined with successive images from satellite based active and passive microwave instruments. This merged analysis has produced high quality fields of ice motion from all of the Arctic Ocean.

Nansen (1905) first noted that the ice pack readily responds to the wind, drifting about 45° to the right of the wind with about 2% of the wind speed. Co-variance studies have combined the buoy trajectory data with the fields of geostrophic wind to further quantify the wind/ice motion relationship; e.g., see Thorndike and Colony (1982). On time scales of days to years, the linear response of sea ice to the local geostrophic wind explains about 70% of the ice motion variance. Maury (1855) recognized that sailing vessels were effected by both wind and surface ocean current. Using wind and navigation data from many vessels, he was able to prepare excellent charts of surface currents for much of the World Ocean. Similarly, the direct frictionally driven ice motion can be subtracted to infer the underlying surface ocean currents.

Recently the International Arctic Buoy Programme data have been used extensively in studies of pollution transport, energy and momentum exchange, and freshwater fluxes. The data also play a key role in forcing and validating mathematical models of the sea-ice/ocean coupled system. 1998 marks the twentieth year of the several Arctic buoy programmes. A mini-conference will be held in Seattle, WA, USA from 3-4 August, to summarize the scientific achievements and to review the future of the IABP.

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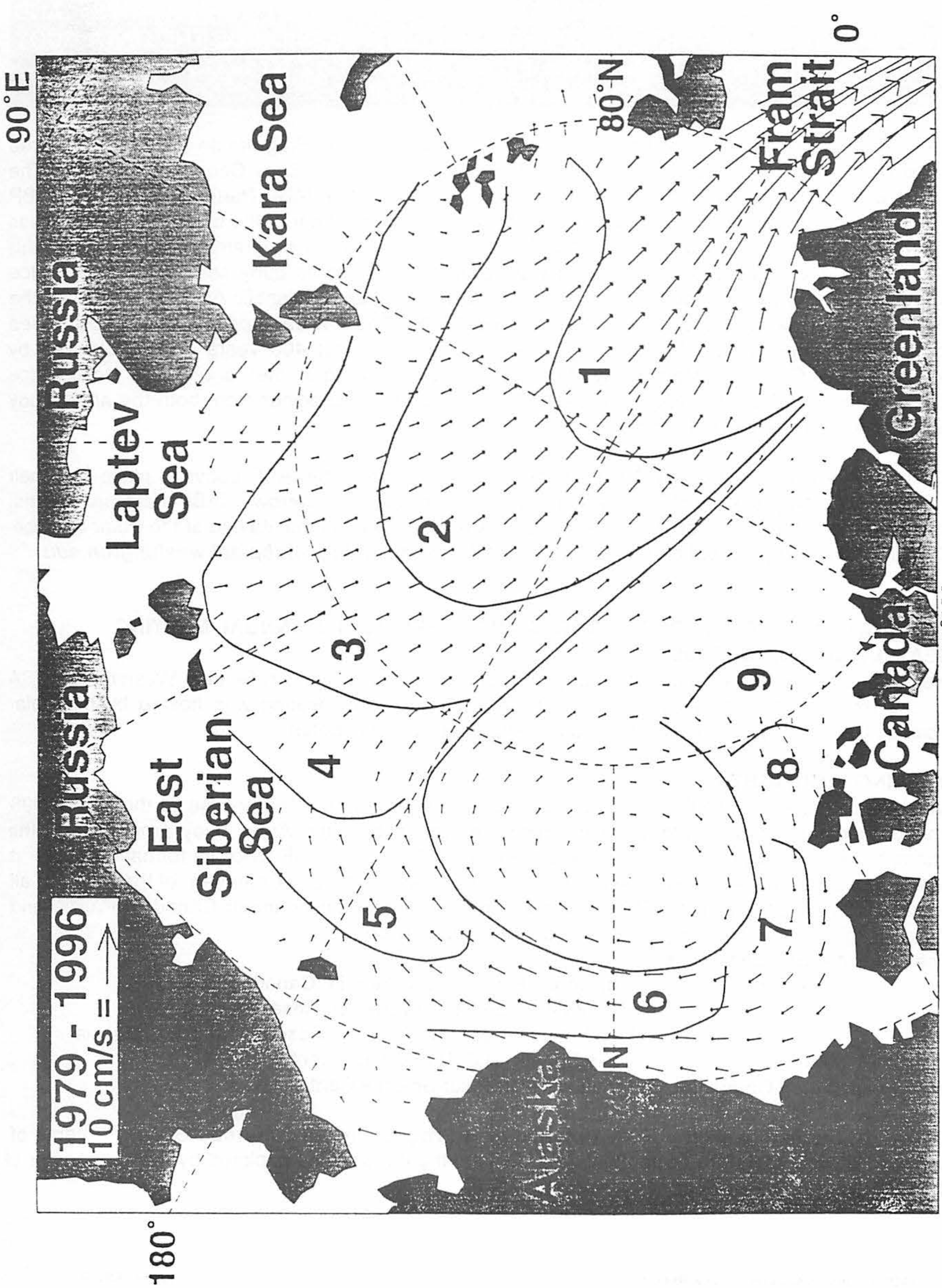
Thorndike, A.S. and R. Colony, 1982: Sea ice motion in response to geostrophic wind. J. Geophys. Res., 97 (C9), 5845-5852.

Walsh, J.E., W.L. Chapman and T.L. Shy, 1996: Recent Decrease of the Sea Level Pressure in the Central Arctic. J. Of Climate, Vol. 9, 480-486.

Figure Caption

Mean field of sea-ice motion in the Arctic Basin based on 1979 through 1996 buoy data. The isochrones represent the number of years the ice resides in the Basin before exiting through the Fram Strait.

R. Colony
V. Savtchenko


1979 - 1996
10 cm/s =
90°E
0°
180°
90°W
80°N
N
Russia
Kara Sea
Laptev Sea
Russia
East Siberian Sea
Alaska
Canada
Greenland
Fram Strait
1
2
3
4
5
6
7
8
9

INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP) CHAIRMAN'S AND COORDINATOR'S REPORT FOR THE FOURTEENTH SESSION OF THE DATA BUOY COOPERATION PANEL, MARATHON, FLORIDA (U.S.A.), 12 TO 16 OCTOBER 1998

prepared 30 August 1998

This report will focus on activities of the International Arctic Buoy Programme that have occurred since the report filed August 1997 for the 13th session of the Data Buoy Cooperation Panel. The report will also outline upcoming activities including directions that IABP Participants and the IABP executive would like the program to head. 1998 was not only the year of the eighth annual business meeting of the IABP, it also marked the 20th year of the Arctic buoy program. In celebration of this anniversary, the IABP business meeting was followed by an arctic buoy conference and an ice workshop. The 2-day mini conference "The Arctic Buoy Program - Scientific Achievements from the first 20 years" was sponsored by the IABP and the DBCP. The 2 ½ day workshop "Operational Sea Ice Charts of the Arctic - Scientific Achievements from the first 400 years" was sponsored by ACSYS (Arctic Climate System Study of the World Research Programme) and the US National Ice Center. The ACSYS international office in Oslo is collating proceedings from both the arctic buoy conference and the ice workshop.

For an up-to-date listing of IABP participants, monthly maps of the IABP buoys in place and their status, buoy diagrams, IABP images and plots to browse and borrow, IABP data animations, pointers to ice charts and more please access the IABP homepage maintained at the Polar Science Center, Applied Physics Laboratory, University of Washington: ***http://iabp.apl.washington.edu***

INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP) EIGHTH ANNUAL MEETING SEATTLE, U.S.A., JULY 1998

Members of the International Arctic Buoy Programme met 29-31 July in Seattle, Washington, USA for the eighth annual business meeting of the program. The meeting was hosted by the Polar Science Centre, Applied Physics Laboratory, University of Washington.

MEETING HIGHLIGHTS

New executive - The IABP executive changed chairman and coordinator-wise at the IABP 1998 annual meeting. Roger Colony, a founding member of both the Arctic buoy program and the International Arctic Buoy Programme, and the coordinator of the IABP since its formation 1991, is headed for a new job at the University of Alaska and Brian O'Donnell, Chairman of the IABP for all but one of the years of the IABP's existence, has moved to Environment Canada's Pacific and Yukon Region where the buoys are in water rather than on ice.

The present IABP executive is:

Chairman:	Tim Goos, Environment Canada, Canada
Vice Chairman:	Thor Kvinge, Christian Michelsen Research, Norway
Member:	Ivan Frolov, Arctic and Antarctic Research Institute, Russia
Member:	Dave Benner, U.S. National Ice Center, U.S.A.

and the appointed Coordinator is Ignatius Rigor, Polar Science Center, U.S.A

Common interests with the IPAB (International Programme for Antarctic Buoys) - Items of common interest to the Participants of the IABP and the IPAB will be explored by the coordinator of the IABP.

IABP data on CD-ROM - MEDS (Marine Environmental Data Service), Fisheries and Ocean, Canada, will work with the coordinator of the IABP and one of the Participants to develop a CD-ROM containing IABP data. It was noted that such data is available via the web from IABP homepage but a CD-ROM would facilitate access to, and use of, the data.

Real time processing of meteorological data - The timeliness of meteorological data getting onto GTS from local users terminals (LUTs) versus from the Service Argos facilities at Toulouse and Landover will be investigated. It was noted that data processed at Service Argos facilities have greater position accuracy than data processed at the LUTs such as Edmonton. Specifically, Environment Canada is interested in the merits of an HRPT station at Resolute or Eureka to put Arctic buoy data onto GTS. The question is how much of the buoy data presently not being received from the satellite in real time would a station at Resolute or Eureka be able to acquire and process and get onto GTS in real time? Additionally what would be the time advantage of such an HRPT station for buoy data onto GTS versus the existing systems of real-time and stored data being received at stations such as Fairbanks and transmitted to Service Argos, Landover, for processing and input to GTS ?

IABP data is being used - Ignatius Rigor, Polar Science Centre, presented two examples of the use of IABP buoy data (A multitude of uses were outlined at the Arctic buoy mini-conference):

- predicting the drift of the SHEBA ice camp (Figure 2) and the position and deformation of the SCICEX survey area and
- inclusion of IABP surface air temperatures in global climatology such as that of Jones et al. (Jones, P.D. , M. New, D.E. Parker, S. Martin, and I.G. Rigor, Surface air temperature and its changes over the past 150 years, Rev. of Geophysics, submitted, July 1998).

IABP PARTICIPANTS

Participants of the IABP remain a mix of operational agencies, meteorological and oceanographic institutes, research agencies and non-government organizations that are interested in the Arctic Ocean and who contribute actively to the program. IABP Participants continue to seek partners within their respective countries and internationally who are willing to supply additional buoys or sensors for existing buoys so that the IABP can grow.

CURRENT BUOY ARRAY AND COOPERATION

Per Figure 1, the buoy array across the Arctic Basin as of 11 August 1998 was comprised of 20 buoys - the SHEBA buoys being counted as a single buoy due to their spacing - The array includes 3 buoys belonging to the U.S. National Ice Center deployed via landing on ice by Environment Canada using Twin Otter time provided in part by Polar Continental Shelf Project. The deployment flights were conducted from Eureka and a member of the U.S. National Ice Centre accompanied the first of the two deployment flights. There was also a June air drop of twoCALIBs in the Canadian Beaufort but one of buoys never did transmit pressure information - became a position only buoy - and the other succumbed mid July to what is believed the breakup of the ice in the Beaufort. Indeed, the ice across the Beaufort by mid August was near the absolute minimum ever observed.

1998 DEPLOYMENTS TO COME

Ongoing Process - Deployments to replenish the buoy array across the Arctic Basin are ongoing. Buoys fail due to battery power coming to an end, other buoys exit the Arctic Basin for the North Atlantic and the ice that supports then melts away, and buoys fall through the ice while others get crushed as ice rafts and ridges. The number of operational buoys is usually at a peak late summer (September) and at a minimum during the early spring (March).

The following outlines planned 1998 deployments from 11 August onward. Many of the buoys are likely in place on ice as this report is being written 30 August. Figure 3 shows the planned deployments, projected positions of the existing array 01 September (dark dots), and 01 October (fainter dots), and the ice 11 August 1998.

- 2 ICEX buoys provided by Alfred Wegener Inst. and 1 AARI buoy provided by AARI / (US) Office of Naval Research Europe, Laptev Sea, from the Polarstern, August, (red) square
- 7 ICEX air buoys provided by UK Meteorological Office (2), Polar Science Centre / Japan Marine Science and Technology Center (3), Norwegian Meteorological Institute (1), and Norsk Polarinstitutt (1), Beaufort and East Siberian Seas, via U.S. Naval Oceanographic Office C-130 "*White Trident*" air drop, August, big solid (red) dots
- 2 AARI buoys provided by AARI / (US) Office of Naval Research Europe, North Barents and North Kara Sea, via the vessel Federov, August, (red) diamonds
- 1 CES Zeno buoy, provided by US National Ice Center, Beaufort Sea, via US Coast Guard icebreaker Polar Star, August or September, (red) triangle
- 2 CES Zeno buoys, provided by US National Ice Center, Beaufort Sea, via US submarine. August or September, (red) open circles

NEW DIRECTIONS

Under ice data - It was noted by Roger Colony that oceanographers have noticed a significant warming of the Arctic Ocean and the erosion of the layer of cold water extending from the surface to 200 metres. Is this a signal of climate change or a signature of natural climate variability? Buoys on ice to measure and feed to GTS the IABP principle parameters of surface air temperature and surface atmospheric pressure remain key to the IABP program. However, IABP participants look to the (expanded) use of POP (Polar Ocean Profiler) buoys to monitor upper ocean temperatures and salinity. The Participants will search for a dedicated person within the IABP to be a principal investigator in support of the deployment of POP buoys.

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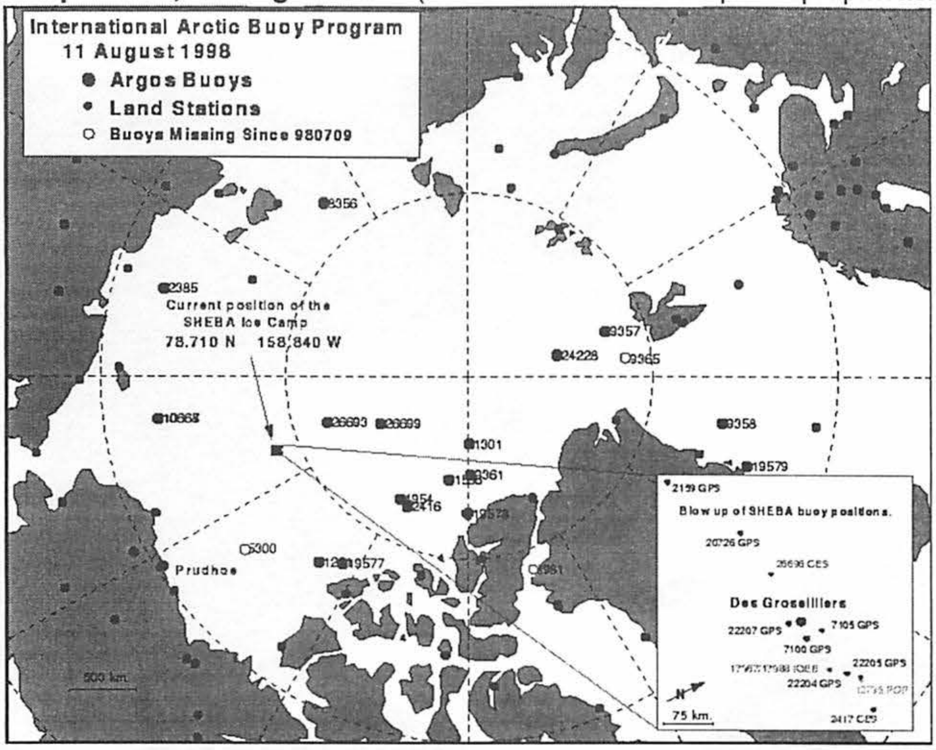
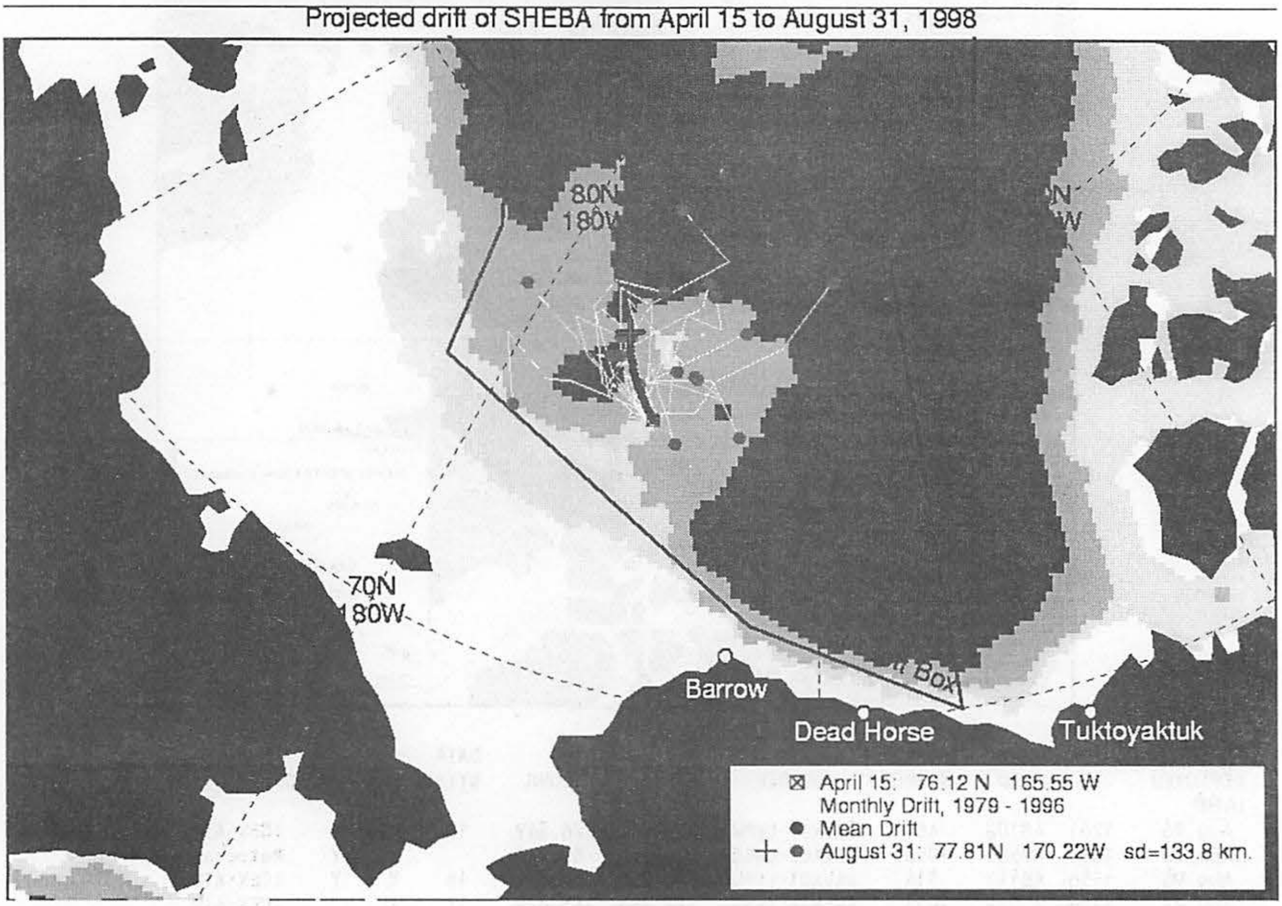
Figure 1. Buoy map / table, 11 August 1998 (from IABP web site http://iabp.apl.washington.edu)



DATE DEPLOYED	ARGOS ID	WMO ID	YPR NUMBER	GTS HEADER	POSITION LAT	LONG	DATA BYTES	P	T	BUOY DESCRIPTION
IABP										
Aug 96	1261	48102	484	SSVX01-LFPW	76.942	-128.849	16	Y	Y	ICEX-AIR
Apr 98	1301	48581	1053	SSVX02-CWEG	86.308	-89.275		Y	Y	Metocean TOGA
Aug 96	1556	48111	314	SSVX01-LFPW	84.234	-100.727	16	Y	Y	ICEX-AIR
Aug 97	2385	25549	1053	SSVX12-KARS	72.753	163.829	17	Y		ICEX-AIR
Apr 98	2416	47523	1053	SSVX02-CWEG	82.102	-115.190		Y	Y	ZENO-3200
Apr 98	4954	48580	1053	SSVX02-CWEG	82.310	-119.140		Y	Y	ZENO-3200
Mar 93	8356	25538	282		77.729	129.844				
Aug 96	9357	63663	919	SSVX07-LFPW	82.143	18.297	22	Y	Y	Metocean
Aug 96	9358	63661	919	SSVX07-LFPW	76.028	-10.608	22	Y	Y	Metocean
Aug 95	9361	25571	919	SSVX07-LFPW	84.603	-88.828		Y	Y	ICEX-AIR
May 92	10667	48531	1016	SSVX02-CWEG	72.931	-172.153	32	Y	Y	IOEB
May 92	10668	48531	1016	SSVX02-CWEG	72.940	-172.133	32			IOEB
Aug 96	19577	47601	1053	SSVX12-KARS	77.642	-123.964	16	Y	Y	ICEX-AIR
Aug 96	19578	47602	1053	SSVX12-KARS	82.500	-90.386	16	Y	Y	ICEX-AIR
Aug 96	19579	48518	1053	SSVX12-KARS	74.163	-18.214	16	Y	Y	ICEX-AIR
Jul 96	24228		9053		85.025	13.583	32	Y	Y	Seimac
Mar 96	26693	48578	1053	SSVX02-CWEG	81.874	-161.904	32	Y	Y	CES X Zeno
Sep 97	26696	48576	1053	SSVX12-KARS	78.564	-162.619	32	Y	Y	CES X Zeno
Jul 96	26699	48573	1053	SSVX02-CWEG	84.531	-151.725	32			CES X Zeno
SHEBA										
May 98	2159		695		77.511	-169.835	32			PMEL GPS Buoy
Sep 97	2417	48572	1053	SSVX02-CWEG	79.068	-151.482	32	Y	Y	CES X Zeno
Sep 97	7100		695		78.698	-157.786	32			PMEL GPS Buoy
Sep 97	7105		695		78.904	-157.922	32			PMEL GPS Buoy
Sep 97	12795	48519	282	SSVX16-KARS	79.185	-154.096	32	Y	Y	POP
Sep 97	17987	48522	1016	SSVX02-CWEG	78.803	-155.203	32	Y	Y	IOEB
Sep 97	17988	48522	1016	SSVX02-CWEG	78.805	-155.228	32			IOEB
Sep 97	20726		695		78.331	-165.716	32			PMEL GPS Buoy
Sep 97	22204		695		78.998	-154.501	32			PMEL GPS Buoy
Sep 97	22205		695		79.194	-154.142	32			PMEL GPS Buoy
Sep 97	22207		695		78.555	-159.091	32			PMEL GPS Buoy
Sep 97	26696	48576	1053	SSVX12-KARS	78.564	-162.619	32	Y	Y	CES X Zeno

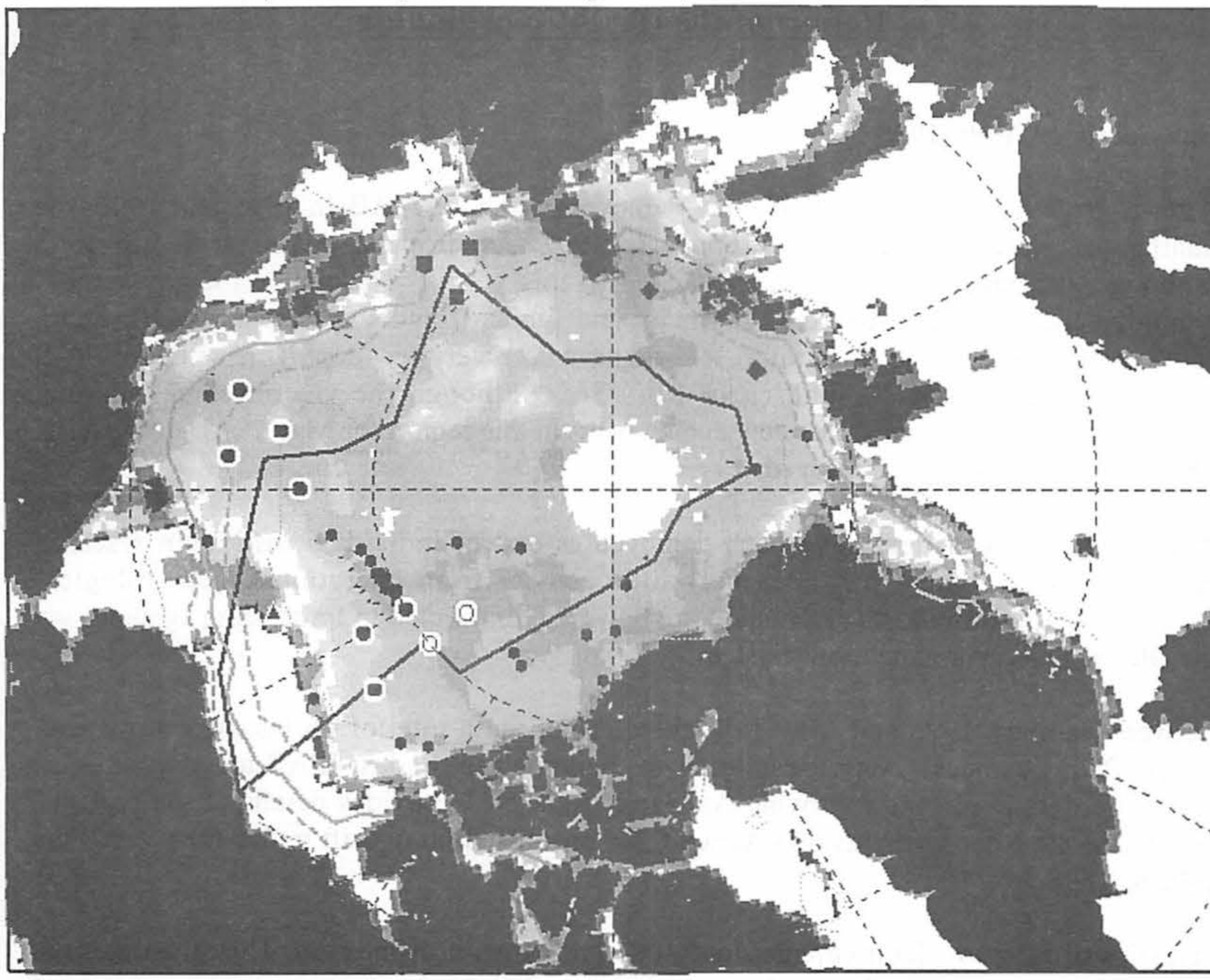
Figure 2. SHEBA position projections



The reported position of the SHEBA camp 30 August was 79 33'N 160 04'W which is about 160 nautical miles northeast of the 15 April projection for 31 August !

Figure 3. Deployments, the existing buoy array positions projected to 01 October 1998, and the ice 11 August 1998

Projected Buoy Drift from August 11, 1998 to October 1, 1998



Report of the IPAB Co-ordinator

Buoy activity, 1996-1998

After a growth in the number of buoy deployments under IPAB in 1995 and 1996, the number of platforms deployed dropped in 1997 and dropped again further in 1998 (although further deployments are planned in this year). The major foci of activity remained the Weddell Sea (US, Germany and Finland) and the East Antarctic sector between 20°E and 160°E (Australia). There have been very few deployments under IPAB in the Bellingshausen, Amundsen or Ross Seas, although the Geophysical Institute, University of Alaska, schedules new deployments in this region for May 1998. [**Footnote:** These were successfully deployed.]

Almost all IPAB drifters have been deployed as part of individual institution research programmes, and there has been very little activity from operational meteorological agencies. Data from most IPAB buoys are however contributed to forecasting agencies via the Global Telecommunications System.

Between January 1995 and May 1998 there have been a total of 66 buoys deployments under IPAB auspices. Activities during the period since the last IPAB meeting (August 1996) are detailed in the following Annexes. Annex C1 provides details of the types of buoys and their deployments and Annex C2 shows IPAB buoy drift tracks for the 3 years 1996 to 1998.

Statistics of all buoy deployments since 1995 are shown in Annex C3. This illustrates the number of buoys active buoys in each month, subdivided into three major sectors of Antarctica; the average number of drifters active in each year; and the average monthly distribution of active platforms. Even at a peak, the number of active drifters falls far short of the optimum requirement. Seasonally buoy numbers show a peak in late autumn when most are deployed from vessels. A second peak in August is the result of a large number of short-term drifters deployed as part of a 1995 winter process study. Buoy numbers drop steadily after the maximum due both to instrument failures, and to northward divergence, which takes many buoys out of the region of interest to IPAB. Although many drifters have sufficient battery power to operate for 2 or more years, only very few survive within the Antarctic pack for a second winter.

Expected future deployments

New deployments are expected in the Ross Sea (2 meteorological buoys and 5 drifters only; Geophysical Institute, Alaska), the Mertz Polynya region around 145°E (4-5 meteorological buoys and a large number of drifters only; AAD, Australia), and in the Weddell Sea (10-12 meteorological buoys over 2 years; AWI, Germany). The coordinator has been advised of no other future deployments.

Participants

To enroll as a participant in the program an institution must submit a Letter of detailing the anticipated contribution of the organization to the Programme. This may be by contributing drifters, deployment opportunities or data collection and processing.

The number of enrolled participants remained constant at 16 until the present meeting, when it increased to 19 from 12 different countries. At present only 3-4 of the participants are actively deploying buoys.

Data Handling

Three-hourly synoptic data from drifters included in the Programme are routed by Service Argos directly onto the GTS, from where they are taken for archiving and distribution by the RNODC, MEDS. Participants also give permission to Service Argos to send a copy of all original data, in the monthly CLS-Argos "Dispose" format, direct to the coordinating office at the Antarctic CRC, Hobart, Australia. These are used to assemble a research archive containing a uniform, quality controlled data set of ice motion and surface meteorology and oceanography, as required by the Antarctic research community. These time series for each platform include data from all available sensors, and for all valid transmissions from the platform. A database, containing information on buoy characteristics and history (metadata) is also maintained for each platform.

Arrangements are presently being made to transfer the research data sets to the National Snow and Ice Data Center/ World Data Center A for Glaciology, Boulder, Colorado, for wider dissemination.

Reporting IPAB activities

IPAB is a self-sustaining programme of the WCRP and reports to the WCRP-JSC through the Arctic Climate System Study (ACSYS). The co-ordinator attended the sixth session of the ACSYS Scientific Steering Group (Seattle, November 1997) and reported on IPAB activities. IPAB is also an action group of the WMO/IOC Data Buoy Co-operation Panel, and a written report on IPAB activities was submitted to the DBCP meeting.

A web site providing information on IPAB activities is maintained at
http://www.antcrc.utas.edu.au/antcrc/buoys/buoys.html

Acknowledgement

Much of the work associated with processing buoy data, maintaining the Research Data Base, and producing the tables and figures in this report, was done by Petra Heil at the Antarctic CRC. John Morrissy, Antarctic Division, also assisted with archiving and processing Argos files.

Ian Allison
IPAB Co-ordinator

Annex C1

Summary Information on IPAB Activities: 1998-1996

The following tables provide details on the buoy types and activity under the IPAB program for the period 1998 to 1996. The following abbreviations are used in the tables:

IPAB No.	Unique identifier given to each IPAB Buoy. Includes code for responsible agency :	
	AWI	Alfred Wegener Institute
	AAD	Australian Antarctic Division
	SPI	Scott Polar Research Institute
	CRC	Antarctic Cooperative Research Centre
	FIN	Finnish Institute of Marine Research & Dept. of Geophysics, Univ. of Helsinki
Argos PTT	Argos transmitter number. Numbers are reused.	
Deployment	Date and location of deployment	
Buoy Type	Manufacturer and model number:	
	DSI	Defense Systems Incorporated
	Turo	Tasmanian Underwater Research & Oceanog.
	PRL	Polar Research Laboratory
	CMI	Christian Michelsen Research AS
	AAD	Aust. Antarctic Division with Telonics PTT
	MO	MetOcean
		Technocean

GTS	WMO Number for buoys reporting via the GTS	
Drogue	Whether ocean drogue fitted (y) or not (n)	
Deployed	on ice	directly onto or in a floe
	ow in ice	in open water leads amidst ice
	thin/new ice	within thin/new ice field
	open ocean	outside the pack ice
Sensors	P	atmospheric pressure
	Ta	air temperature
	Ti	ice temperature
	SST	sea surface temperature
	W	wind speed and direction
	Atm	other atmospheric parameters
	GPS	GPS positioning
tba	details missing at time of publication To be announced in the future.	

1998

Buoys

IPAB No.	Argos PTT	Deployment			Buoy Type	GTS	Drogue	Deployed	P	Ta	SST	W	Other
		First date	Lat	Long									
AAD40	24668	Apr-97	-64.9	117.3	MO Ice TOGA	73501	n	on ice	y	y	y		
AAD42	18647	Apr-97	-65.2	140.0	MO Ice TOGA	73503	n	on ice	y	y	y		
AAD46	18646	Apr-98	-66.2	143.6	MO Ice TOGA	73505	n	new ice	y	y	y		
AAD47	18653	May-98	-64.8	77.7	MO Ice TOGA	74540	n	new ice	y	y	y		
AAD48	18654	May-98	-63.0	96.0	MO Ice TOGA	tba	n	thin ice	y	y	y		
AAD49	18655	May-98	-63.0	107.0	MO Ice TOGA	tba	n	new ice	y	y	y		
AAD50	18656	May-98	-64.5	119.0	MO Ice TOGA	tba	n	new ice	y	y	y		
AAD51	24771	Jul-98	-65.1	145.3	AAD/Telonics	-	n	on ice	n	n	n		
AWI86	8059	Jan-97	-73.7	322.3	MO Ice TOGA	71541	n	on ice	y	y			Ti, GPS
AWI87	8060	Jan-97	-74.4	319.8	MO Ice TOGA	71542	n	on ice	y	y			Ti, GPS
AWI89	8064	Jan-97	-75.1	326.5	MO Ice TOGA	71544	n	on ice	y	y			Ti, GPS
AWI91	8057	Apr-98	-69.4	359.9	tba	tba	n	tba	y	y			
AWI92	9356	May-98	-69.7	355.2	tba	tba	n	tba	y	y			

Activity (until August)

IPAB No.	Argos PTT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AAD40	24668	X	X	X	X	X	X	X	X				
AAD42	18647	X	X	X	X	X	X	X	X				
AAD46	18646				X	X							
AAD47	18653					X	X						
AAD48	18654					X	X	X	X				
AAD49	18655					X	X	X	X				
AAD50	18656					X	X	X	X				
AAD51	24771							X	X				
AWI86	8059	X	X	X	X	X	X	X	X				
AWI87	8060	X	X										
AWI89	8064	X	X	X	X								
AWI91	8057				X	X							
AWI92	9356					X	X						
Buoys reporting		5	5	4	6	10	8	7	7				

An additional seven buoys deployed by the Geophysical Instate, University of Alaska, in the Ross Sea between 18 and 20 May 1998 are not yet included in these tables. A hexagonal array of seven ice drift buoys was deployed, the seventh buoy being at the centre of the array, for examination of mesoscale ice motion and deformation. The buoys were originally spaced roughly 50 km apart. Two buoys had air temperature, barometric pressure and wind speed/direction sensors, and reported via the GTS; the other five were position only. Data from these buoys will be incorporated by IPAB.

1997

Buoys

IPAB No.	Argos PTT	Deployment First date	Lat	Long	Buoy Type	GTS	Drogue	Deployed	P	Ta	SST	W	Other
AAD18	4471	Apr-95	-64.6	110.9	CMI	73507	n	on ice	y	y	y		
AAD33	24664	Aug-95	-64.5	141.0	MO Ice TOGA	74534	n	on ice	y	y	y		
AAD40	24668	Apr-97	-64.9	117.3	MO Ice TOGA	73501	n	on ice	y	y	y		
AAD41	18648	Apr-97	-65.2	128.2	MO Ice TOGA	73504	n	on ice	y	y	y		
AAD42	18647	Apr-97	-65.2	140.0	MO Ice TOGA	73503	n	on ice	y	y	y		
AAD43	18649	Apr-97	-64.3	148.8	MO Ice TOGA	73502	n	on ice	y	y	y		
AAD44	24667	Apr-97	-75.6	176.2	MO Ice TOGA	72503	n	on ice	y	y	y		
AAD45	24666	Apr-97	-74.0	176.1	MO Ice TOGA	72502	n	on ice	y	y	y		
AWI86	8059	Jan-97	-73.7	322.3	MO Ice Beacon	71541	n	on ice	y	y			Ti, GPS
AWI87	8060	Jan-97	-74.4	319.8	MO Ice Beacon	71542	n	on ice	y	y			Ti, GPS
AWI88	8061	Jan-97	-74.0	326.7	MO Ice Beacon	71543	n	on ice	y	y			Ti, GPS
AWI89	8064	Jan-97	-75.1	326.5	MO Ice Beacon	71544	n	on ice	y	y			Ti, GPS
AWI90	8068	Jan-97	-74.7	329.1	MO Ice Beacon	71545	n	on ice	y	y			Ti, GPS
FIN04	25161	Jan-96	-73.7	323.1	MO T-916	71558	n	on ice	y	y		y	Atm.
FIN05	25933	Jan-96	-73.5	321.8	Technocean	71560	n	on ice	y	y		y	Atm.
FIN06	25932	Jan-96	-73.9	321.5	Technocean	71559	n	on ice	y	y		y	Atm.
FIN07	10855	Jan-96	-73.9	324.0	CMI	n	n	on ice					
FIN08	10856	Jan-96	-73.9	324.0	CMI	n	n	on ice					
FIN09	5895	Feb-96	-73.4	322.4	PRL Met	71591	n	on ice	y	y		y	Atm.
FIN10	10858	Feb-96	-72.5	343.5	CMI	n	n	on ice					

Activity

IPAB No.	Argos PTT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AAD18	4471	X	X	X	X	X	X	X	X				
AAD33	24664	X	X	X	X	X							
AAD40	24668				X	X	X	X	X	X	X	X	X
AAD41	18648				X	X							
AAD42	18647				X	X	X	X	X	X	X	X	X
AAD43	18649				X	X	X	X	X				
AAD44	24667				X								
AAD45	24666				X	X	X	X					
AWI86	8059	X	X	X	(X)	(X)	(X)	(X)	X	X	X	X	X
AWI87	8060	X	X	X	(X)	(X)	(X)	(X)	X	X	X	X	X
AWI88	8061	X	X	X	X	X	X	X	X	X	X	X	X
AWI89	8064	X	X	X	X	X	(X)	(X)	X	X	X	X	X
AWI90	8068	X	X	X	X	X	X	X	X	X	X	X	X
FIN04	25161	X	X	X	X	X							
FIN05	25933	X											
FIN06	25932	X											
FIN07	10855	X											
FIN08	10856	X	X	X	X	X							
FIN09	5895	X	X	X									
FIN10	10858	X	X	X	X	X							
Buoys reporting posn.		14	11	11	14	13	7	7	9	7	7	7	7
Addnl. without posn.					+2	+2	+3	+3					

1996

Buoys

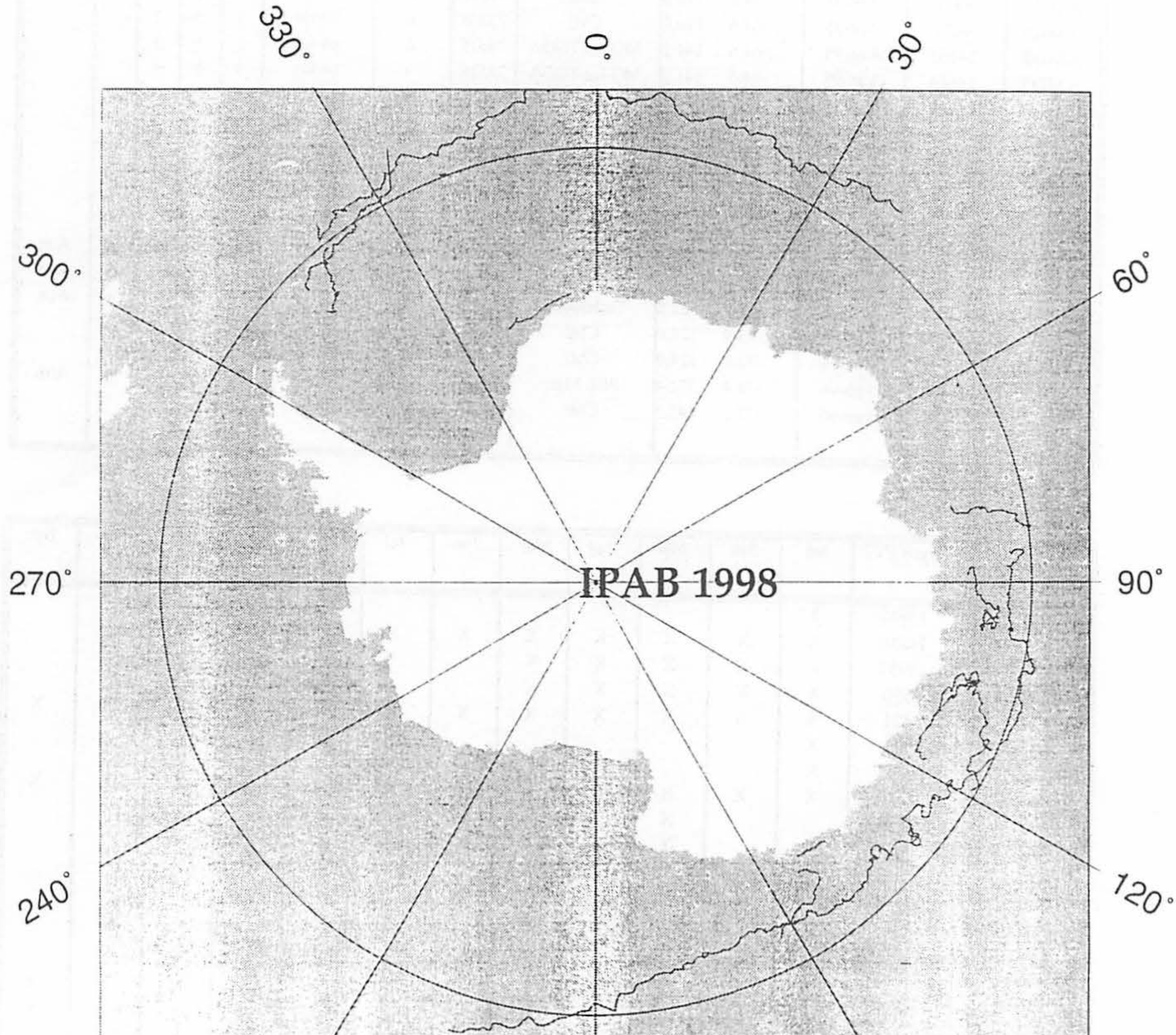
IPAB No.	Argos PTT	Deployment First date	Lat	Long	Buoy Type	GTS	Drogue	Deployed	P	Ta	SST	W	Other
AWI68	14955	Feb-95	-74.6	312.2	MO	71548	n	on ice	y	y			GPS
AWI69	14956	Feb-95	-76.0	310.6	MO	71549	n	on ice	y	y			GPS
AWI70	14957	Feb-95	-74.7	302.7	MO	71550	n	on ice	y	y			GPS
CRC05	6550	Dec-95	-62.5	79.7	Turo T-701	74537	y	open ocean	y	y	y		
AAD18	4471	Apr-95	-64.6	110.9	CMI	73507	n	on ice	y	y	y		
AAD19	4473	Apr-95	-64.6	120.0	CMI	73508	n	on ice	y	y	y		
AAD32	24665	Aug-95	-64.6	141.2	MO Ice TOGA	74535	n	on ice	y	y	y		
AAD33	24664	Aug-95	-64.5	141.0	MO Ice TOGA	74536	n	on ice	y	y	y		
AAD34	24669	Mar-96	-65.7	150.0	Turo T-AN-302	n	y	ow in ice	y	y	y		
AAD35	24673	Mar-96	-65.7	149.9	Turo T-AN-302	n	y	ow in ice	y	y	y		
AAD36	24672	Apr-96	-65.2	79.3	Turo T-AN-302	n	y	on new ice	y	y	y		
AAD37	24674	Apr-96	-64.3	89.7	Turo T-AN-302	n	y	ow in ice	y	y	y		
AAD38	24670	Apr-96	-63.7	99.9	Turo T-AN-302	n	y	ow in ice	y	y	y		
AAD39	24671	Apr-96	-64.4	114.4	Turo T-AN-302	n	y	on new ice	y	y	y		
FIN04	25161	Jan-96	-73.7	323.1	MO T-916	71558	n	on ice	y	y		y	Atm.
FIN05	25933	Jan-96	-73.5	321.8	Technocean	71560	n	on ice	y	y		y	Atm.
FIN06	25932	Jan-96	-73.9	321.5	Technocean	71559	n	on ice	y	y		y	Atm.
FIN07	10855	Jan-96	-73.9	324.0	CMI	n	n	on ice					
FIN08	10856	Jan-96	-73.9	324.0	CMI	n	n	on ice					
FIN09	5895	Feb-96	-73.4	322.4	PRL Met.	71591	n	on ice	y	y		y	Atm.
FIN10	10858	Feb-96	-72.5	343.5	CMI	n	n	on ice					

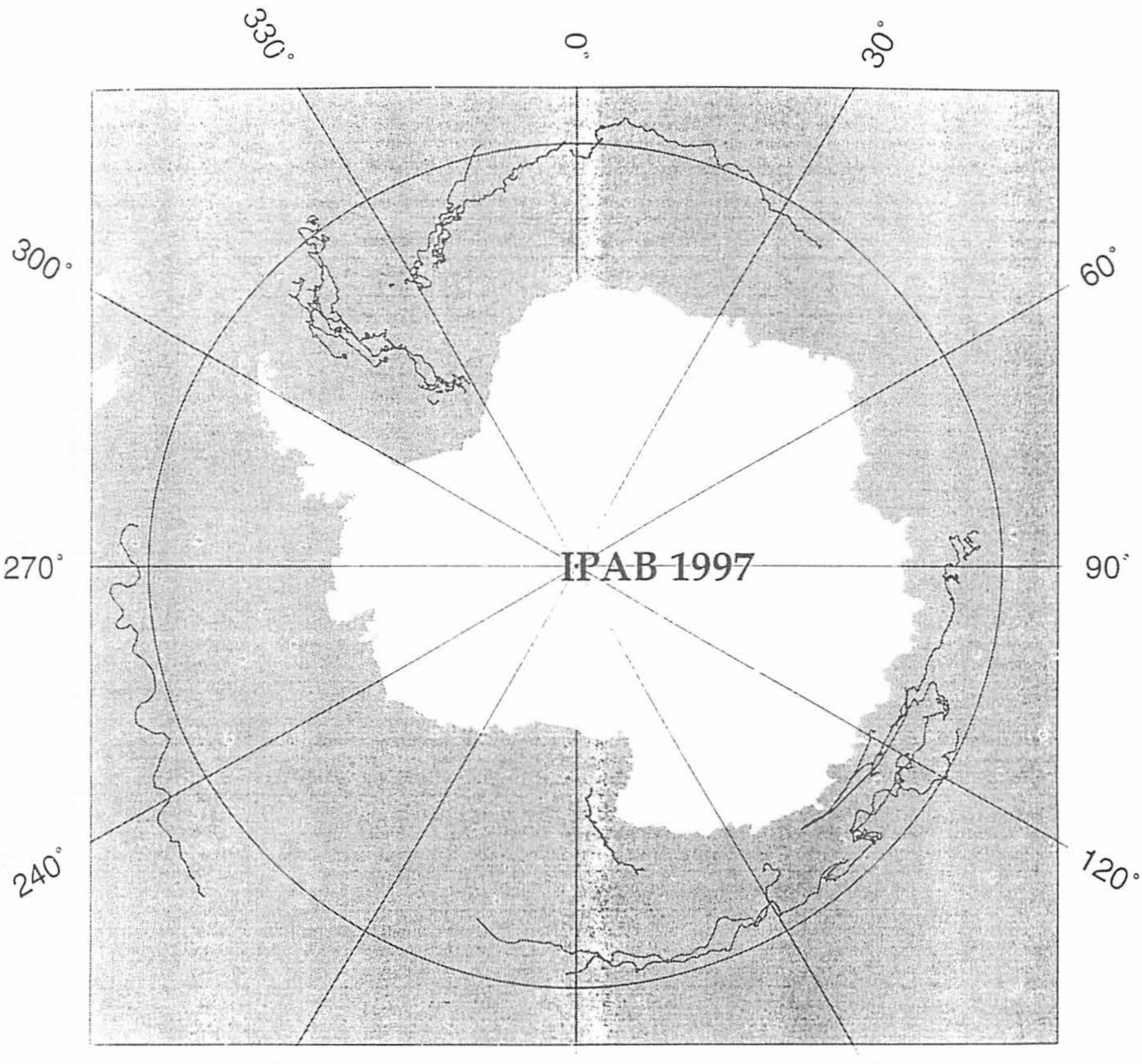
Activity

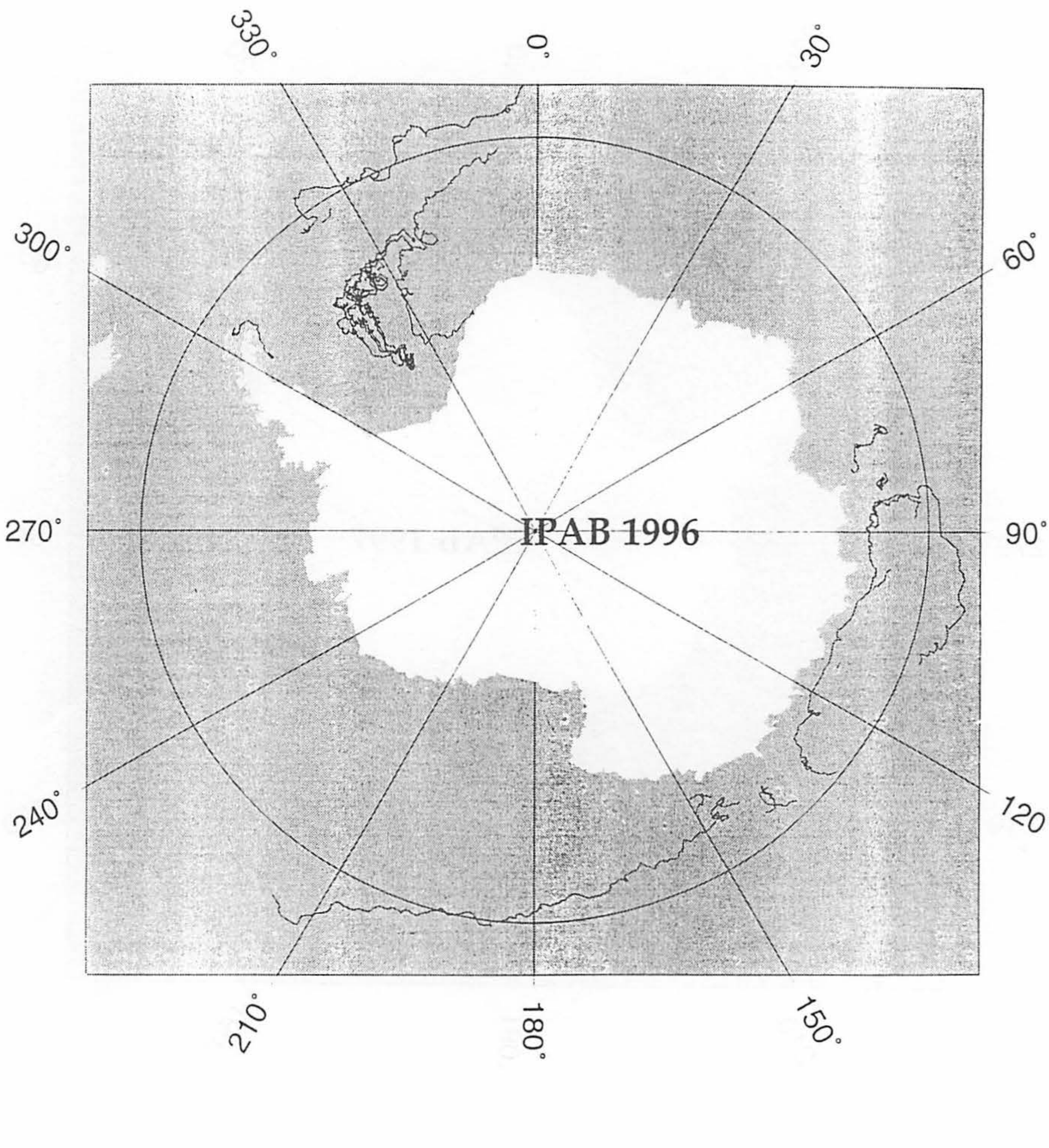
IPAB No.	Argos PTT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AWI68	14955	X											
AWI69	14956	X	X	X	X	X	X	X	(X)				
AWI70	14957	X	X	X	X	X							
CRC05	6550	X	X	X	X	X							
AAD18	4471	X	X	X	X	X	X	X	X	X	X	X	X
AAD19	4473	X											
AAD32	24665	X											
AAD33	24664	X	X	X	X	X	X	X	X	X	X	X	X
AAD34	24669			X	X	X							
AAD35	24673			X	X								
AAD36	24672				X	X	X						
AAD37	24674				X	X	X						
AAD38	24670				X	X							
AAD39	24671				X	X							
FIN04	25161	X	X	X	X	X	X	X	X	X	X		
FIN05	25933	X	X	X	X	X	X	X	X	X	X	X	X
FIN06	25932	X	X	X	X	X	X	X	X	X	X	X	X
FIN07	10855	X	X	X	X	X	X	X	X	X	X		
FIN08	10856	X	X	X	X	X	X	X	X	X	X	X	X
FIN09	5895		X	X	X	X	X	X	X	X	X	X	X
FIN10	10858		X	X	X	X	X	X	X	X	X	X	X
Buoys reporting		13	12	14	18	17	12	10	10	9	9	7	7

Annex C2

IPAB Buoy Drift Tracks, 1998-1996




330°
0°
30°
300°
60°
270°
IPAB 1997
90°
240°
120°
210°
180°
150°


330°
0°
30°
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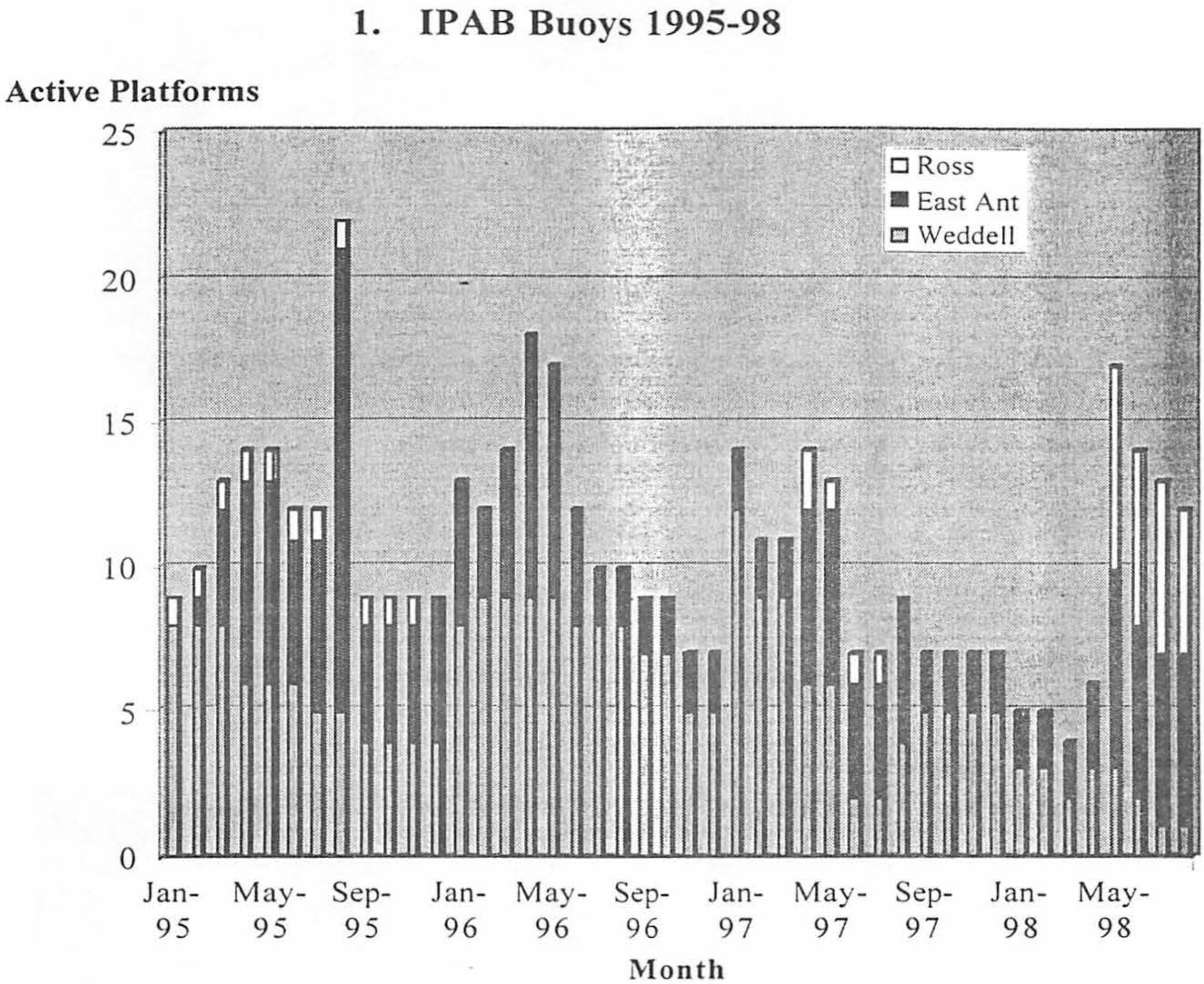
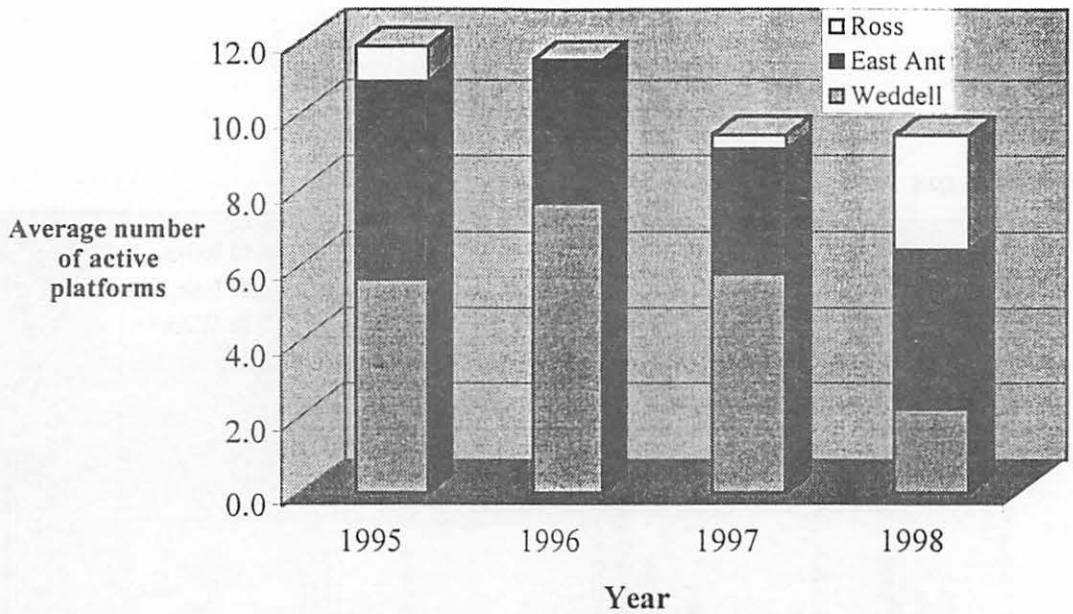
270°
IPAB 1996
90°
240°
120°
210°
180°
150°

Annex C3

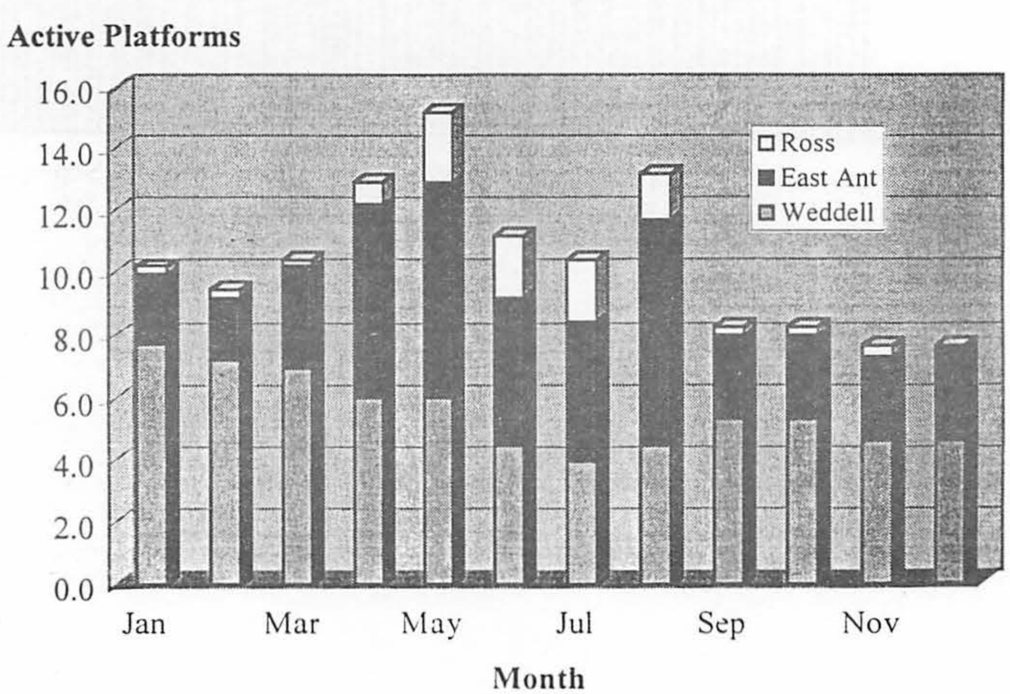
IPAB Buoy Statististics 1995-1998



2. Total IPAB Buoys



3. Average Monthly Distribution of IPAB Buoys



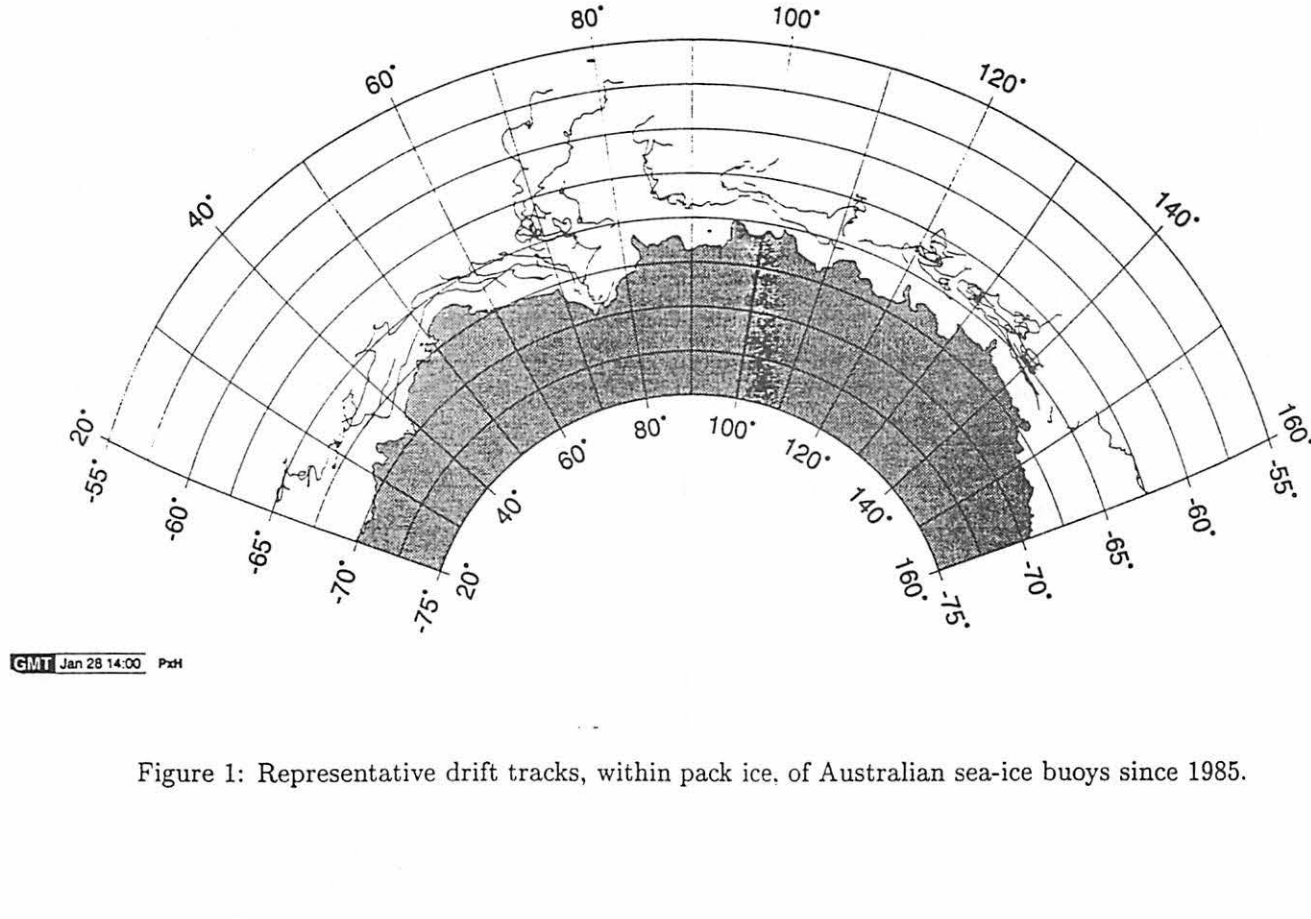


Figure 1: Representative drift tracks, within pack ice, of Australian sea-ice buoys since 1985.

REPORT BY THE INTERNATIONAL BUOY PROGRAMME FOR THE INDIAN OCEAN

1. INTRODUCTION

The International Buoy Programme for the Indian Ocean was formally established at a meeting in La Reunion, in 1996. The primary objective of the IBPIO is to establish and maintain a network of platforms in the Indian Ocean to provide meteorological and oceanographic data for both real time and research purposes. This task includes support to the World Weather Watch Programme (WWW), the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP), the Global Ocean Observing System (GOOS), tropical cyclone forecast and monitoring, as well as to the research activities of participating institutions.

The programme is self-sustaining, supported by voluntary contributions from participants in the form of equipment, services (such as communications, deployment, storage, archiving, co-ordination...).

2. ANNUAL MEETING

The third annual meeting of the IBPIO was held in Kuala Lumpur, Malaysia, from the 7th to the 9th of July 1998. The meeting was hosted by the Malaysian Meteorological Service (MMS).

The meeting noted with interest the implementation of an important new programme of moored buoys managed by the National Institute of Ocean Technology, India. Twelve buoys, built by Oceanor (Norway), were deployed in two steps in Indian waters : September 1997 in Bay of Bengal, then in February 1998 in Arabian Sea. The network is composed of 7 Seawatch coastal buoys and 5 Wavescan buoy's (4 of them are offshore).

The final report of the meeting will be soon available through the Chairman or the Programme Co-ordinator of the IBPIO.

To date, five organisations have formally participated in the International Buoy Programme for the Indian Ocean.

- Bureau of Meteorology (BoM), Australia ;
- Global Drifter Centre of NOAA/AOML (GDC), USA ;
- Meteo-France ;
- National Institute of Oceanography (NIO), India ;
- South African Weather Bureau (SAWB).

The participants re-appointed Mr. Graham Jones (BoM), as Chairman and Dr. Gangadhara Rao (NIO), as Vice-Chairman. Mr. Pierre Blouch (Meteo-France) and Mr. Warren Krug (GDC) were respectively re-appointed as Programme Co-ordinator and Programme Committee member. Mr. Johan van der Merwe (SAWB) was appointed as new Programme Committee member.

3. OPERATIONAL PROGRAMME

3.1 Buoy deployments

Forty-five drifting buoys have been deployed during the 97-98 intersessional period. This number is fewer than was expected this time last year, but many buoys are ready to be deployed before the end of 1998. The overall number of buoys in operation decreased over the 12 past months but this decrease applied mainly to SVP oceanographic drifters and not to barometer drifters. The number of buoys providing air pressure is relatively stable : around 45 buoys on average (figure 1). Although the number of buoys providing wind values remains few, it is increasing.

More than 80 drifting buoys should be deployed during the next intersessional period. At least, 10 of them will be deployed by air thanks to Navoceano. Contributions will come from:

- Bureau of Meteorology, Australia :	10 buoys - some with wind sensors
- Global Drifter Centre :	20 SVP + 20 SVP-B[1] + 5 SVP/GPS
- Meteo-France :	7 buoys - some with wind sensors
- National Institute of Oceanography :	~ 25 SVP-B + 8 SVP
- South African Weather Bureau :	~ 5 SVP-B

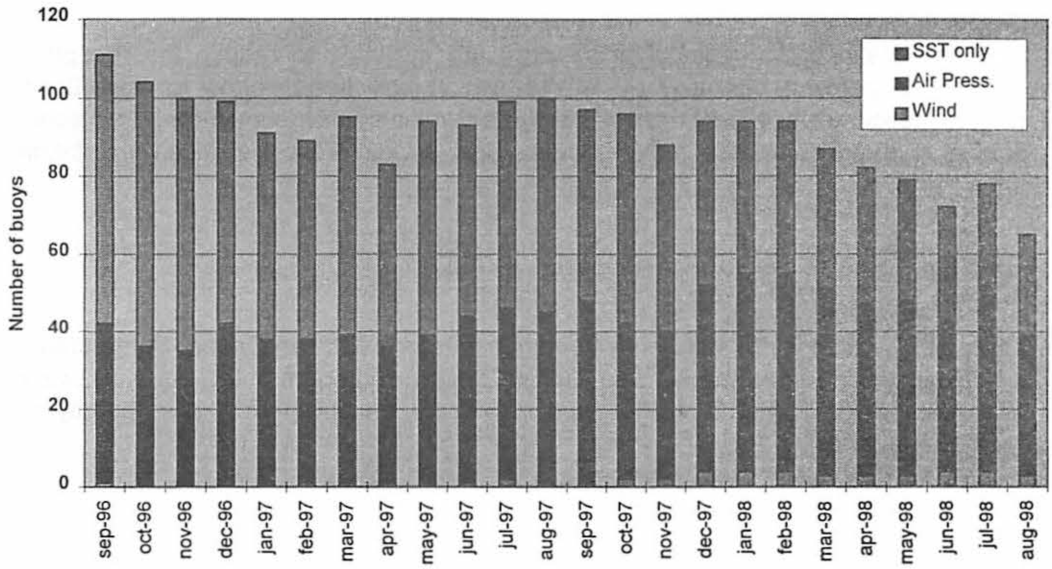


Figure 1. Number of drifting buoys operating in IBPIO according to the parameters they measure

Most of the deployments are carried out by research vessels and ships of opportunity plying in the Indian Ocean from many harbours such as Perth (Australia), Goa (India), Durban and Cape Town (South Africa) and La Reunion. Some ship voyages to remote islands are useful too, for deployments in the southern latitudes: Heard I. from Australia; Amsterdam I., Kerguelen and Crozet Is. from La Reunion and Marion Is. from South Africa.

Owner	SST only	Air Pressure	Wind
Atlantic Oceano. and Met. Laboratories	29	13	-
Australian Bureau of Meteorology	-	7	1
Météo-France	-	1	3
National Institute of Oceanography	-	1	-
Navoceano	-	6	-
South African Weather Bureau	-	11	-
Total	**29**	**39**	**4**

Table 1. Operating drifting buoys by the end of June 1998

[1] Including 10 drifters equipped with barometers funded by Meteo-France

Some buoys, owned by SAWB, will migrate from the South Atlantic Ocean, westerly driven to the Indian Ocean. This flux, which constitutes a non-negligible contribution from South Africa, is more or less compensated by the escape of other buoys to the South of Australia.

3.2 Data recovery

The data are recovered through the Argos system and sent on the GTS through the processing centers of Toulouse and Landover.

Several local reception stations (for regional acquisition) are available to reduce the reception delays. These are at Capetown, operated by SAWB, which has been linked to the Global Processing Center of Toulouse since December 4th, and La Reunion which should be linked soon. IBPIO buoys drifting in the East of the Indian Ocean, also benefit from the receiving station operated by BoM in Perth.

3. PLANS

Presently the density of observation is not sufficiently homogeneous in the Indian Ocean. Some areas, and particularly the tropical cyclone one (Arabian Sea, Gulf of Bengal, and south of the Equator), were clearly identified as having a lack of data. IBPIO participants are encouraged to give priority to deployment of buoys in these areas.

4. TECHNICAL ISSUES

The IBPIO Programme Co-ordinator monitors and regularly reports on buoy technology, communications... The annual meeting also allows participants to exchange technical information about data formats, SVP-B and SVP-BW drifter evaluations, techniques to measure the wind on drifting buoys, data quality controls...

5. INFORMATION ON THE IBPIO

IBPIO information is available on the World Wide Web at *http://www.shom.fr/meteo/ibpio*. The main pages give a description of the programme, its objectives and management, listings of participants and links to related subjects such as DBCP data quality control information. Some pages are monthly updated with buoy status, buoy trajectories, data availability charts, deployment log.

The issue of the promotional leaflet on the IBPIO was delayed. It should be soon available.

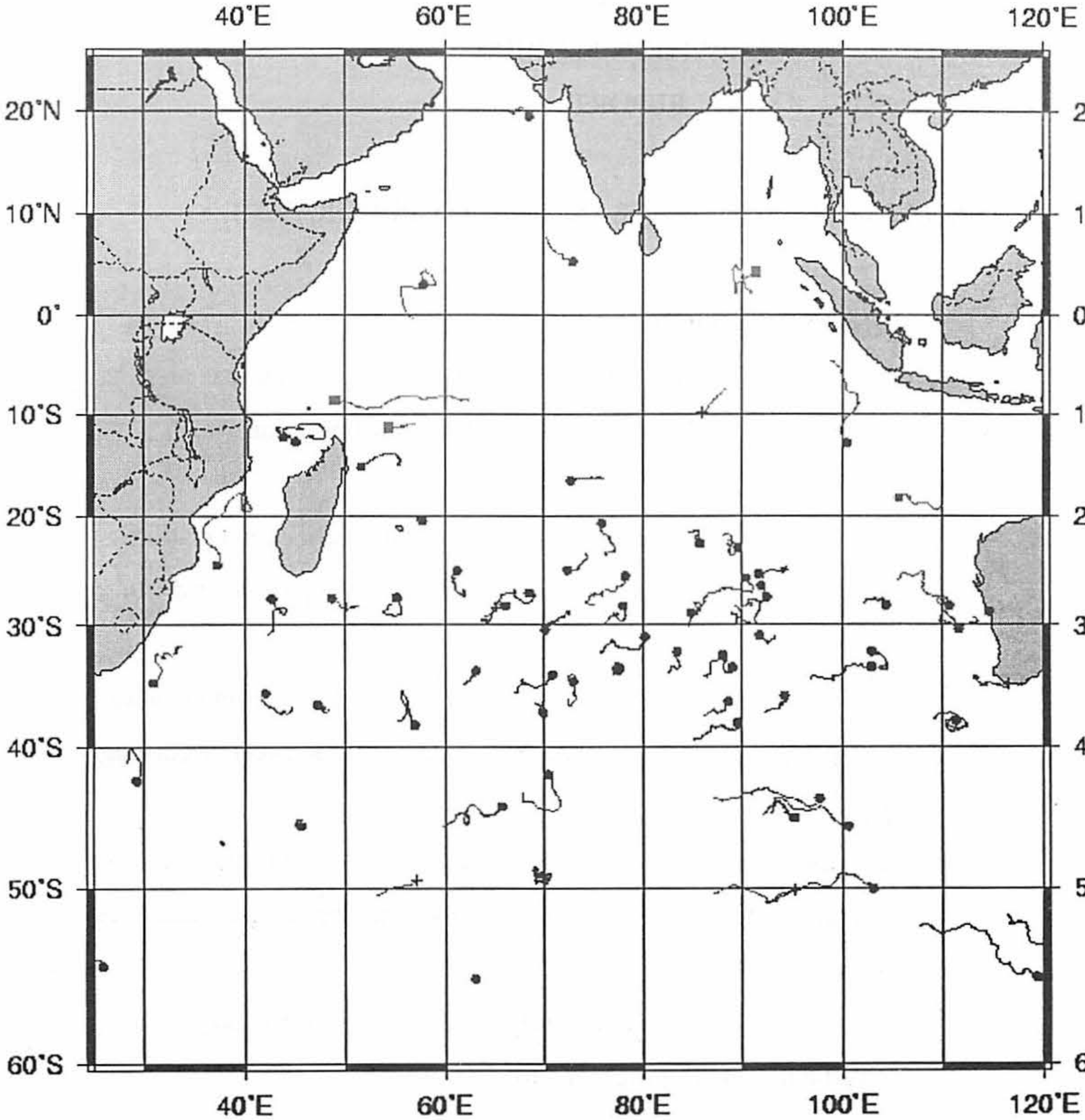


Figure 2. Buoys drifting in the Indian Ocean - August 1998

14th DBCP

MARATHON-FLORIDA

REPORT

INTERNATIONAL SOUTH ATLANTIC BUOY PROGRAMME

1.0 – INTRODUCTION

The International South Atlantic Buoy Programme was accepted as Regional Action Group of the WMO-IOC Data Buoy Co-operation Panel.

The ISABP strive to:

maintain a data network over South Atlantic using in situ ocean platforms such as island weather stations, moored buoys and in particular drifting buoys;

establish and maintain data collection and data communication facilities, and ensure that the necessary quality control is undertaken according to DBCP guidelines;

distribute basic meteorological and oceanographic data from the network at operationally useful time-scales over Global Telecommunications System;

arrange for the archival of data from the network and for the provision of archived data sets to program participants;

liaise on technical aspects of buoy development and operational matters;

continually review the effectiveness of the program in satisfying data requirements of the users.

2 – WORKSHOP AND MEETING

The last one, ISABP-5 was held in Buenos Aires – Argentine, from 10th to the 14th August 1998. It was hosted by Mr. José Luis Sciotti, Director of the Naval Hydrographic Office (Argentine Navy). Mr. Manuel Picasso, Chief of Meteorological Service (i.b.) collaborated with the arranging and organizing the meeting, our thanks.

Those organizations have participated:

NAVOCEANO;

NOAA/OAR/AOML;

NDBC

CLS-ARGOS;

MARINE HYDROPHYSICAL INSTITUTE, UKRANIAN ACADEMY OS SCIENCE;

U.K. MET. OFFICE;

SAWB

SEA FISHERIES RESEARCH INSTITUTE (SOUTH AFRICA)

INSTITUTO ANTARTICO ARGENTINO (ARG.);

INSTITUTO NACIONAL DE INVESTIGACION Y DESAROLLO PESQUERO (ARG.);

SERVICIO METEOROLÓGICO NACIONAL (ARG.);

SERVICIO DE HIDROGRAFIA NAVAL - DEPARTAMENTO E METEOROLOGIA Y OCEANOGRAFIA DE LA ARMADA ARGENTINA (ARG.);

COMISSION NACIONAL DE ATIVIDADES ESPACIALES (ARG.);

INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS – INPE (BR.);

DIRETORIA DE HIDROGRAFIA E NAVEGAÇÃO – DHN (BR.)

The participants took the opportunity to congratulate and thank MR. PIET LE ROUX, for the success of the ISABP, his effort, guidance and assistance during the meeting. Piet Le Roux retired as Chairman and from the SAWB and the meeting wished him well for the future.

2.1. DISCUSSION OF THE VALUE OF THE WORKSHOP

The consensus of the participants was that the workshop was a useful method of exchanging information about the ISABP requirements, operations and plans and it was agreed that it should continue to be part of the annual meeting.

The feeling however was that more technical papers must be encouraged with the objective to especially involve participants from the host country to present papers. It was also suggested that the Programme Committee send a letter of appreciation to the organization participating in the Programme.

The Sixth Programme Meeting in Cape Town next year will be held together with the IBPIO Meeting.

3 - PRESENT AND FUTURE

3.1.- Present

The existence of a significant network of fixed weather stations, automatic station and drifting buoys in the south area;

The operational LUTs in Gough and Marion Island, Cape Town South Africa improve the operational forecasting – SAWB;

The very good cooperation between participants from the continents bordering on our area of interest;

Supplied drifting buoys from the USA;

The rarely data in the mid and tropical Atlantic;

No LUT on SW area of the interest.

3.2 - Future

Encourage other countries and institutions to participate on ISABP;

Mr. Wynn Jones of the UK. Met Office discussed the proposed installation of the LUT on the Falklands/Malvinas island towards the end of 1998;

Discuss the operational use of INPE's LUT (BR.);

Increase the buoy deployment on mid SW Atlantic (INPE and DHN with the PNBOIA – BRAZILIAN NATIONAL BUOY PROGRAMME);

Introduce a Spanish and Portuguese version ISABP home page.

4.0 – DRIFTING BUOY DEPLOYMENTS

The Programme started the inter-session period with 59 operational buoys. In March 1998 it decreases to 55 and then increased to 68 at present approximately.

Towards the end 1998 and beginning of 1999 DHN – PNBOIA will intend to deploy 13 SVP-B drifters, just bought, reception and dissemination the data trough INPE's LUT and CLS-ARGOS.

South Africa is deploying a further 30 drifters in the South Atlantic before the end of 1998. Ten of these were donated by AOML.

5.0 – DATA QUALITY CONTROL

Extend data QC procedures implemented by the DBCP must be increase for new participants to subscribe in Internet Mailing List (buoy-qc@vedur.is).

6.0 – NEW PROJECTS (CAPACITY AND TECHNOLOGY TRANSFER)

We would like to suggest the creation of a special and standard schedule/project to motivate (Labs, Fisheries Research, Universities, National Meteorological Services and others) that have a interest in the collection of data at sea, but don't know aspects like, sensor specification, appropriate range of sensor for own work area, QC, telemetry system, costs, budgets etc.

Finally as newly elected Chairman, it has been a challenging months for me. I would like to tank Mr. Piet Le Roux and Mr. Louis Vermaak for assistance and guidance.

Global Drifter Program
1998 Report
March 1999

Mark Bushnell, NOAA/NOS/CO-OPS
Warren Krug, NOAA/AOML/PhOD-GDC

Background

The Global Drifter Program (GDP) is the successor of the WOCE/TOGA Surface Velocity Program (SVP). It was accepted in principle as a WMO/DBCP Action Group at the 12th DBCP meeting, and its formation was completed during the 1997 inter sessional period. The GDP steering committee members are;

Mark Swenson, NOAA/AOML, USA. Chairman
Dong Kyu Lee, Pusan National University, Korea. Vice-Chairman
Warren Krug, NOAA/AOML/PhOD-GDC, Program Coordinator
Mark Bushnell NOAA/NOS/CO-OPS, USA. Program Coordinator (resigned 11/98)
Peter Niiler, Scripps Institute of Oceanography, USA
Gilles Reverdin, IFREMR, France

The GDP Operating Principles and the Program Coordinator's Terms of Reference are available at the GDP world wide web site at http://www.aoml.noaa.gov/phod/dac/gdc.

Present Status

During 1998 the GDP has worked to rebuild the global array, which had been diminished during the previous year due to a lack of Argos funding. An accord reached at the 17th NOAA/Argos Joint Tariff Agreement in Oct. 1997 permitted array expansion, resulting in a 22% increase in the number of active drifters over a 9-month period (661 drifters on 09/28/98 versus 543 drifters on 12/29/97). Figure 1 shows the deployment locations of more than 400 drifters, deployed with the assistance of more than 40 volunteer ships or research vessels, and aircraft. Almost 25% of the drifters were deployed from aircraft.

Phase II of the US National Weather Service (NWS) experimental barometer and wind drifter array took place during 1998. There were three changes in Phase II that helped to reduce the data latency and improve data availability;

1) All drifters operated continuously, rather than three hours on and six off,

2) A Local User Terminal (LUT) located at the Naval Postgraduate School in Monterey received data re-transmissions directly from the satellite during overflight, eliminating orbital delays in many cases, and

3) The GDC purchased "Multi-Satellite Coverage Service" from Argos, which provided for data from all available NOAA polar orbiting satellites rather than just the two operational satellites as agreed in the NOAA/Argos MOU.

More than 120 drifters were deployed for the NWS during the past three years. NWS response to the program remains mixed, with the GDC receiving both highly favorable and unfavorable reviews. The program has not been continued.

Several new GDP sub-programs emerged during the past year, and they are;

-National Oceanographic Partnership Program, Year of The Ocean (NOPP/YOTO).
As part of their Year Of The Ocean program, the NOPP has funded the purchase of 140 SVP drifters and 10 SVP optical drifters. Deployments began in March 1998 using drifters in stock, so that the YOTO array could be realized more quickly. More than 90 drifters have been deployed so far, primarily in the Caribbean Basin and the Tropical Atlantic. See the NOPP/YOTO web site at **http://www.drifters.doe.gov/**, or the NOAA/AOML Oceanography of the Intra-Americas Sea web site at **http://www.aoml.noaa.gov/phod/wimp/iai/** for additional details regarding drifters deployed for NOPP/YOTO.

-NOAA's El Nino Impact Rapid Response
The GDC was funded to deploy an array of drifters off the US West Coast to assist with studies of the impact of El Nino on the region. A total of 76 drifters were deployed (48 SVP, 24 SVPB and four SVPBW drifters), using 11 ships and one aircraft deployment.

-NOAA's Office of Global Programs (OGP) Tropical Atlantic array
In an effort to expand the El Nino/Southern Oscillation Observing System into the Atlantic, NOAA's Office of Global Programs funded the procurement of 35 SVP and 10 SVPBW drifters in 1998. The five year program will expand to deploy 87 drifters per year in the Tropical Atlantic, including 10 WOTAN drifters for the Hurricane Array.

-We began a new cooperative agreement with the Instituto Canario de Ciencias Marinas (ICCM) in the Canary Islands. Starting in March 1998, a monthly drifter deployment occurs at the ESTOC hydrographic time series station. In addition to providing a useful data product for ESTOC interests, the deployments serve to seed the drifter sparse southeast North Atlantic region.

1998 Accomplishments

As in 1997, a cooperative arrangement between the GDC, NOAA/OGP, NAVOCEANO, and MeteoFrance lead to another deployment of 12 wind drifters in the tropical Atlantic. Data from these was again successfully used by NOAA's National Hurricane Center and the National

Hurricane Research Division to assist in the forecast of tropical storms.

During the past two years the GDC has worked to improve the status of the drifter metadata. In July 1998 a greatly improved data set was provided to the drifter manufacturers and the DBCP Technical Coordinator. Since then, updates have been placed into a public FTP site. These files permit users to plot deployment locations, determine sensor availability for the drifters, compute transmitter and drogue survival rates for various batch productions, etc. The assistance of John Stadler at the GDC and the cooperation of the drifter manufacturers is gratefully acknowledged.

For the NWS Phase II effort, the Data Assembly Center has created a map showing drifter locations and a table listing data availability on the GTS for each sensor. The map and table are updated weekly. Forecasters can view the map and table to determine what drifter data should be available, and begin investigation of the data path if the data is absent. This small step towards the confirmation of data reception by users is an example of the work to be conducted by the new NOAA GOOS center at AOML.

The GDC has been investigating drifter data transmission using Orbcomm satellites. During the past year Orbcomm drifters from both Seimac and Metocean have been successfully tested. It has been confirmed that the electronics fit into the SVP drifter and that transmissions are received by the Orbcomm satellites without interference even in an urban area. Data was received within several minutes in cases where the "bent pipe" data path was available, and also successfully received using Orbcomm's store-and-forward "Globalgrams". Additional testing is required to examine battery life and cost issues.

The GDC was also successful in obtaining a Department of Commerce Small Business Innovative Research (SBIR) award for the investigation of alternative satellite data transmission systems. NAL Research has identified Iridium as the most likely Low Earth Orbit Satellite (LEOS) system to meet the requirements of drifting buoys in the future. They propose a drifter transmitting a WMO coded message directly to NOAA's GTS gateway, making use of two-way communications to control the drifter.

1998 Problems

The single largest setback during 1998 was the air deployment decertification of Clearwater and Technocean drifters. During a January air deployment, the drifter parachutes struck the aircraft tail. Drifter manufacturers and NAVOCEANO are working together to develop a drifter air deployment package that can be successfully tested and certified. At present, only Metocean drifters are certified for air deployment.

The Metocean wind drifters continue to provide valid wind speeds and directions using the Wind Observation Through Ambient Noise (WOTAN), but the wind direction observation appears to require a post deployment correct. The compass readings of the twelve wind drifters deployed in the Tropical Atlantic were checked and confirmed satisfactory prior to deployment. After deployment, offsets between 0-30 degrees were required to bring the drifters into agreement with models and first-guess fields. Additional in-water testing is required to confirm the existence of this problem and to identify the cause.

1999 Plans

The proposed global drifter array for ocean observations in support of ENSO predictions is shown below. To the extent that resources permit, this will be the goal of the GDP for the next three years.

Area	Resolution Sq. Km.	Array size # of drifters	Deployments/year
Pacific (20S-20N)	200 x 1250	235	159
Indian (20S-20N)	200 x 1250	104	70
Southern Ocean (60S-20S)	1000 x 1000	118	79
Atlantic (20S-30N)	200 x 1250	129	87
Pacific (E. Trop)			100
TOTALS		586	495

1999 Plans

-Continue the ESTOC time series deployments

-Continue the NOPP/YOTO deployments

-Purchase of 25 additional SVP drifters for the NOPP/YOTO program. These drifters will be deployed in the Tropical Atlantic and Caribbean Basin

-Phase III of the US NWS program. Thirteen drifters will be deployed in the Gulf of Alaska and Bering Sea.

- Purchase and deployment of 10 SVPBW drifters in the Tropical Atlantic in support of real time tracking of tropical storms

-Air deployment re-certification of the Technocean and Clearwater SVPB drifters

-Promotion of a common formats for SVP, SVPB and SVPBW WOCE drifters

-Continue the cooperative deployments with weather services world wide.

-GDC will provide the NDBO with two ORBCOMM drifters for test and evaluation

DBCP 14
12-16 October 1998
Marathon, FL

TAO Implementation Panel Action Group Report

H. Paul Freitag
Linda J. Mangum
Michael J. McPhaden

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Pacific Marine Environmental Laboratory
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Seattle, WA 98115

Preface

The Tropical Atmosphere-Ocean (TAO) Implementation Panel (TIP) became an Action Group of the Data Buoy Cooperation Panel (DBCP) during the past year. This first annual report will introduce TAO to the DBCP, focusing on the what TAO is, how it is structured, and other issues which are relevant to the DBCP.

Introduction

The TAO Array provides a major source of data necessary for monitoring and predicting short-term climate variability, most notably the El Nino/Southern Oscillation (ENSO). A component of the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS), the array consists of approximately 70 deep-ocean moorings spanning the equatorial Pacific Ocean (Figure 1). The past year has offered a striking example of short-term climate variability, with the tropical Pacific switching from strong El Nino conditions in October 1997 to La Nina conditions at present (Figure 2). TAO data clearly defined the El Nino conditions which were present in October 1997. These conditions included: equatorial sea surface temperatures (SST) warmer than normal everywhere east of the dateline, with anomalies exceeding 5°C in the east; positive subsurface temperature anomalies east of the dateline, with anomalies over 10°C at 100 m; a nearly flat thermocline from west to east; and equatorial surface winds anomalously eastward over much of the central Pacific. Presently, SST and subsurface temperatures are colder than normal over much of the equatorial basin, the thermocline steeply rises from west to east, and equatorial surface winds are anomalously westward over the central and western Pacific. Moreover, the transition between El Nino and La Nina conditions was quite rapid, *e.g.*, the SST anomaly at 0°, 125°W changed from +4°C to -3°C in one month. No other single source of information gives such detailed 4-dimensional data necessary for the understanding of climate variability as does the TAO Array.

TAO moorings were designed by the Engineering Development Division (EDD) at Pacific Marine Environmental Laboratory (PMEL). Initial ATLAS mooring deployments were made in

1984 and the array expanded to its present size by the end of 1994 TAO technicians construct the electronic instrumentation and are responsible for sensor calibrations and checkout. Pre-deployment and post-recovery calibrations are performed, enabling estimates of sensor accuracy and drift. Raw data are telemetered in real-time to PMEL via Service Argos (Figure 3). Calibration coefficients and quality control checks are applied at PMEL. The data are then made available by PMEL to the research community, other governmental agencies and the public via ftp (ftp.pmel.noaa.gov/taodata), or the World Wide Web (http://www.pmel.noaa.gov/toga-tao/home.html). Data are also processed and placed on the Global Telecommunications System (GTS) by Service Argos, for distribution to operational centers where they are assimilated into weather and climate forecast models. PMEL also monitors TAO data submission to the GTS for comparison to the data being processed in house.

TAO Implementation Panel

TIP was formed to define strategies that would ensure uninterrupted and long-term maintenance of the TAO Array. Established in 1992 under the auspices of the International Tropical Ocean Global Atmosphere (TOGA) Program, sponsorship has since shifted jointly to the World Climate Research Program's study of Climate Variability and Predictability (CLIVAR), GOOS and GCOS. Membership on the panel is by invitation of the GOOS Planning Office, based on recommendations made by TIP or its sponsors. The last annual meeting, TIP-6, was held in Reading, England, in November, 1997. Some of the issues raised at TIP-6 were:

- The need for verification of surface flux climatologies and surface fluxes from atmospheric and coupled ocean-atmosphere models. It was recommended that specialized instrumentation (*e.g.*, radiometers, rain gauges) be added to moorings along the 165°E, 140°W and 95°W meridians and in the tropical Atlantic. These data are considered experimental and thus will not be included with operational TAO data at present.

- The lack of ocean salinity data may negatively impact El Nino SST predictions. In response, TAO has added surface and subsurface salinity measurements at selected mooring sites. These data are also considered experimental and thus not included with operational TAO data at present.

- Although relative humidity (RH) has been measured from TAO moorings for several years, these data were not getting onto the GTS. Recent modeling studies have shown that relatively small changes in boundary layer moisture can have a large impact on model based flux determinations and deep convection. In response to the TIP recommendations, RH data have been added to TAO GTS messages.

- Noting a history of informal collaboration between the TIP and the DBCP, the TAO Panel requested formal recognition as an Action Group of the DBCP. This recognition was granted and therefore the TIP presents this report to this 14th session of the DBCP.

The TIP will next meet in Abijan, Ivory Coast, in November 1998.

Field Operations

The success of the TAO Array is highly dependant on sufficient and dependable research vessel support. Maintenance of the Pacific array requires 11 months of ship time annually. The majority of these are supplied by the NOAA Ship KA'IMIMOANA, which is dedicated to servicing the TAO Array and provides about 8 months of ship time per year. The remainder of the necessary time is provided by the Japan Marine Science and Technology Center (JAMSTEC) and the NOAA ship RONALD BROWN. Although the design life of ATLAS moorings is 1 year, most sites are visited twice a year (Figure 4) for possible replacement of failed or damaged surface instrumentation.

Data Issues

Overall data return from the TAO Array is very good. Most sites have a data return rate of more than 80% (Figure 5). Sites with lower data return tend to be in the western Pacific. Much of the data loss is due to damaged sensors or lost moorings due to vandalism, which appears to be most pronounced in the western Pacific. The worst case to date is the 5°N, 137°W site at which 3 moorings have been deployed since 1995 and none recovered. TAO has created brochures in five languages which describe the moorings, how to safely operate near them, and the research aims of the project. Hopefully, knowledge of the array and it's potential benefits will result in a decrease in the amount of vandalism incurred.

TAO monitors the amount of data which are placed on the GTS by Service Argos for quality control purposes. About 80 - 90% of surface and subsurface data which reaches PMEL is available on the GTS (Figure 6). It is thought that much of the "lost" data is due to messages with transmission errors, which eventually reach PMEL in corrected form, but have already been declared as bad by Service Argos. Lags in data arrival, inherent in the satellite system, may cause a reduction in the amount of data which are usable by some forecast models.

The difference between the amounts of surface and subsurface data is due to the fact that the surface data are the most recent hourly values, which change with each satellite pass, while the subsurface data are daily means. To reduce both battery and Service Argos costs, TAO moorings transmit only 8 hours per day, which results in about 3 surface observations per day. These are clustered around daylight satellite passes, and thus users will notice a lack of real-time data at most sites near the 0600 UTC and 1200 UTC synoptic periods.

The sharp decline in surface observations in March 1998 was due to the switch from 3 satellite to 2 satellite processing. Initially there was no cost to the project for the additional data, but when a significant cost was imposed, it could no longer be justified from a climate research standpoint.

Summary

TIP welcomes the interaction afforded by becoming an Action Group of the DBCP. The benefits to TAO include, among other things, direct participation in a most effective international mechanism for coordinating the implementation of the global array of research and operational ocean buoy programs. Benefits to the data buoy community as a whole includes the opportunity to speak with a united voice on real-time data transmission and usage issues, which affect all programs.

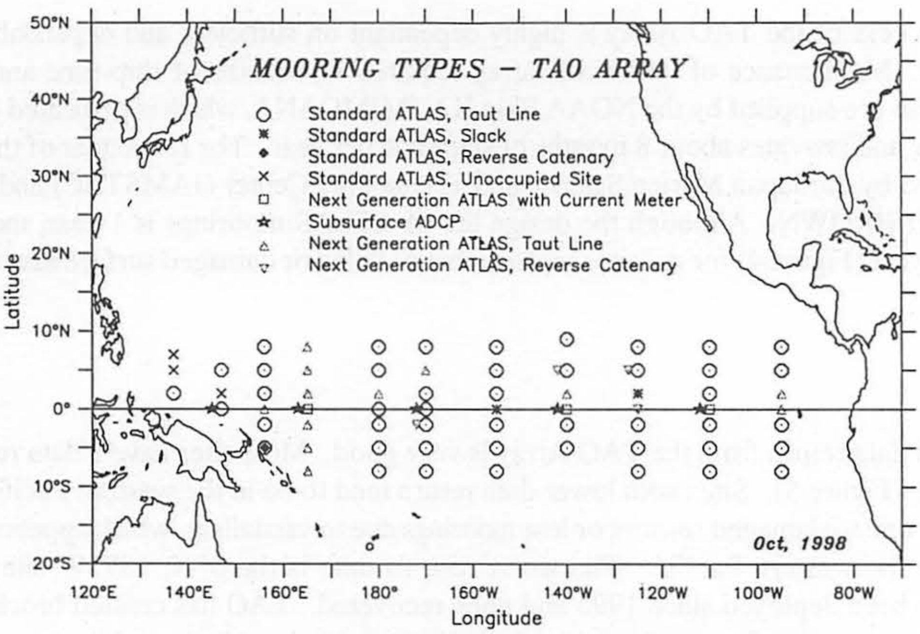


Figure 1: Location and types of moorings within the TAO Array.

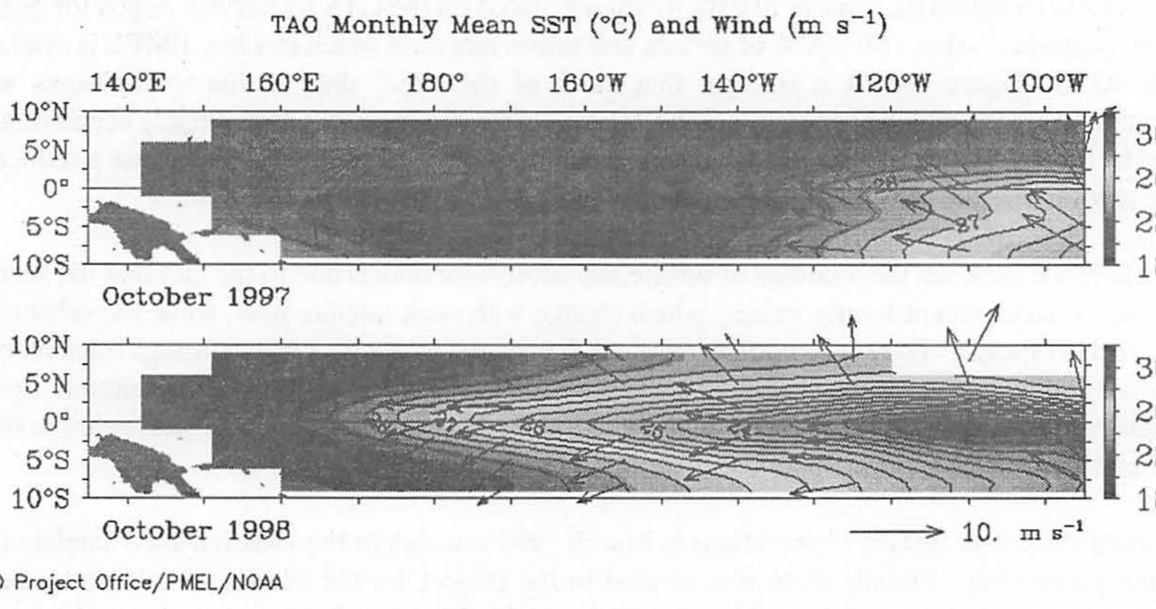


Figure 2: SST contours and wind vectors for the months of October 1997 and October 1998.

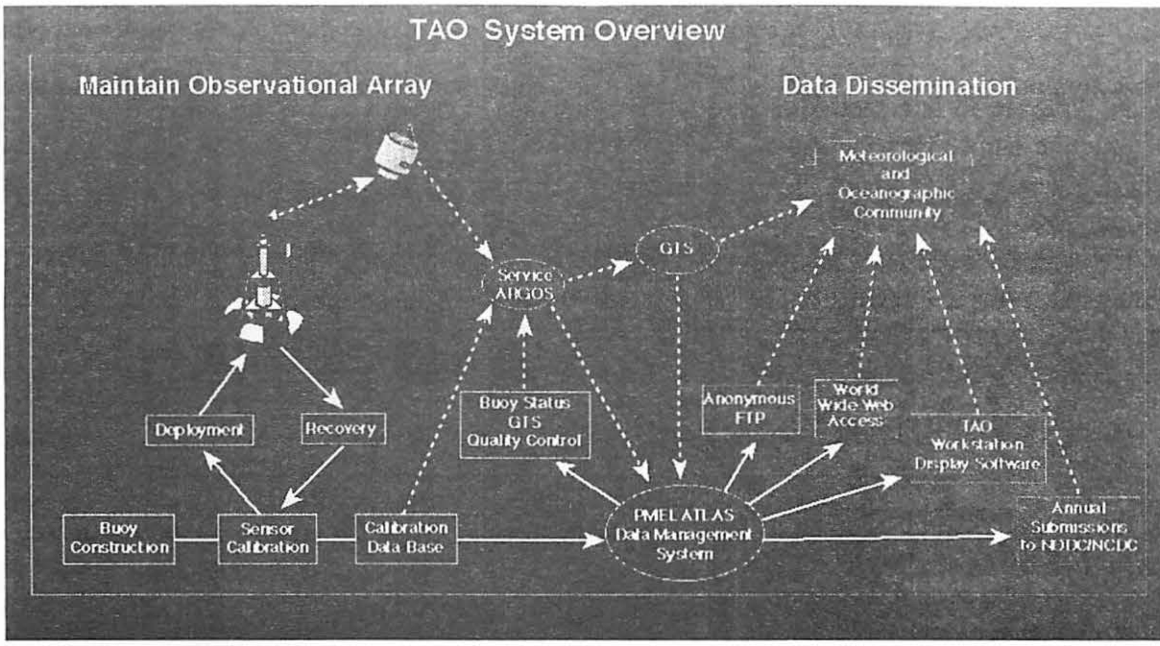


Figure 3: TAO system overview.

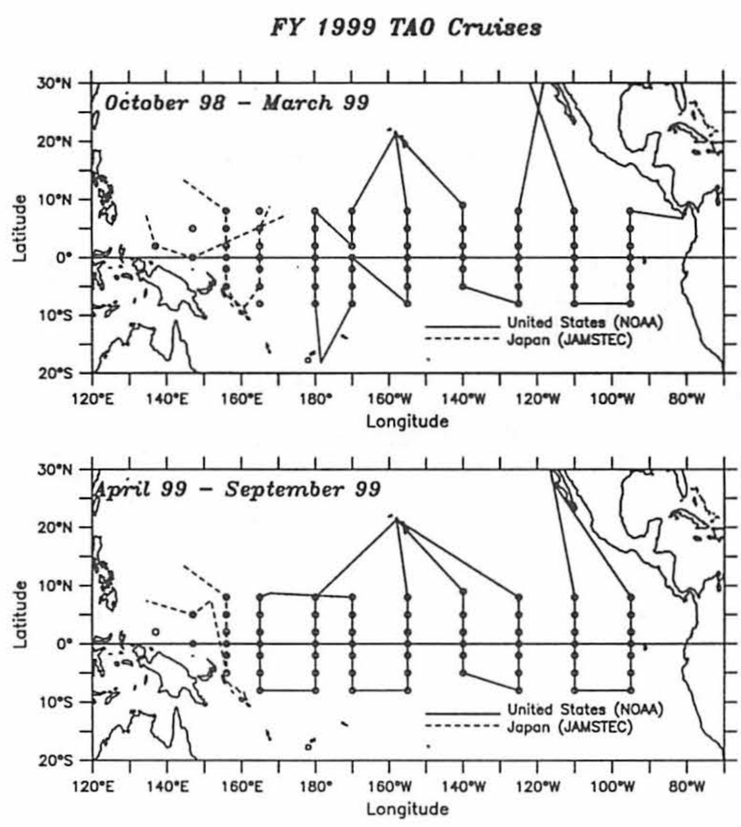


Figure 4: TAO cruise plan for US fiscal year 1999.

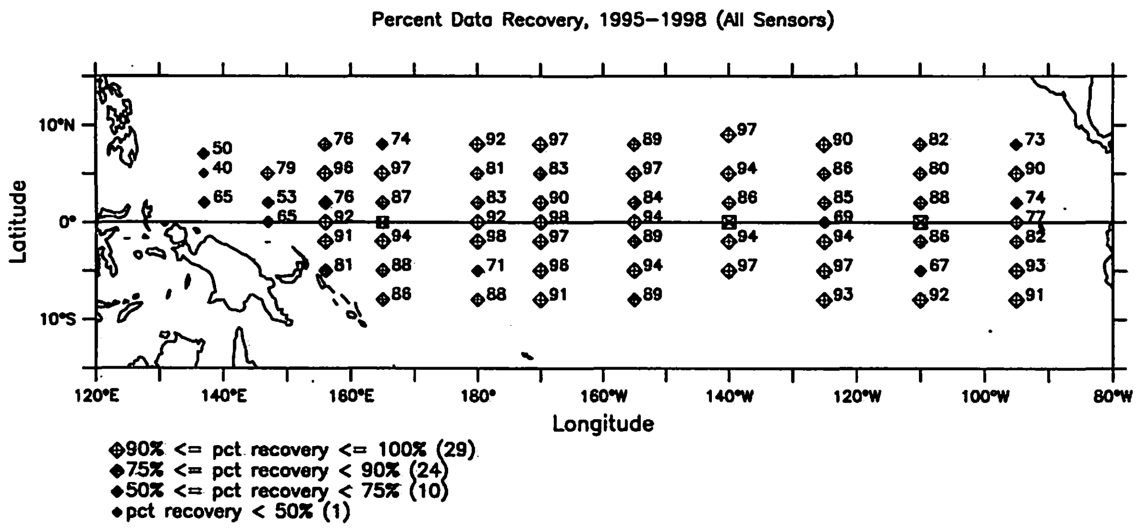


Figure 5: TAO data return for the period 1995 through 1998.

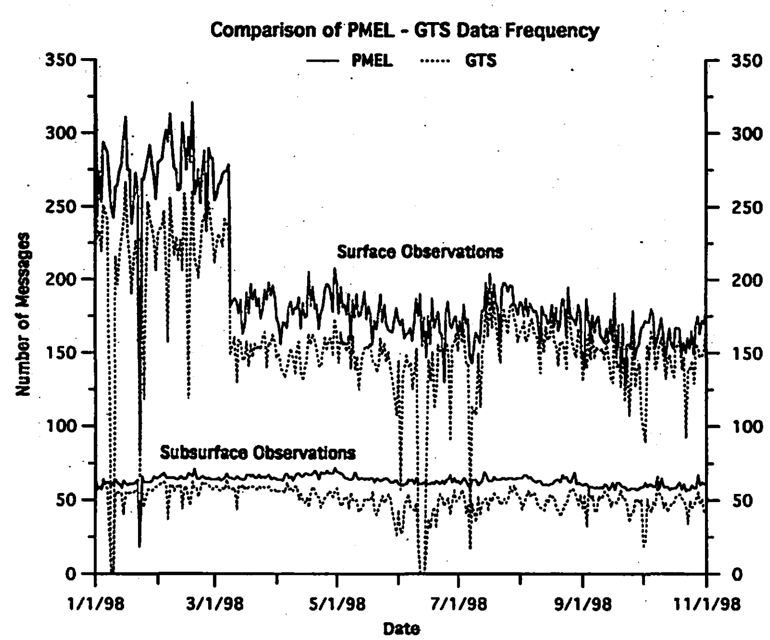


Figure 6: Data frequency of surface and subsurface observations received at PMEL and placed on the GTS by Service Argos.

Northeast Pacific Cooperative Drifter Program

Michael K. Burdette
National Data Buoy Center

United States and Canadian forecasters are continually challenged in their efforts to prepare accurate forecasts for the coastal areas of the Northeast Pacific. The Gulf of Alaska and the North Pacific are well known as areas for development and intensification of major storm systems which pose a moderate to severe threat to the coastal and land areas of the U.S. and Canada. Although the Northeast Pacific is well served by U.S. and Canadian moored buoys, and Voluntary Observing Ships, large expanses of ocean still exist where little meteorological information is available to forecasters.

This noted lack of meteorological observations, along with the associated risk, was severely felt on October 11, 1984, when an under-forecasted, rapidly deepening storm, a "marine bomb," struck the West Coast of Canada, resulting in the loss of seven fishing vessels and five lives. Subsequent investigation into the incident, known as the "Le Blonde Report," highlighted the importance of understanding the physics of rapidly deepening storms, and developing methods for early detection. One action addressing requirements identified in the report was to supplement the existing moored buoy networks on the west coast with drifting buoys that could measure needed parameters such as wind speed and direction, pressure, and sea state, as future developments allowed. Since that time, Environment Canada has attempted to maintain a network of 10-12 drifting buoys in the Northeast Pacific as an early warning network. The National Data Buoy Center (NDBC) has also deployed a few drifters in the area for other unrelated projects. Over the years, however, it has been difficult for Environment Canada to maintain the network with little or no assistance.

In 1997, the Atmospheric Environment Branch of Environment Canada contacted NDBC, recommending a joint effort to deploy and maintain a drifter array for 3 years. The resulting network would be larger, more reliable, and more valuable than either could support individually.

In September, 1998, the first six deployments were successfully made. Drifters measuring wind speed and direction, barometric pressure, air temperature, sea temperature, and location were placed along 160W longitude, at 40N, 41N, 43N, 46N, 49N, and 52N latitudes. The buoys are expected to slowly drift towards the west coast of the U.S. and Canada over the next 2 years. They will report through the Polar Orbiting Environmental Satellites, with data being distributed through Service Argos to the Global Telecommunications System. Data will be available to all west coast forecasters on the SSVX08 header. Marine interests should note that the data will also be plotted on standard National Meteorological Center (NMC) Surface Analysis Charts. One important point to be kept in mind when analyzing the data is that the winds are measured at one meter above the sea surface and contain no adjustment to the standard 10-meter observation height. If not adjusted to 10-meter height for use, the data will show a low wind speed bias.

NDBC and Environment Canada are expecting to add additional buoys to the array over the next 2 years. As current buoys drift slowly towards the coastlines of the U.S. and Canada, additional buoys will be deployed behind them. The result will be a comprehensive buoy array stretching from 160W toward the coastlines in 1999 and 2000.

ANNEX III

REPORTS FROM DATA MANAGEMENT CENTRES

The following pages contain the reports by the:

- Responsible National Oceanographic Data Centre (RNODC) for drifting buoys of the International Oceanographic Data and Information Exchange (IODE) system of IOC, which is implemented by the Canadian Marine Environmental Data System (MEDS); *p. 2*

- Specialized Oceanographic Centre (SOC) for drifting buoys of the Integrated Global Ocean Services System (IGOSS) of IOC and WMO, which is implemented by the Subdivision Prévision marine (SCEMO/PREVI/MAR) de Météo-France. *p. 14*

RESPONSIBLE
NATIONAL
OCEANOGRAPHIC
DATA
CENTRE

for Drifting Buoys

Marine Environmental Data Service Report

14th Session of the Data Buoy Co-operation Panel

Marathon, Florida (USA)

October 1998

REPORT OF THE WMO/IOC RESPONSIBLE NATIONAL OCEANOGRAPHIC CENTRE FOR DRIFTING BUOYS

Introduction

The Marine Environmental Data Service (MEDS) in Canada became a Responsible National Oceanographic Data Centre (RNODC) for Drifting Buoy Data on behalf of the Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organization (WMO) in January 1986. The purpose of this report is to describe the activities of the RNODC-MEDS in acquiring and making drifting buoy data available to the scientific community during the last nineteen months (January 1997 - July 1998).

Data Flow

Table 1 shows various statistics derived for this last 19-month period of activity. The first column of the table gives the month and year, the second column provides the number of messages received by MEDS for this particular month-year while the third column provides the ratio in percentage of messages with the quality flags equal to 1 for position and date/time. A quality flag of 1 means that no errors were found either in the date/time stamp of the message nor in the observed data themselves. The next two columns provide the statistics on the buoys themselves; columns 4 shows first the number of buoys reporting on the GTS and for which MEDS is receiving the data while column 5 gives the number of operational drifting buoys according to the Technical Coordinator DBCP. The last column of this table gives the ratio expressed in percentage of the number of buoys for which MEDS is receiving data during each particular month.

Figure 1 is an illustration of the level of activities performed by MEDS during this same 19-month period. For each month, it displays the number of messages received, the number of messages received with both quality flags (position and date/time) equal to 1 and the number of messages received from drifting buoys only (the difference is received from fixed platforms). The total number of messages received, processed and archived by MEDS each month for this time period is 2,522,473 with an average of 132,762 messages per month (an increase of 1.5% over last year figure).

With regard to the ratio describing the quality of the messages received (see Figure 1), it must be pointed out that this ratio was higher by approximately 15% a few years ago. The decrease of the ratio is not caused by poor data being reported but is a reflection of the processing of the drifting buoy messages received on the GTS. Positions received an automatic flag of 3 (suspicious) when the same message is reported by an ARGOS Centre and a LUT centre (LUT gets the level 3 rating). Messages are also flagged as suspicious (QC=3) when an old position is being reported on any satellite pass.

Figure 2 illustrates, over the same 19-month time period, the number of buoys for which MEDS is receiving data via the GTS route over the number of physical drifting buoys that transmitted at least once during that month. The second number is provided by the Technical Coordinator of the DBCP (TC DBCP). The average gap between each value is 1,518 messages per month (s.d.= 170) but the gap seems to increase with time. It was 1,411 in last year's report. It must be pointed out though that the number of physical buoys provided by the DBCP TC includes all drifting buoys which have transmitted during that particular month. Therefore, this number includes operational buoys, buoys with no localization computed, backup buoys, inactive buoys and buoys near their death. As pointed out earlier, the gap seemed to have increased since March 1998, therefore the number of buoys for which MEDS is receiving data has been decreasing since that month.

With regard to the number of messages received by MEDS, this number is inflated by two different sources. Multiple messages are reported on the GTS as they are processed by an ARGOS centre (KARS or LFPW) and a LUT centre (EDMO, OSLO or BGSF). In this case, MEDS keeps both messages. It may be picked up by a single LUT, but having different parameters (channels) echoed back by the satellite. In this case, a message is not a duplicate message if it has different parameters. Otherwise, MEDS keeps the best (most complete) message. Inflation is also caused by multiple messages on the same satellite pass. Identical messages are deleted during processing when the information is exactly the same within some tolerance limits (35-minute window on time and smaller than 15 km in space, 5 knots in speed) where reported positions are not old positions. If the information from multiple messages is outside these tolerance limits, then duplicate messages are being kept.

An interesting occurrence is the significant increase since October 1997 of sub-surface measurements as illustrated by Figure 3. This graph provides the number of messages received by MEDS for which there are sub-surface observations attached to the GTS message. These messages are for drifitng buoys only and do not reflect the sub-surface measurements carried routinely by fixed platforms. In October and November of 1997, there were more than 8,000 messages reporting sub-surface observations from these drifting buoys. This monthly count has decreased since but is remaining significantly higher than usual with an average of 3,730 messages per month which contained sub-surface observations. This average increases to more than 5,900 if only the months from September 1997 to July 1998 are used in the computation.

Figure 4 describes the number of messages per buoy per day of operation. This number is fairly constant over the 19-month period as there are on the average 6.3 messages per buoy per day of operation (compared to 5.5 in last year report).

Historical Data Acquisition

Since the FGGE program and since January 1986 when MEDS became the RNODC for Drifting Buoys Data, the archive has grown constantly as shown in Figures 5 and 6. These two figures illustrate the same type of information. Figure 5 provides the number of messages received by MEDS each year while Figure 6 shows the growth of MEDS Drifting Buoys Archive. At the end of December 1997, it contained a total of 12,491,077 messages. More than 67.5% of these messages have a quality flag equal to 1 (good quality on position and date/time) and 88.0% of these messages are originating from a drifting buoy as opposed to a fixed platform. Sub-surface data are available from these buoys since 1987 and the archive now contains a total of 193,538 messages with sub-surface information.

Development

Most of the resources for development were spent this year in the production of a CD-Rom for WOCE/Surface Velocity Program (WOCE/SVP). This CD was completed by the end of 1997 and was distributed at the WOCE Conference held in May of 1998 in Halifax, Canada. Copies of the CD are available from MEDS or AOML on a request basis.

MEDS has also proposed the production of a new CD for the International Arctic Buoy Program. Established in 1991, this Program has accumulated throughout the years a substantive and very valuable data set. Several data products are available from the IABP Web site but it was felt that this scientific data could be distributed openly to the international scientific community using the CD as a medium, thus providing a higher visibility to the Program. A proposal for the format and table of contents was done by MEDS at the last IABP meeting held in Seattle in July of 1998 and was well received. The work will follow when MEDS receives the scientific quality control data from Boulder, Colorado, to be inserted on the CD. One of the comments received during MEDS presentation was the inclusion of the Antarctic data with this data set. Progress has not been accomplished as of now for that portion of the project but will be initiated as soon as possible. MEDS will work with the IABP Office to integrate the real-time and delayed mode data for inclusion on the CD.

Services

MEDS issues an annual report summarizing the data received and processed during the previous year and showing the locations of the buoys. Starting with 1997, this annual report will be made available on MEDS Web site (http://www.meds.dfo.ca/Meds/e_rec_db.html). The maps included with this report will complement the maps already available electronically. There will be four maps produced per month (Atlantic, Pacific, Arctic and Southern Oceans) with an inventory available for that particular month as well.

In addition, MEDS also delivers data for a user specified area, time and range of buoys in GF-3 format (also available now as a CSV data file) on various computer media (such as computer magnetic tape, computer diskette and Exabyte cartridge). Displays of buoy tracks are also available for any ocean area and time frame upon request.

MEDS maintains an archiving system for the Drifting Buoys Bulletin Board messages (Owner Buoy QC messages) available each day through InterNet. Because of changes of software used to read the electronic mail, the format of the mail messages has changed enough to require a change in the system to archive the messages. Work is still in progress to complete the change over with the goal to provide to the user community a retrieval system through InterNet.

Report prepared by: Paul-André Bolduc
Marine Environmental Data Service
Date: October 1998. Ottawa, Canada.

Table 1: Monthly Statistics on Number of Buoys and Number of Messages received at MEDS from January 97 to July 98 with Evaluation of the QC and Comparison with DBCP TC Reported Numbers

Month/ Year	# of messages received	Ratio in % of messages QC OK	# Buoys MEDS	# of Buoys TC/DBCP	Ratio in %
Jan 97	139,850	41.05	806	2,118	38,05
Feb 97	110,766	40.08	750	2,050	36,59
Mar 97	128,618	40.18	758	2,316	32,73
Apr 97	122,795	40.63	685	2,197	31,18
May 97	126,727	39.80	662	2,279	29.05
Jun 97	108,681	40.37	621	2,263	27,44
Jul 97	134,366	41.66	688	2,783	24,72
Aug 97	138,803	41.34	693	2,193	31,60
Sep 97	135,017	41.14	739	2,166	34,12
Oct 97	144,385	41.56	691	2,173	31,80
Nov 97	130,859	41.34	647	1,984	32,61
Dec 97	135,754	40.84	629	2,079	30,25
Jan 98	132,962	41.87	637	2,118	30,08
Feb 98	126,370	41.42	667	2,050	32,54
Mar 98	151,188	40.50	717	2,259	31,74
Apr 98	140,796	42.01	702	2,248	31,23
May 98	136,429	42.12	669	2,229	30.01
Jun 98	141,564	42.18	741	2,304	32,16
Jul 98	136,546	44.24	675	2,211	30,53

Figure 1

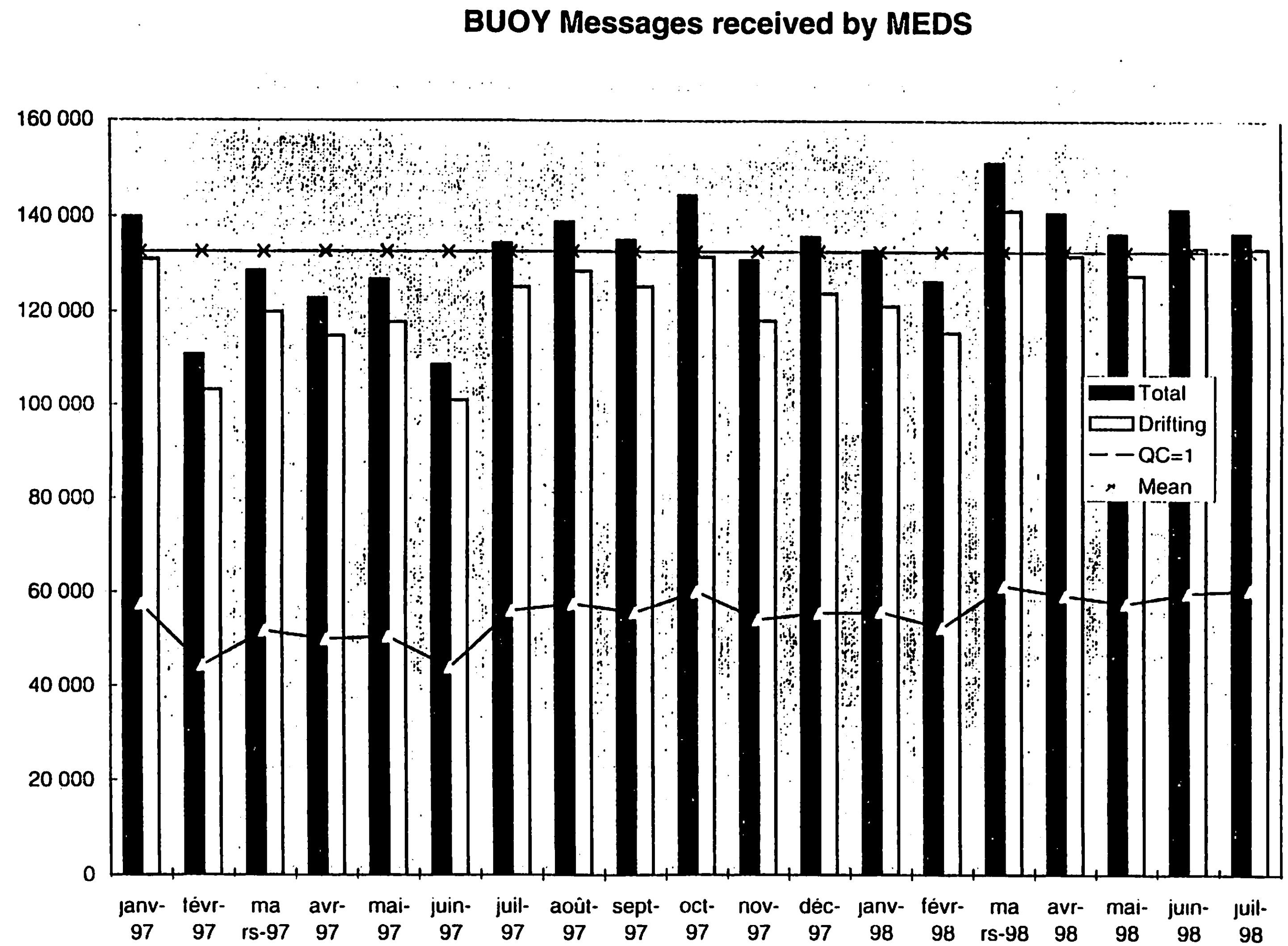
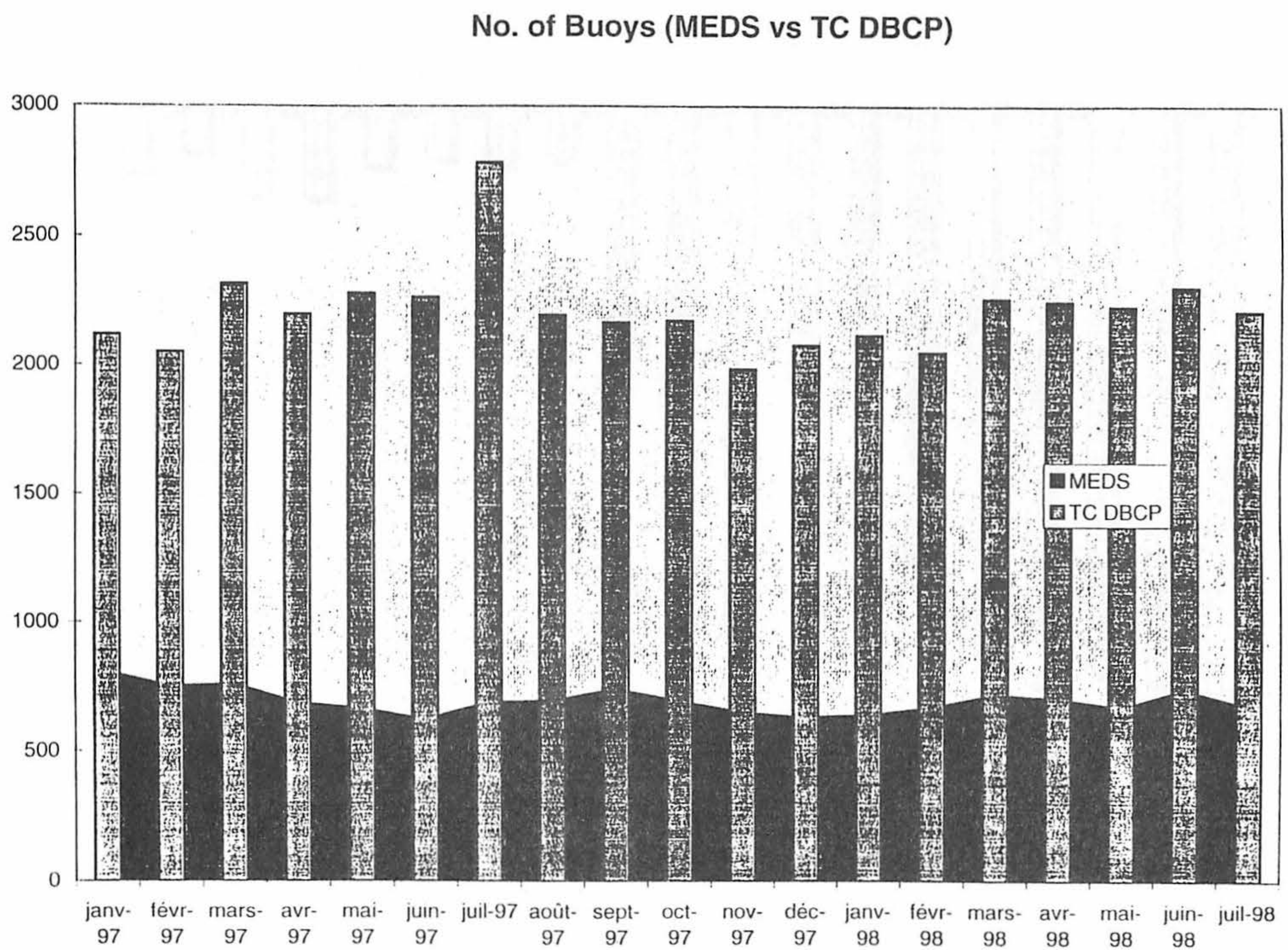

BUOY Messages received by MEDS
160 000
140 000
120 000
100 000
80 000
60 000
40 000
20 000
0
janv-97
févr-97
mars-97
avr-97
mai-97
juin-97
juil-97
août-97
sept-97
oct-97
nov-97
déc-97
janv-98
févr-98
mars-98
avr-98
mai-98
juin-98
juil-98
Total
Drifting
QC=1
Mean

Figure 2



No. of Buoys (MEDS vs TC DBCP)
3000
2500
2000
1500
1000
500
0
MEDS
TC DBCP
janv-97
févr-97
mars-97
avr-97
mai-97
juin-97
juil-97
août-97
sept-97
oct-97
nov-97
déc-97
janv-98
févr-98
mars-98
avr-98
mai-98
juin-98
juil-98

Figure 3

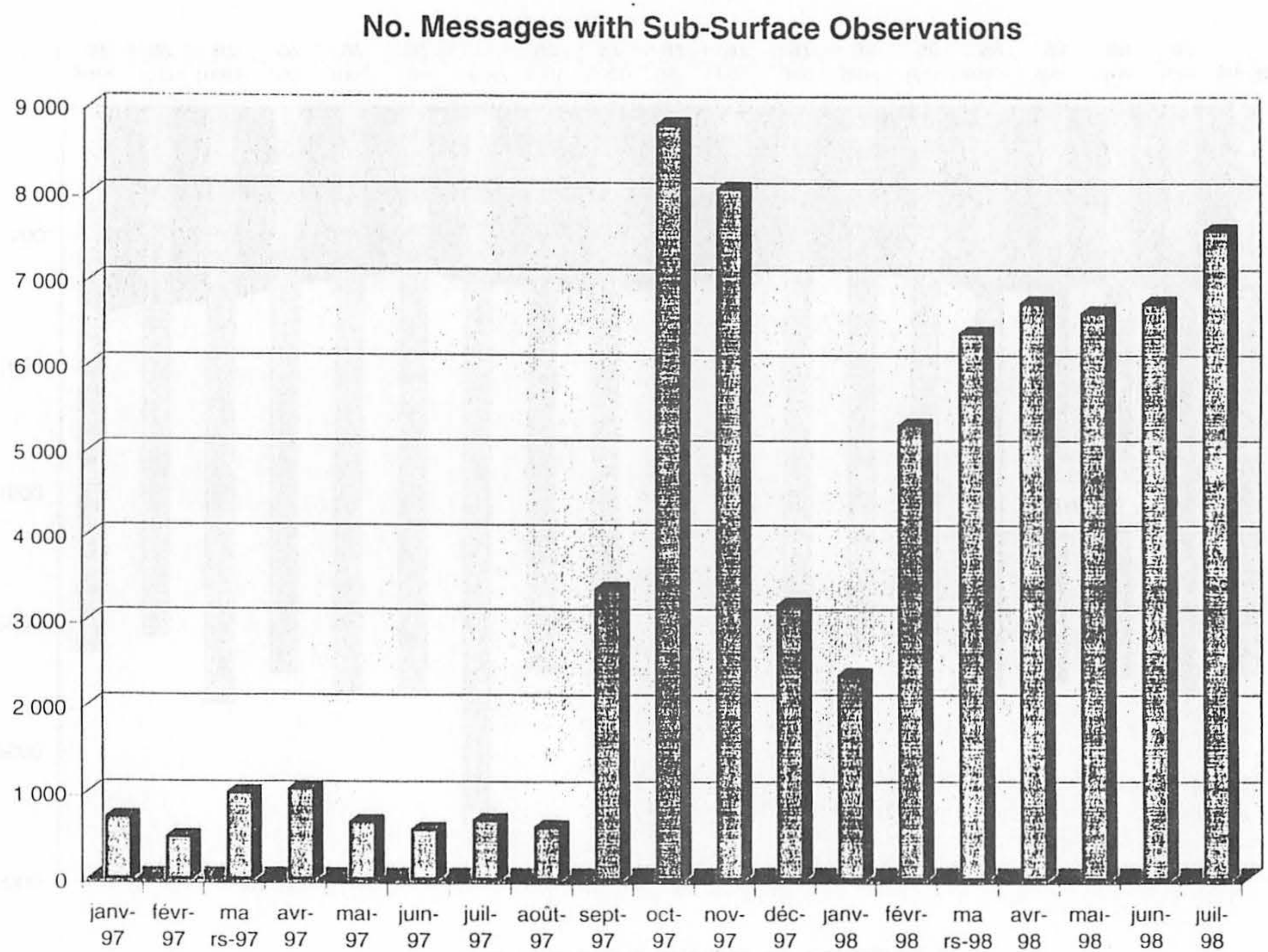

No. Messages with Sub-Surface Observations
9 000
8 000
7 000
6 000
5 000
4 000
3 000
2 000
1 000
0
janv-97
févr-97
mars-97
avr-97
mai-97
juin-97
juil-97
août-97
sept-97
oct-97
nov-97
déc-97
janv-98
févr-98
mars-98
avr-98
mai-98
juin-98
juil-98

Figure 4

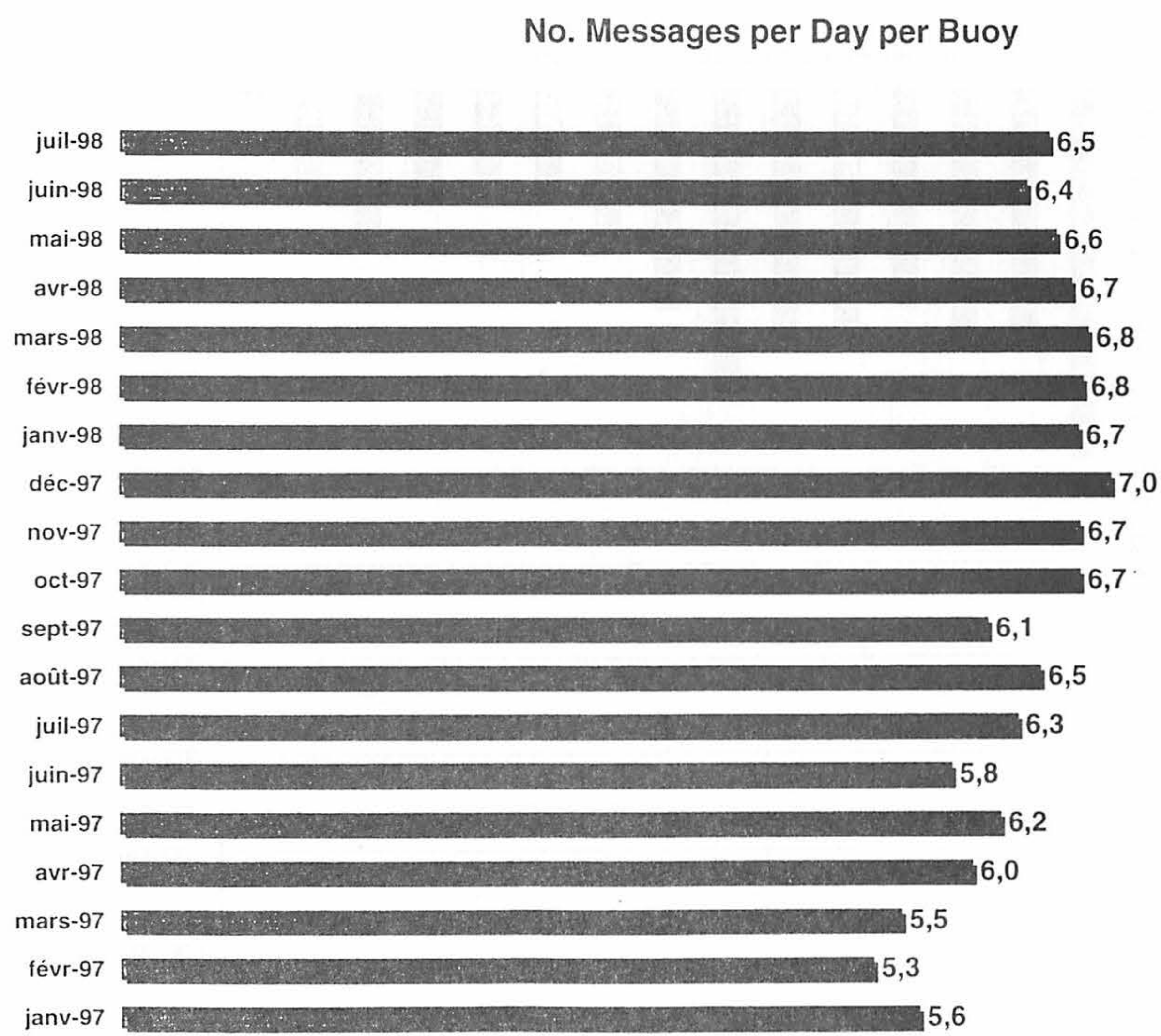
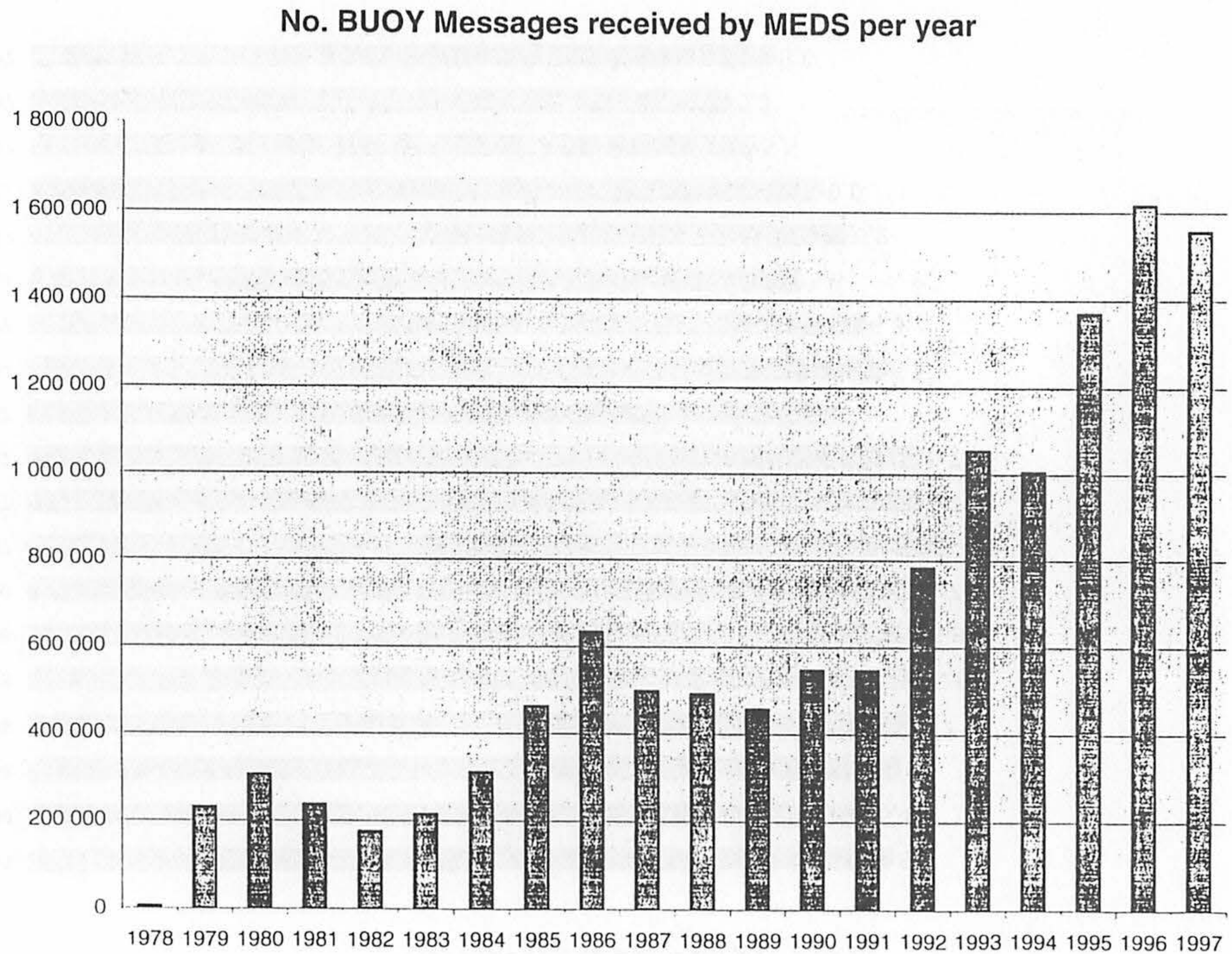

No. Messages per Day per Buoy
juil-98
6,5
juin-98
6,4
mai-98
6,6
avr-98
6,7
mars-98
6,8
févr-98
6,8
janv-98
6,7
déc-97
7,0
nov-97
6,7
oct-97
6,7
sept-97
6,1
août-97
6,5
juil-97
6,3
juin-97
5,8
mai-97
6,2
avr-97
6,0
mars-97
5,5
févr-97
5,3
janv-97
5,6

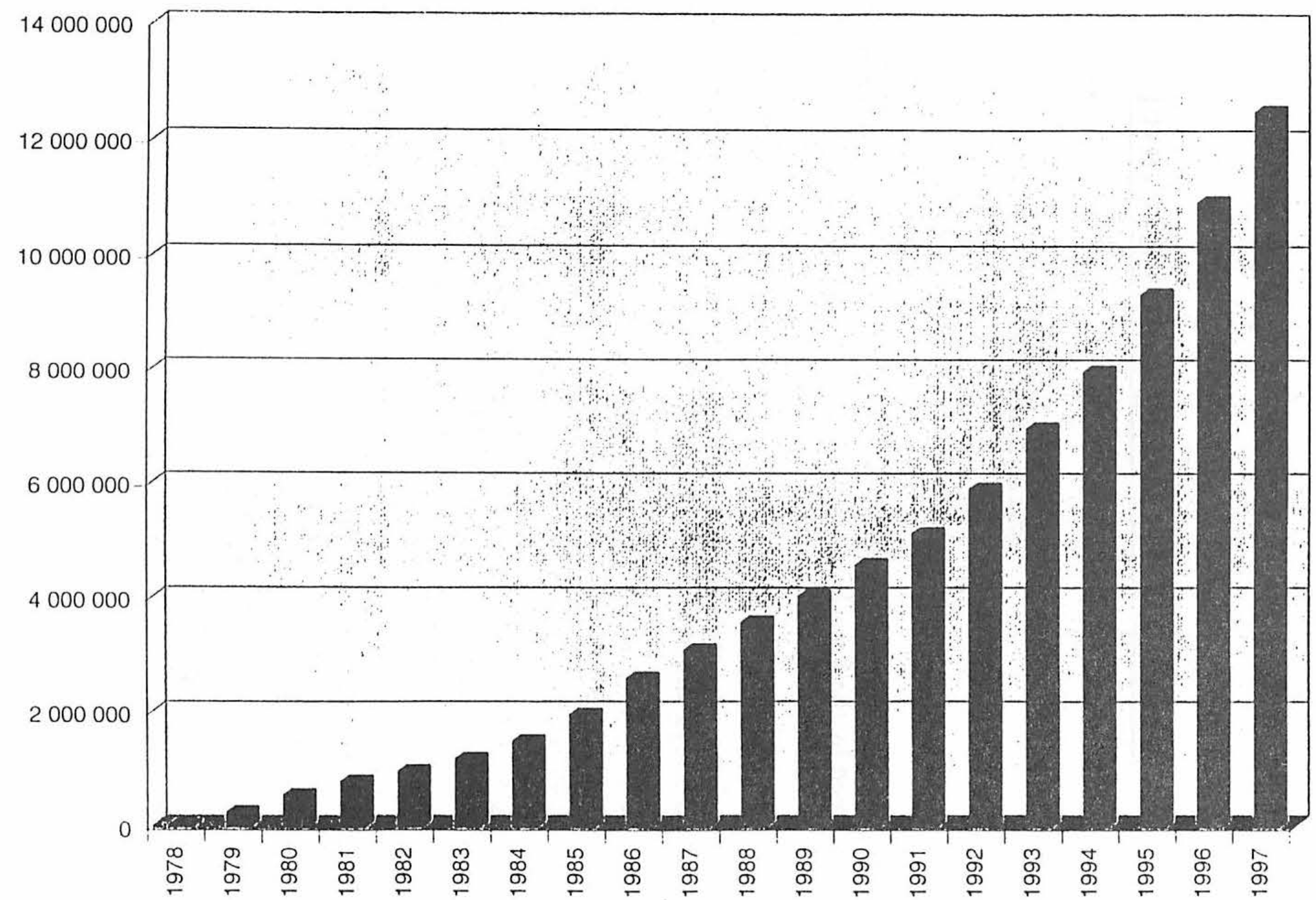
Figure 5



No. BUOY Messages received by MEDS per year
1 800 000
1 600 000
1 400 000
1 200 000
1 000 000
800 000
600 000
400 000
200 000
0
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997

Figure 6

Growth of MEDS BUOY Archive



METEO FRANCE

SOC for Drifting Buoy Report

1997-1998

A daily collection and archiving of buoy reports from the world ocean is performed by the French Meteorological service.

As usual the French SOC produces monthly graphic products for buoys, moored buoys, drifting buoys, ships.

Figures 1, 2, 3, 4, show the time evolution of reports for wind (direction and speed) and for pressure respectively for all buoys, moored buoys, drifting buoys and ships since the 1st of January 1997.

Figures 5 and 6 show the time evolution of waveob reports and sensors since the 1st of January 1997.

Each month mapping position plot charts and Marsden square distribution are produced for buoys and ships and are sent to 70 users in the world. Figures 7, 8, 9 and 10 show products for June 1998.

Each month Marsden square distribution chart of mean monthly data availability (top) and percentage of buoy reports compared to ship + buoy reports (bottom) for wind, pressure, air temperature, sea surface temperature are produce. Figures 11, 12, 13 and 14 show such products for June 1998.

French SOC Representative

Dr Philippe Dandin

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Tel: +33 5 61 07 82 90 Fax: +33 5 61 07 85 38 email : philippe.dandin@meteo.fr

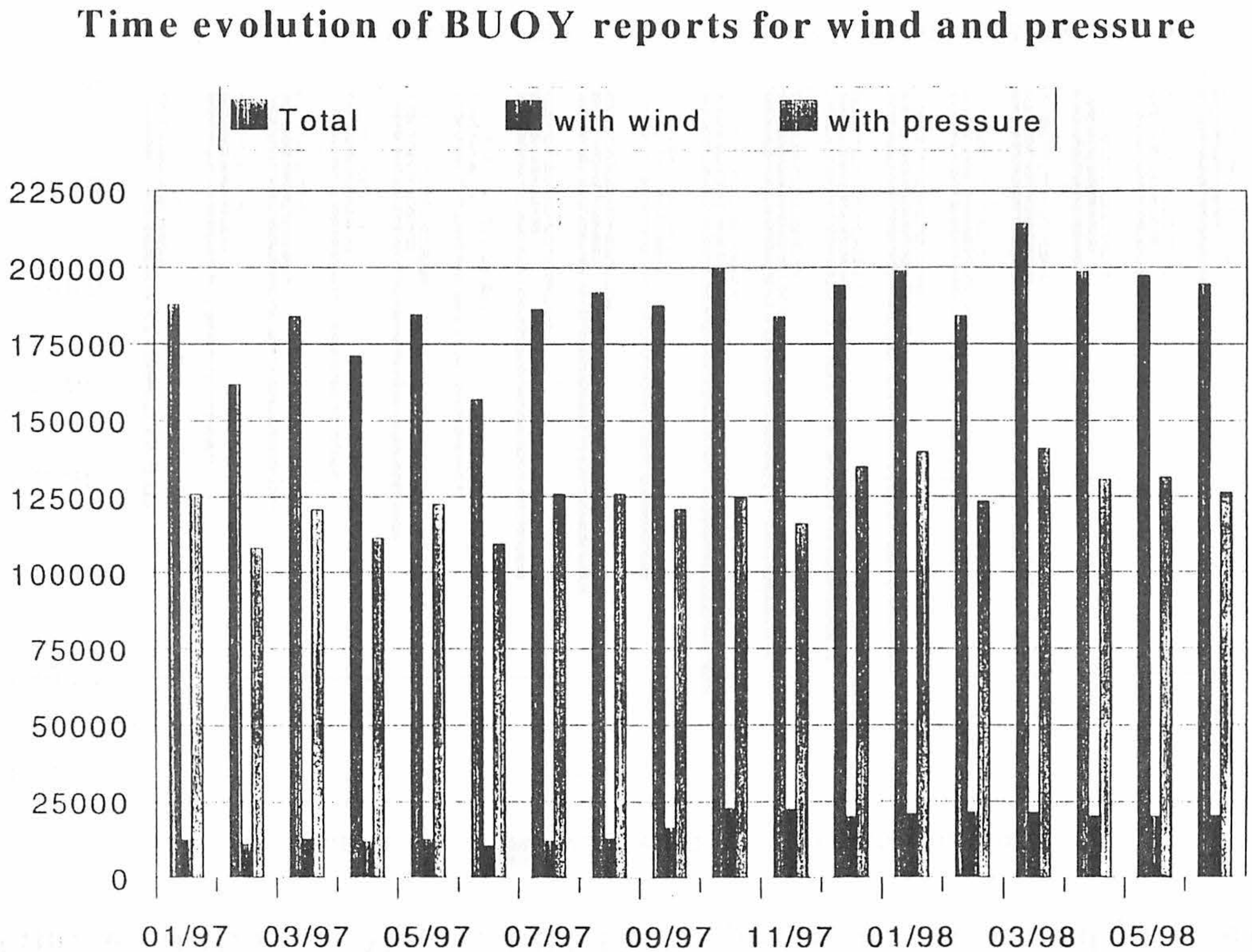

Time evolution of BUOY reports for wind and pressure
Total
with wind
with pressure
225000
200000
175000
150000
125000
100000
75000
50000
25000
0
01/97
03/97
05/97
07/97
09/97
11/97
01/98
03/98
05/98

Figure 1

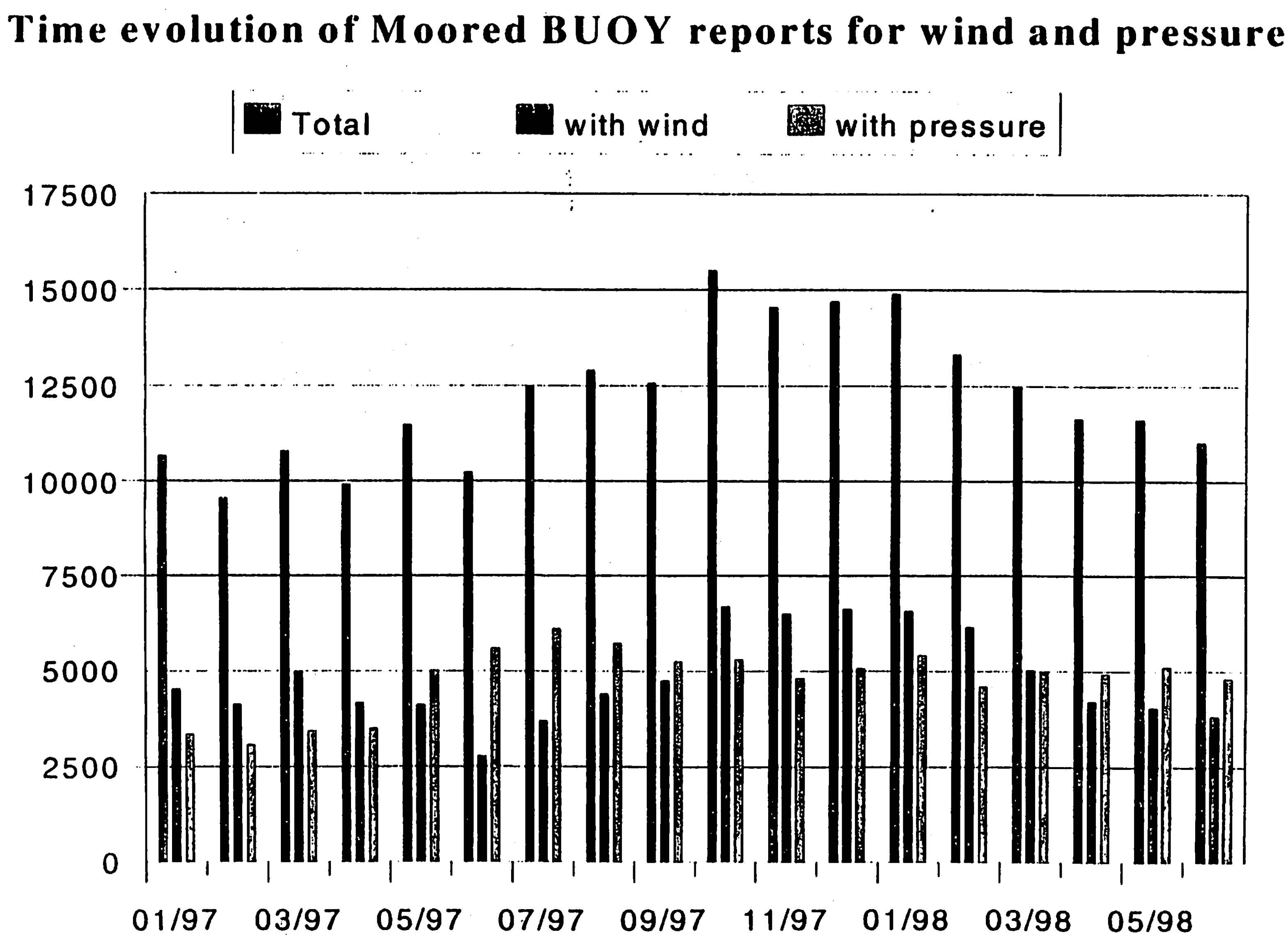

Time evolution of Moored BUOY reports for wind and pressure
Total
with wind
with pressure
17500
15000
12500
10000
7500
5000
2500
0
01/97
03/97
05/97
07/97
09/97
11/97
01/98
03/98
05/98

Figure 2

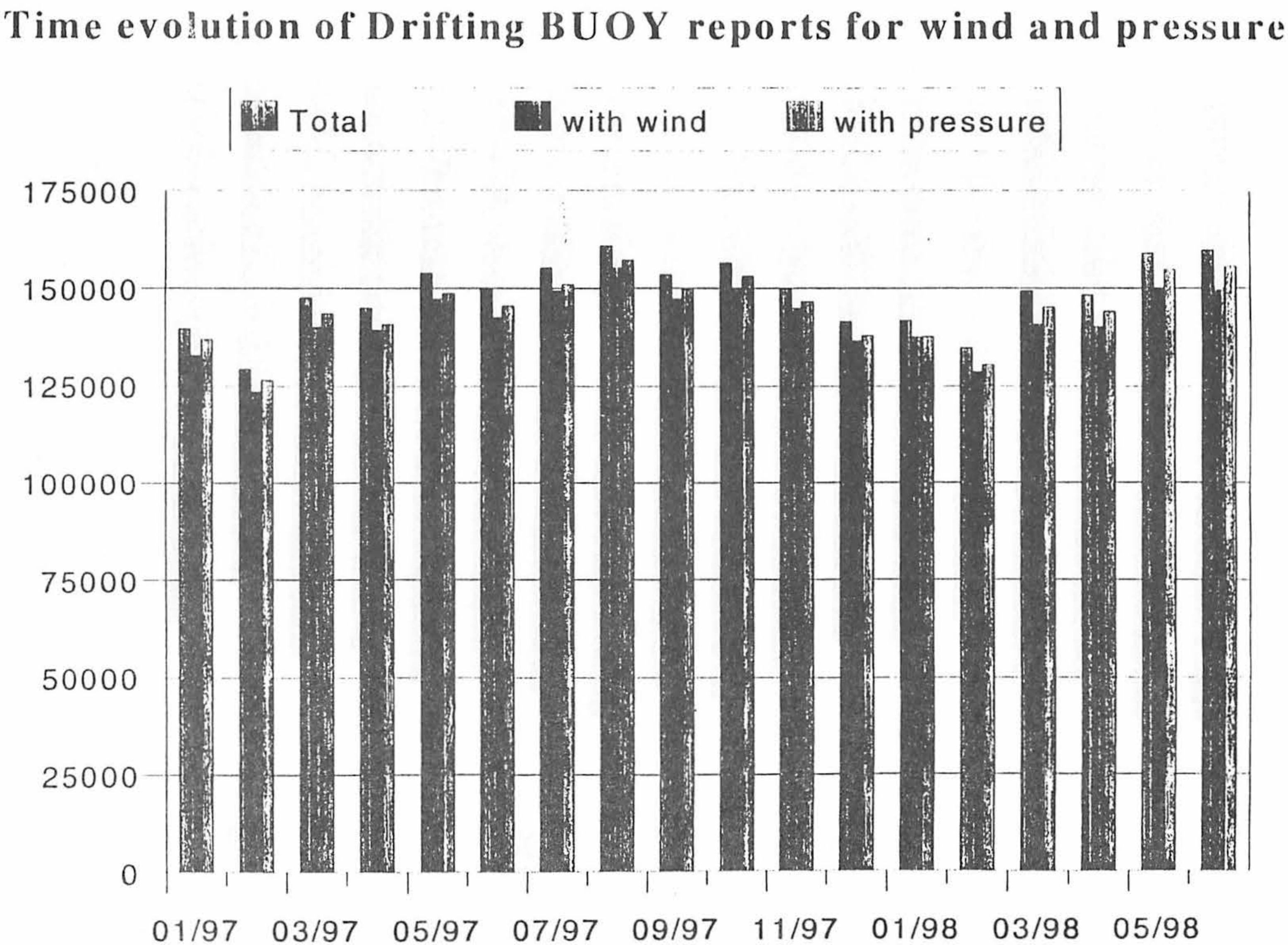

Time evolution of Drifting BUOY reports for wind and pressure
Total
with wind
with pressure
175000
150000
125000
100000
75000
50000
25000
0
01/97
03/97
05/97
07/97
09/97
11/97
01/98
03/98
05/98

Figure 3

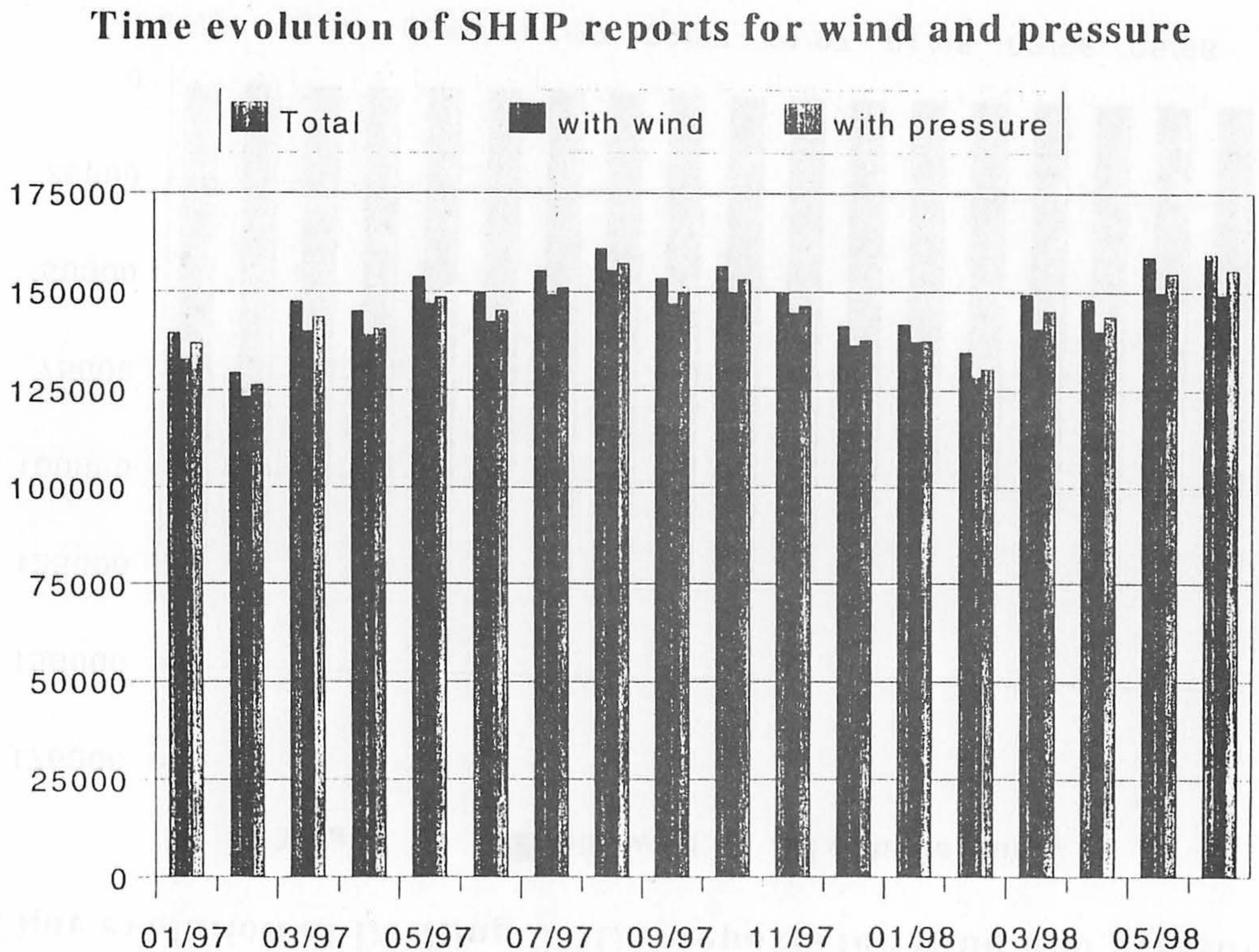

Time evolution of SHIP reports for wind and pressure
Total
with wind
with pressure
175000
150000
125000
100000
75000
50000
25000
0
01/97
03/97
05/97
07/97
09/97
11/97
01/98
03/98
05/98

Figure 4

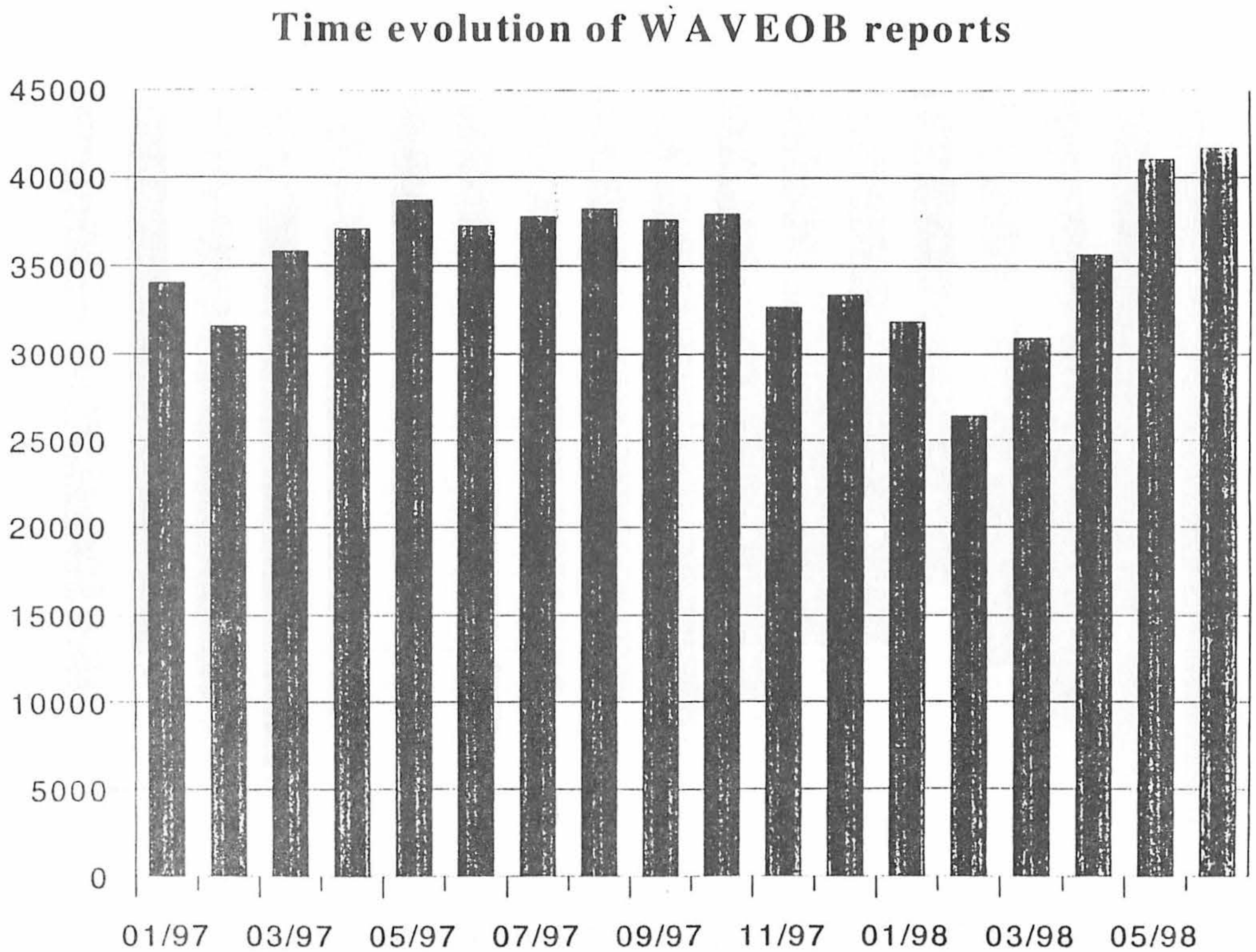
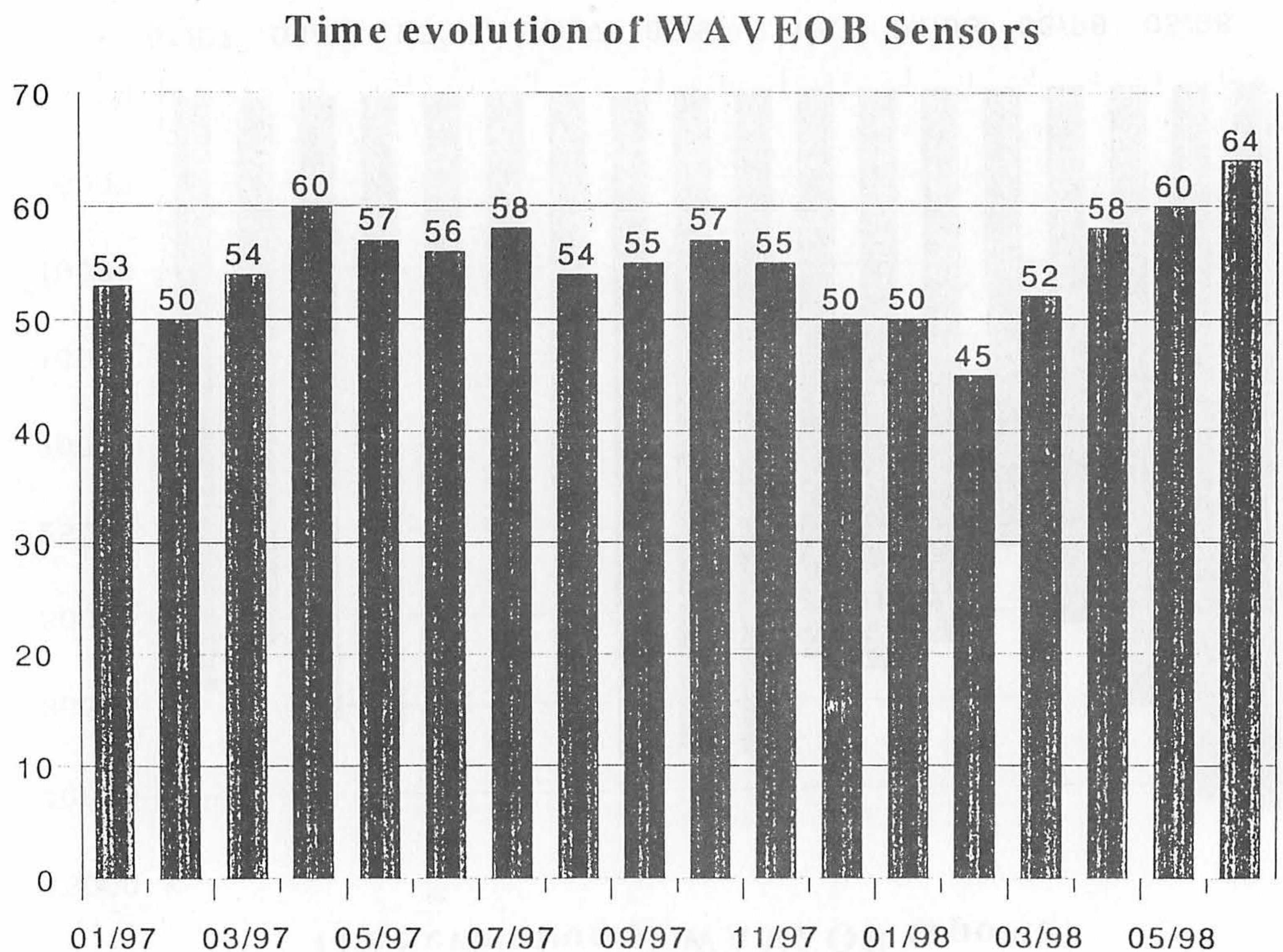

Time evolution of WAVEOB reports
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
01/97
03/97
05/97
07/97
09/97
11/97
01/98
03/98
05/98

Figure 5



Time evolution of WAVEOB Sensors
70
60
50
40
30
20
10
0
53
50
54
60
57
56
58
54
55
57
55
50
50
45
52
58
60
64
01/97
03/97
05/97
07/97
09/97
11/97
01/98
03/98
05/98

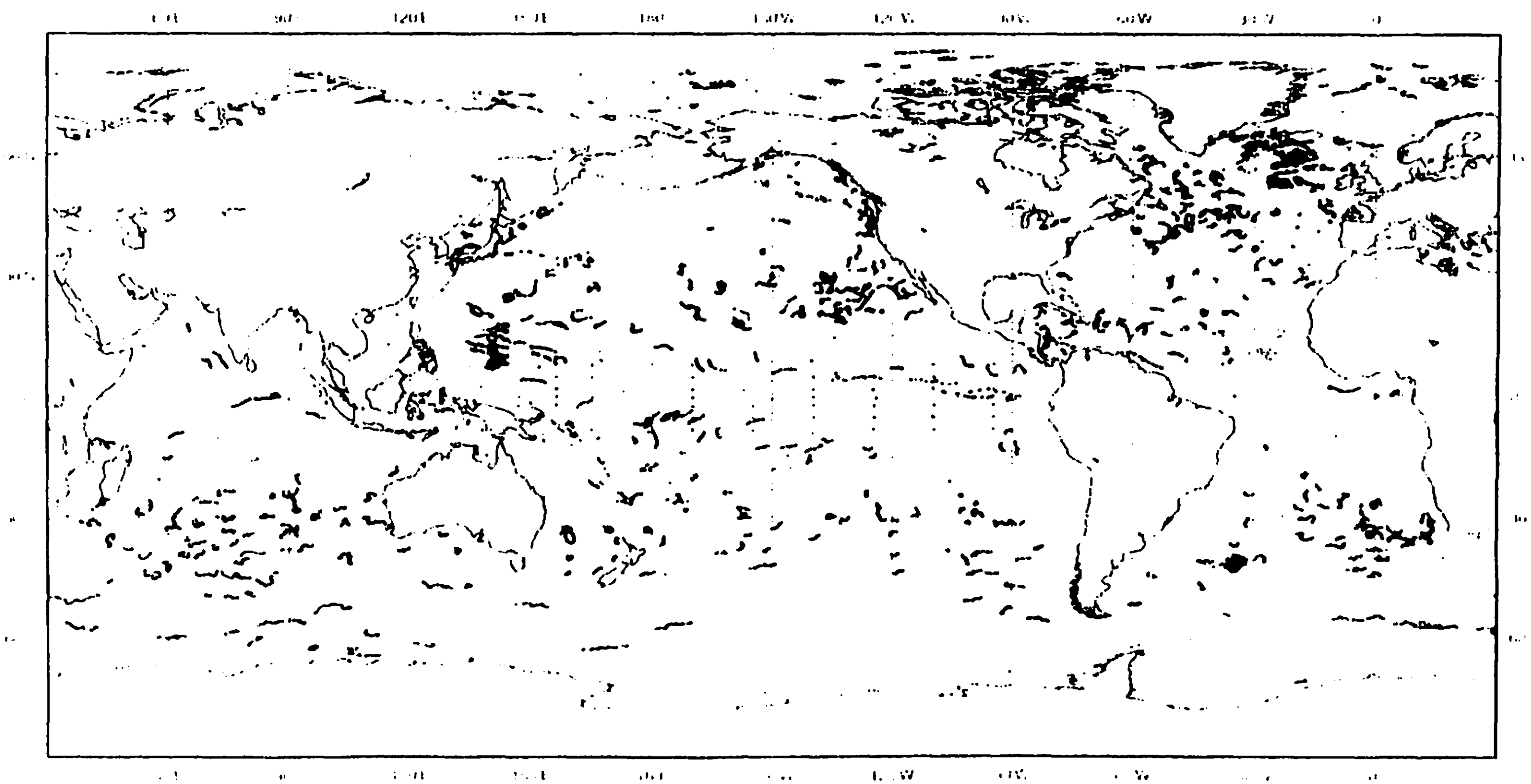
Figure 6

METEO FRANCE

Carte de pointage des observations recues en Juin 1998

Mapping position plot chart of data received during June 1998

Messages : BUOY **Total : 194855**



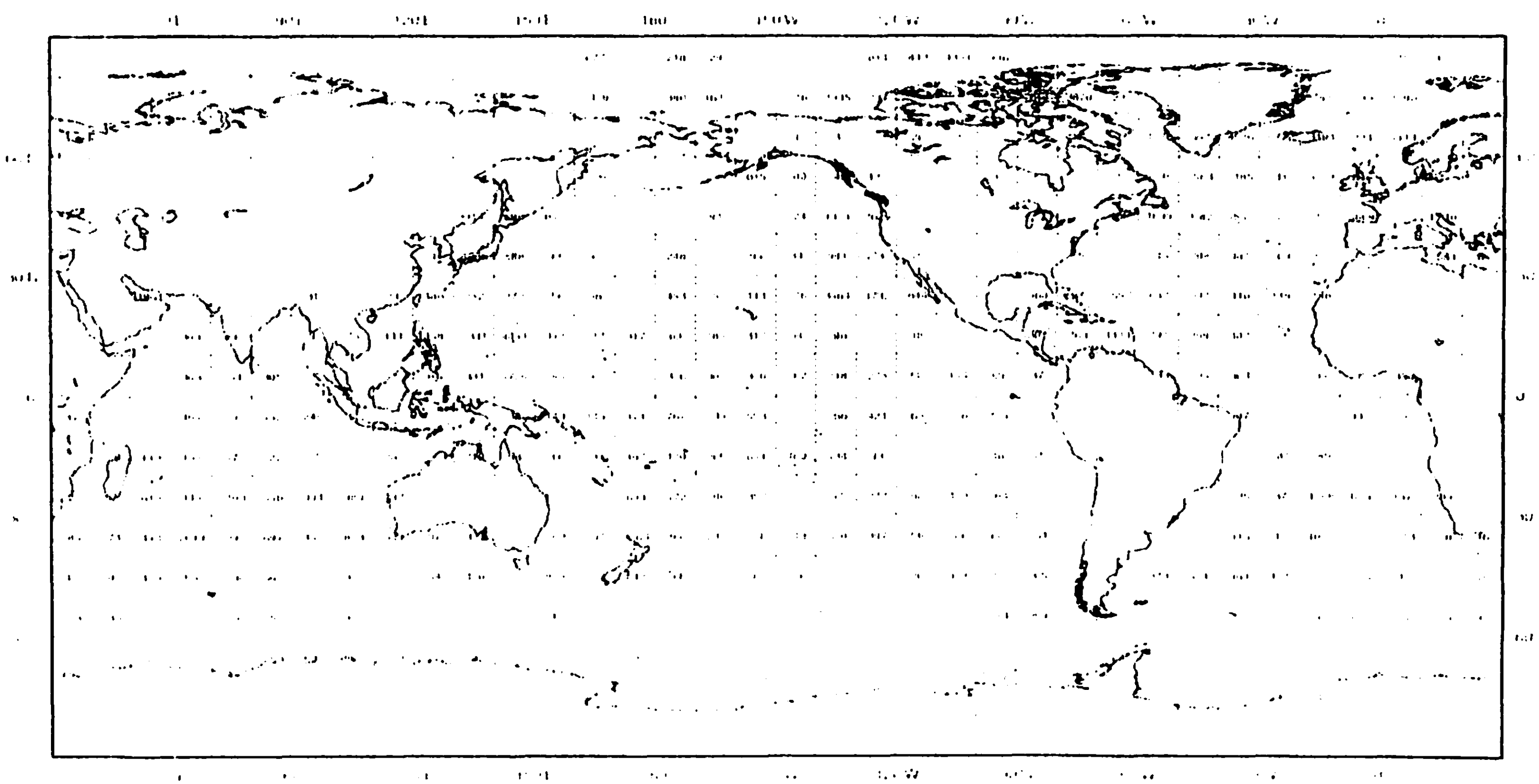
MAGICS 4.2 Solaris - mpma497 - 3 July 1998 09:18:50

METEO
FRANCE

Repartition par carre Marsden des observations recues en Juin 1998

Marsden square distribution chart of data received during June 1998

Messages : BUOY Total : 194855



MAGICS 4 2 Solaris - mpma497 - 3 July 1998 09:20:11

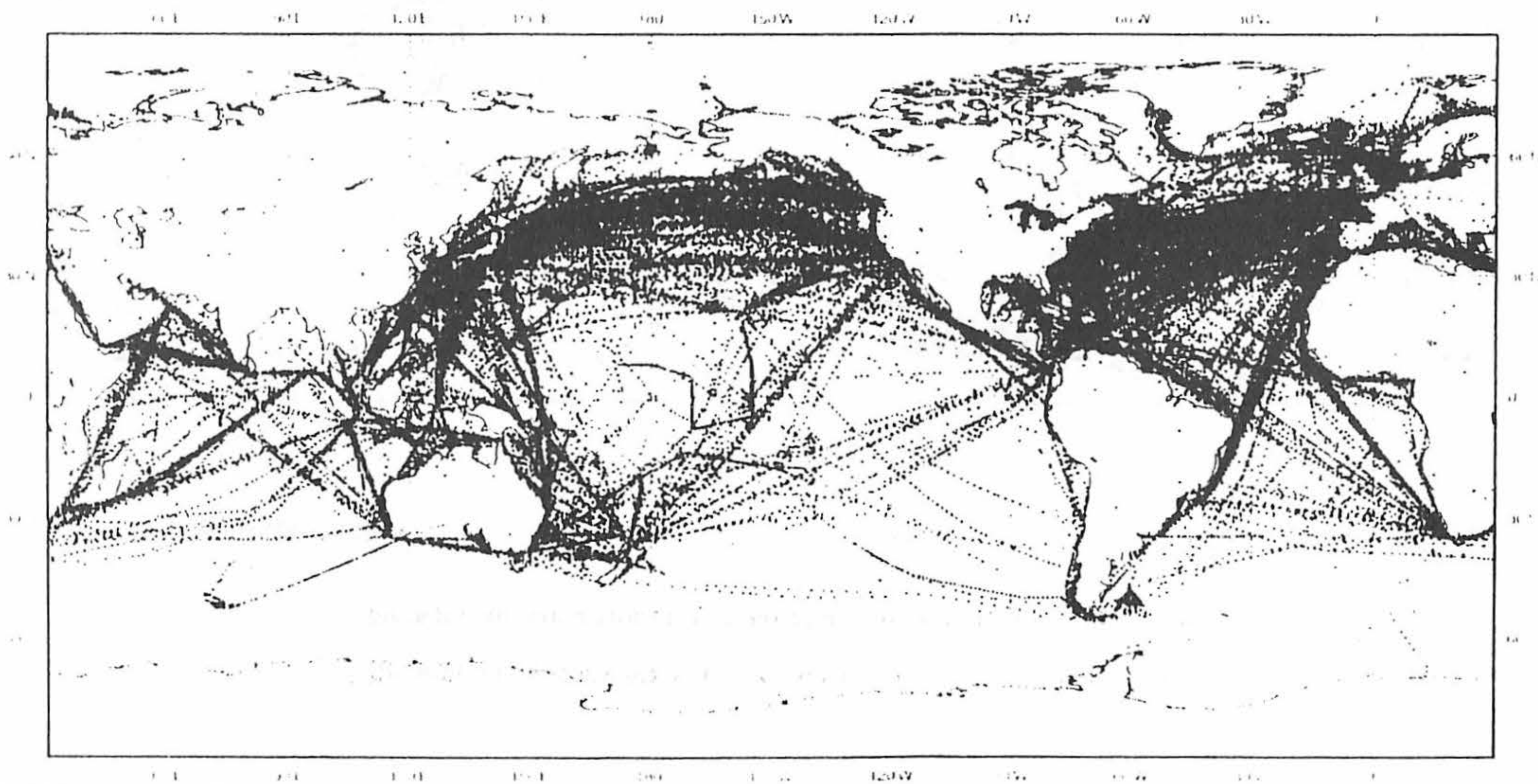
METEO
FRANCE

Carte de pointage des observations recues en Juin 1998

Mapping position plot chart of data received during June 1998

Messages : SHIP

Total : 159691



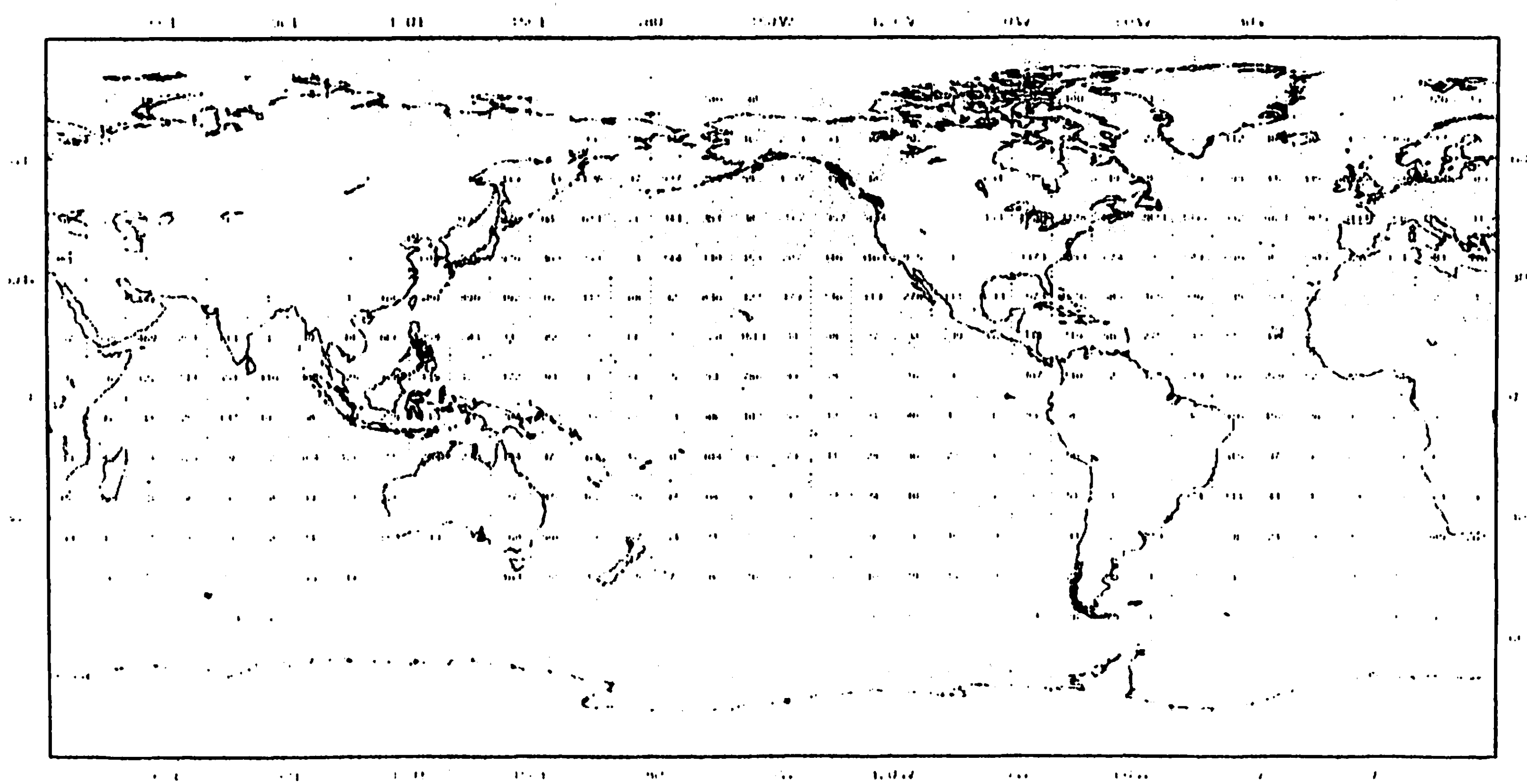
MAGICS 4.2 Solaris - mpma497 - 3 July 1998 09:21:08

METEO FRANCE

Repartition par carre Marsden des observations recues en Juin 1998

Marsden square distribution chart of data received during June 1998

Messages : SHIP **Total : 159691**

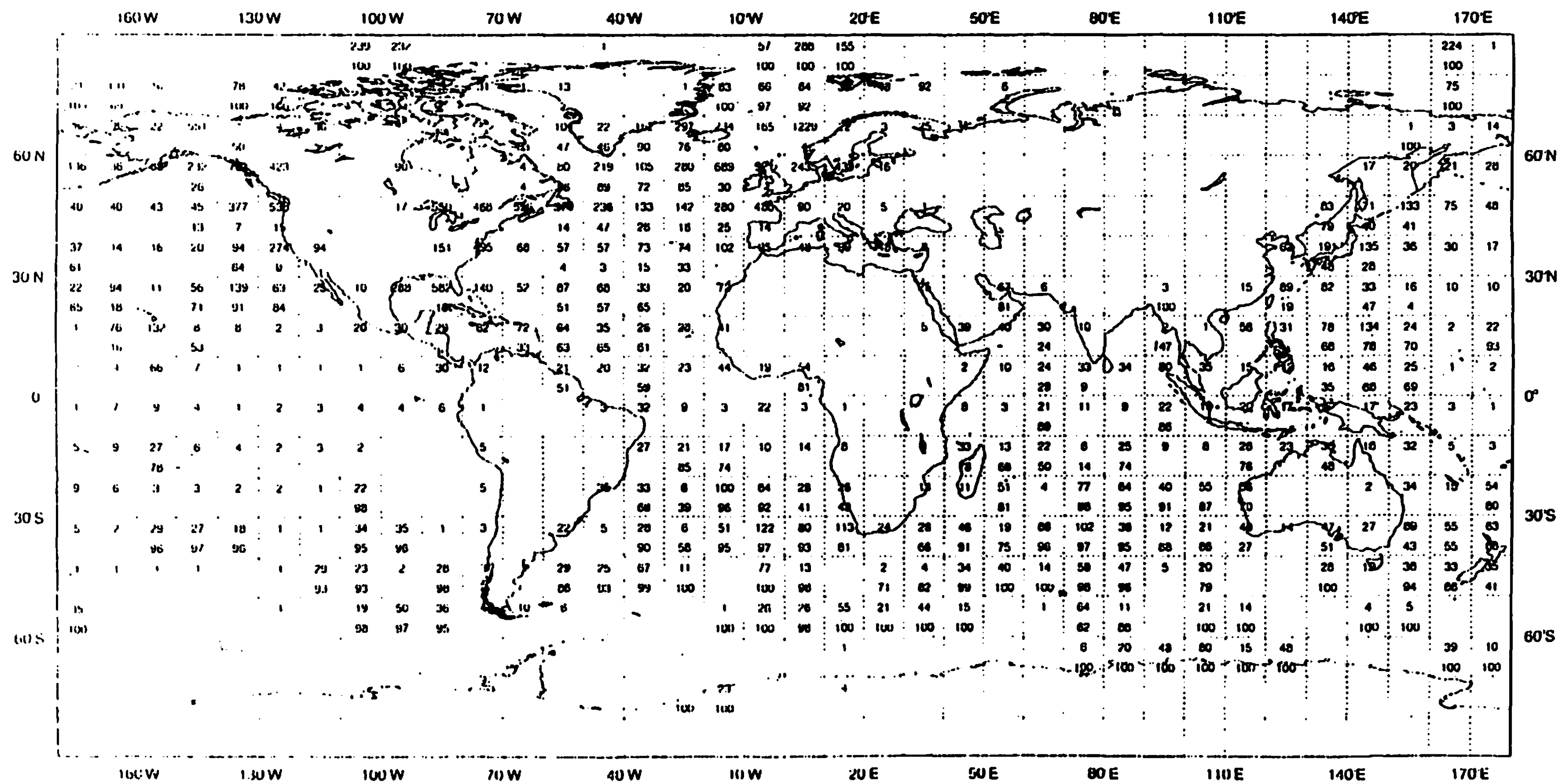


MAGICS 4.2 Solaris - mpma497 - 3 July 1998 09:21:55

METEO
FRANCE

METEO - FRANCE **PRESSURE** **JUNE 1998**

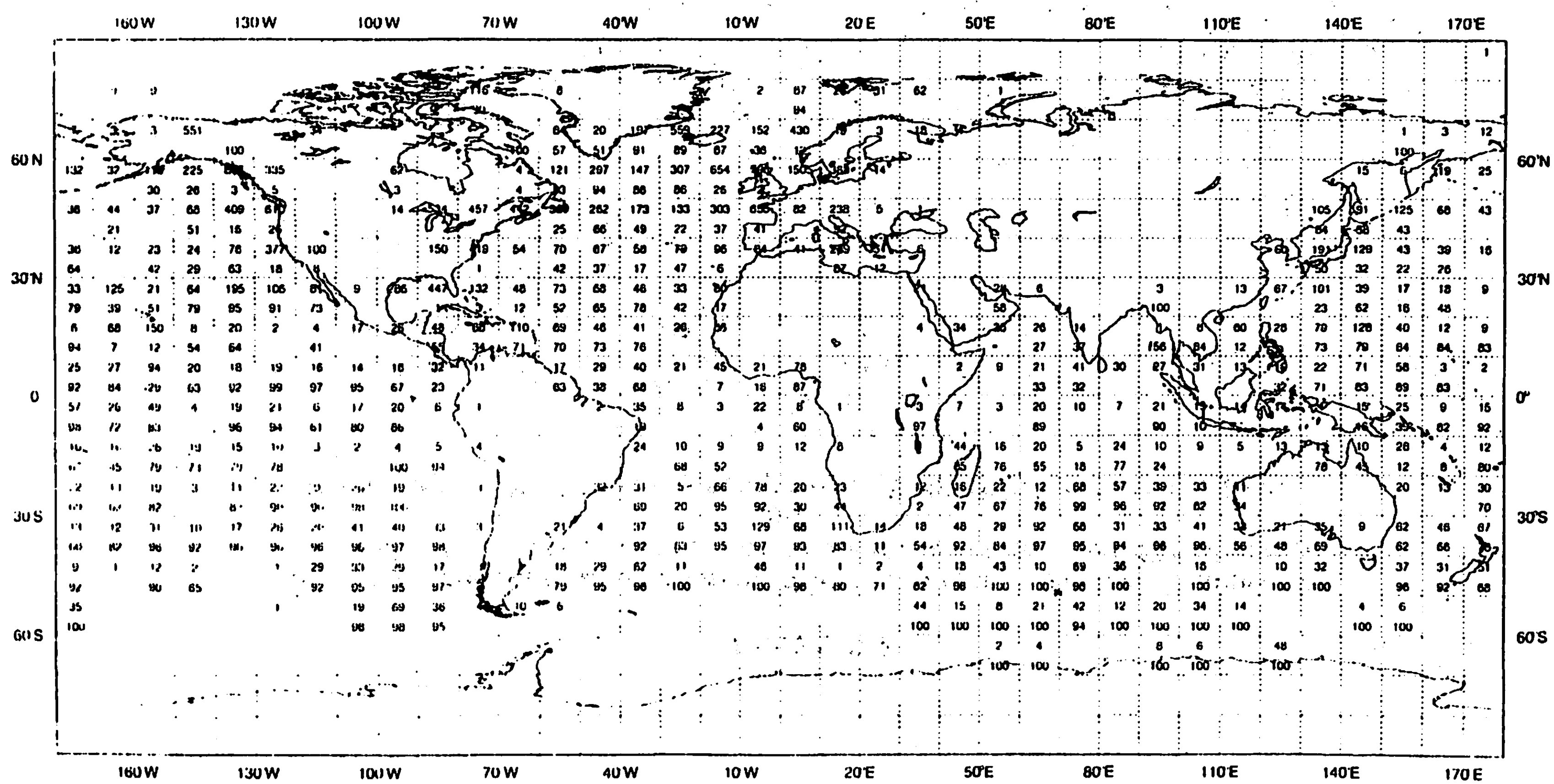
Marsden square distribution chart of mean monthly data availability index (top)
(Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOY reports)
and
Percentage of BUOY reports compared to SHIP+BUOY reports (bottom)



METEO FRANCE

METEO-FRANCE **SEA SURFACE TEMPERATURE** **JUNE 1998**

Marsden square distribution chart of mean monthly data availability index (top)
(Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOY reports)
and
Percentage of BUOY reports compared to SHIP+BUOY reports (bottom)

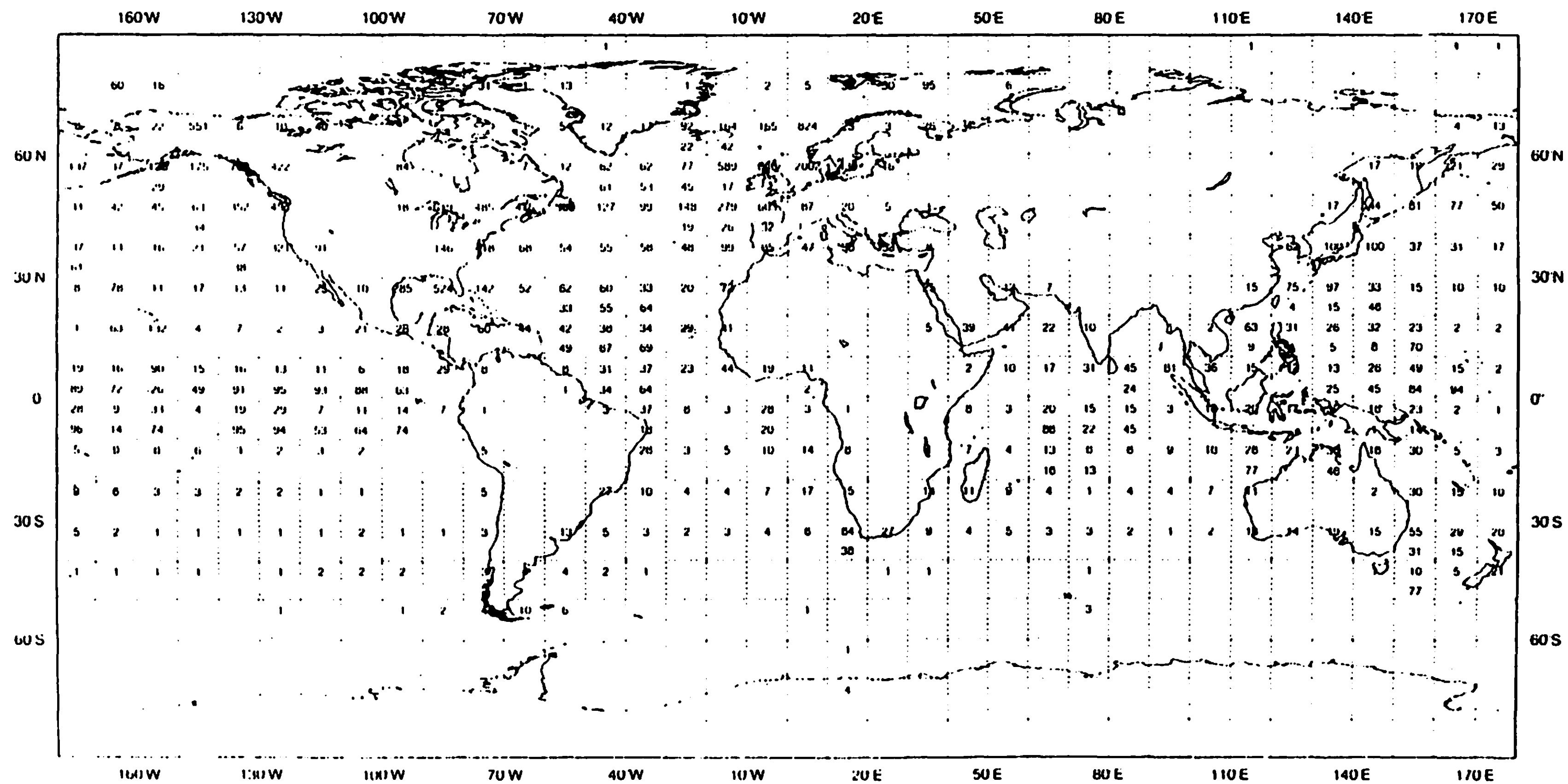


MAGICS 4.2 Solaris - mpma497 - 3 July 1998 09:43:03

METEO FRANCE

METEO - FRANCE WIND JUNE 1998

Marsden square distribution chart of mean monthly data availability index (top)
(Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOY reports)
and
Percentage of BUOY reports compared to SHIP+BUOY reports (bottom)

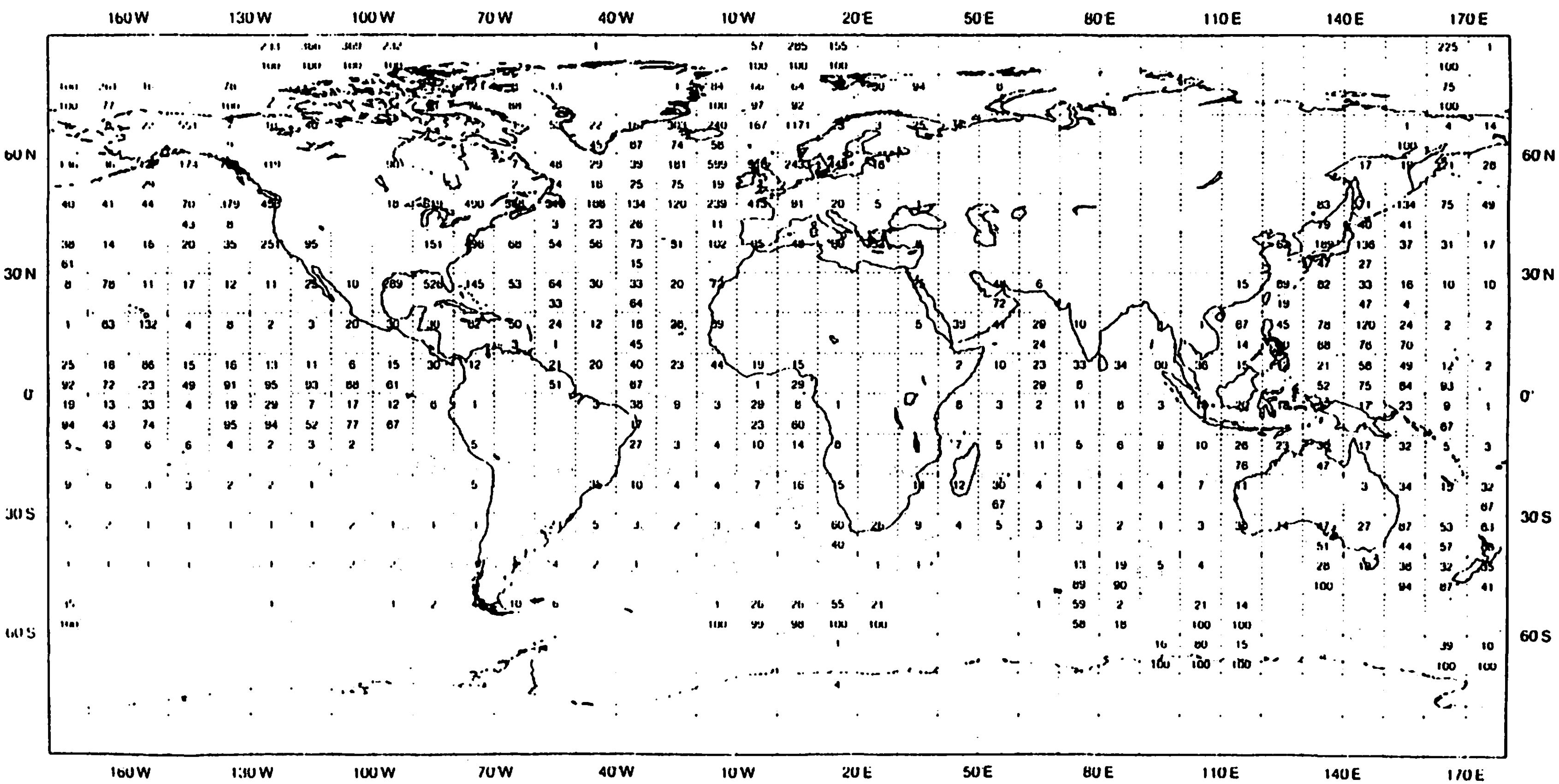


MAGICS 4 2 Solaris - mpma497 - 3 July 1998 09:43:08

METEO FRANCE

METEO-FRANCE TEMPERATURE JUNE 1998

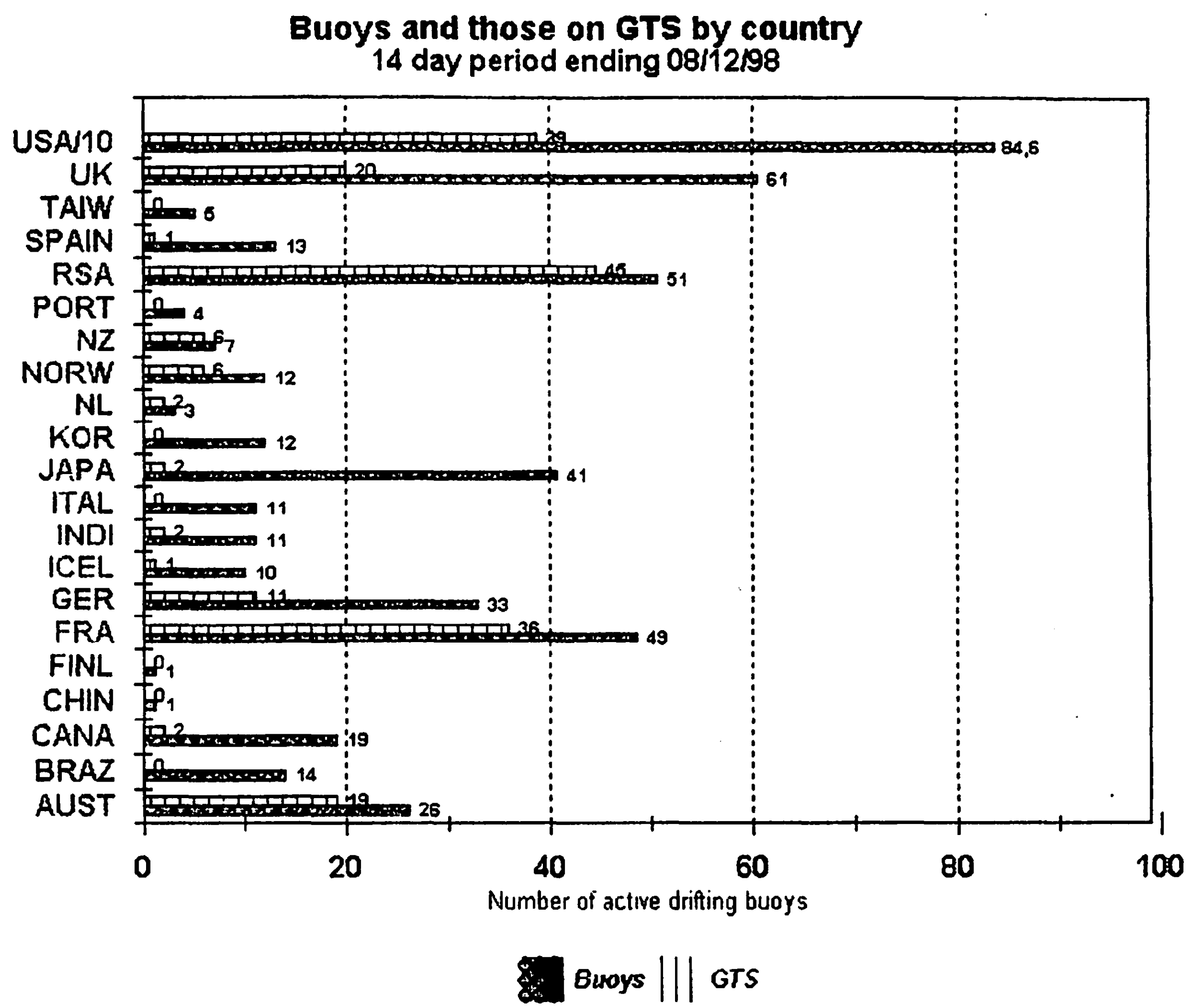
Marsden square distribution chart of mean monthly data availability index (top)
(Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOY reports)
and
Percentage of BUOY reports compared to SHIP+BUOY reports (bottom)



MAGICS 4.2 Solaris - mpma497 - 3 July 1998 09:43:12

ANNEX IV

Distribution of GTS and non-GTS platforms by country



Total: 1230 buoys. 543 on GTS (i.e. 44.1%)

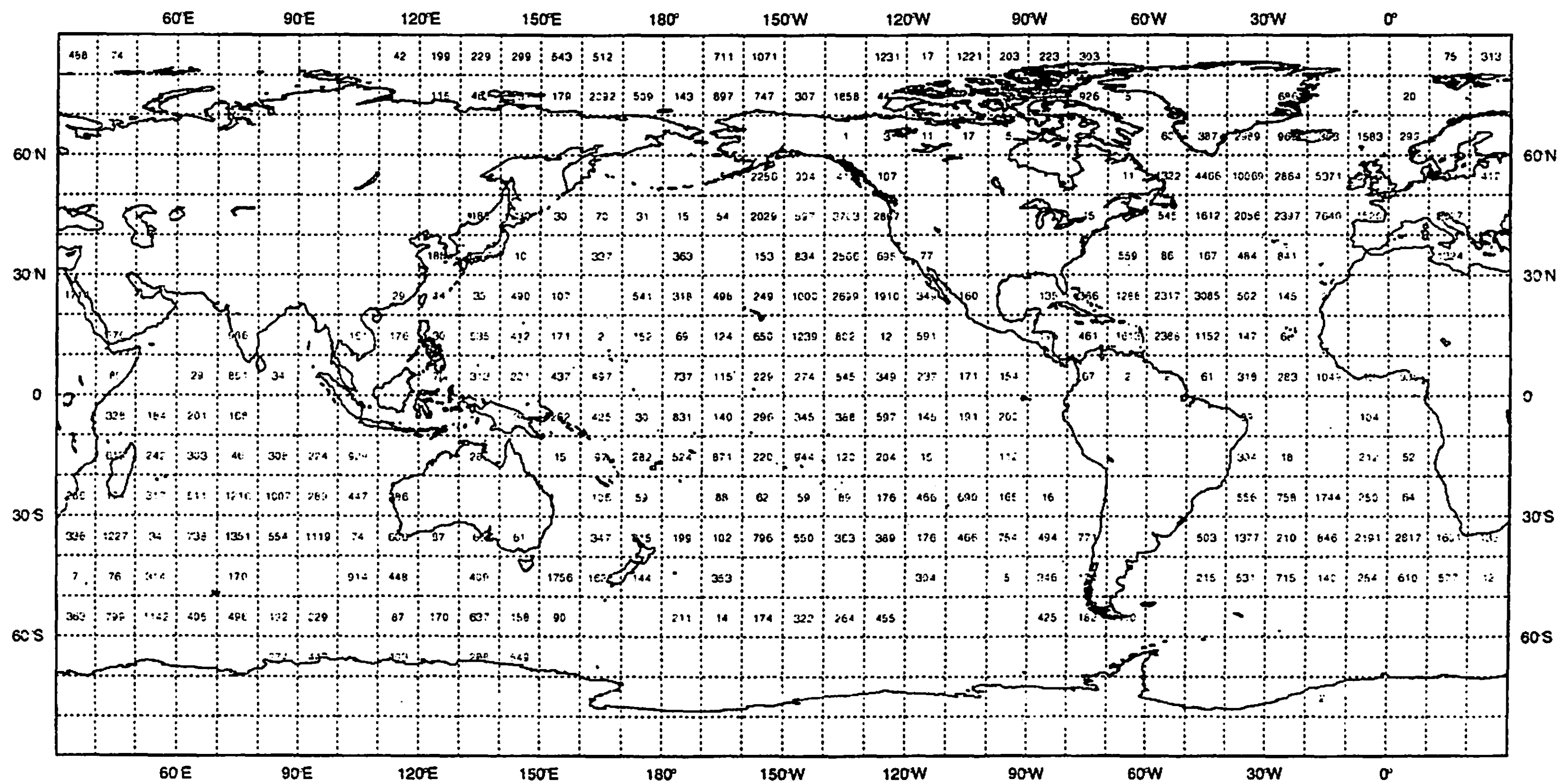
Number of BUOY reports received at Toulouse during October 1998

METEO
FRANCE

Repartition par carre Marsden des observations recues en Octobre 1998

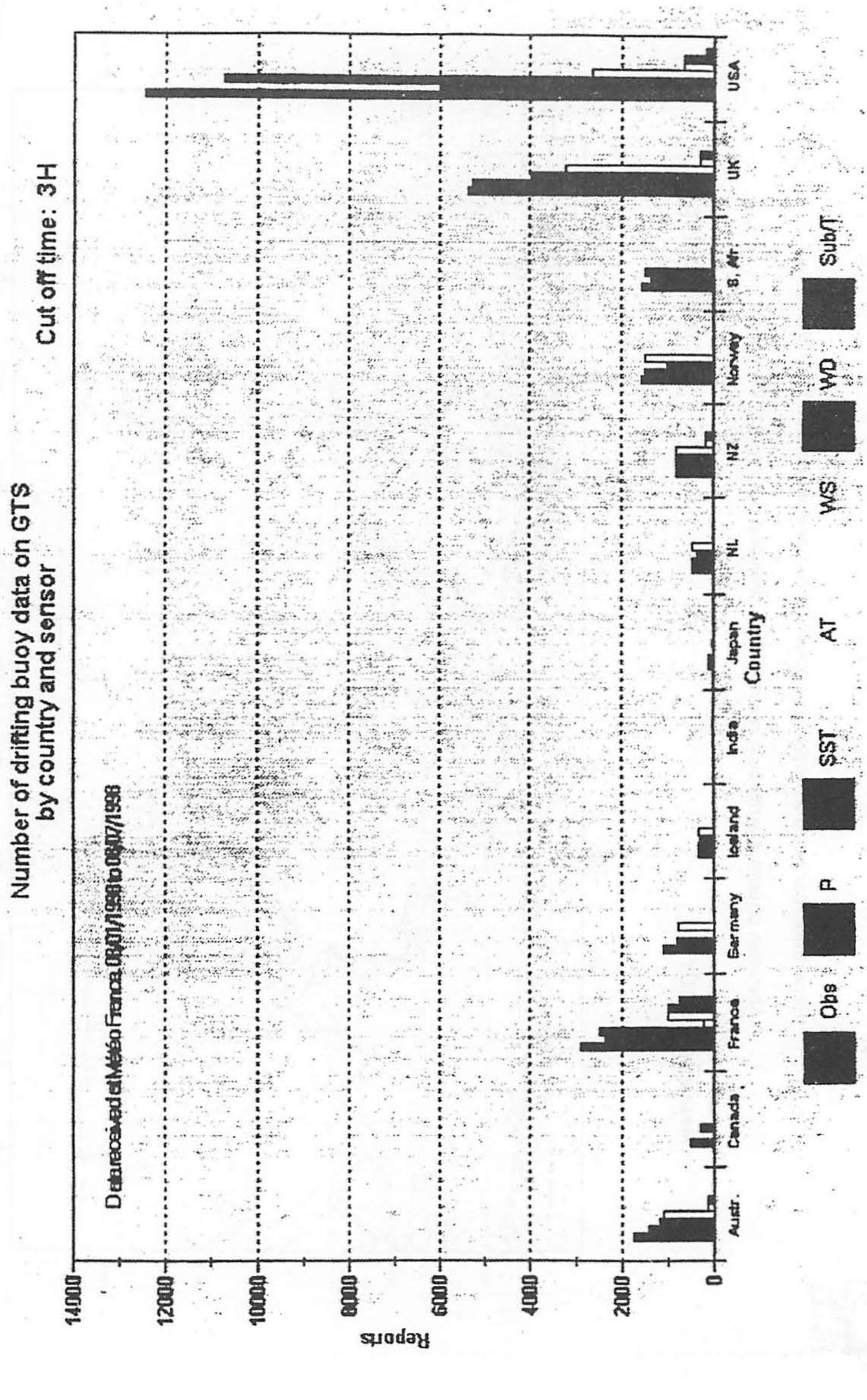
Marsden square distribution chart of data received during October 1998

Messages : BUOY **Total : 199974**



MAGICS 4.2 Solaris - mpma497 - 2 November 1998 17:58:49

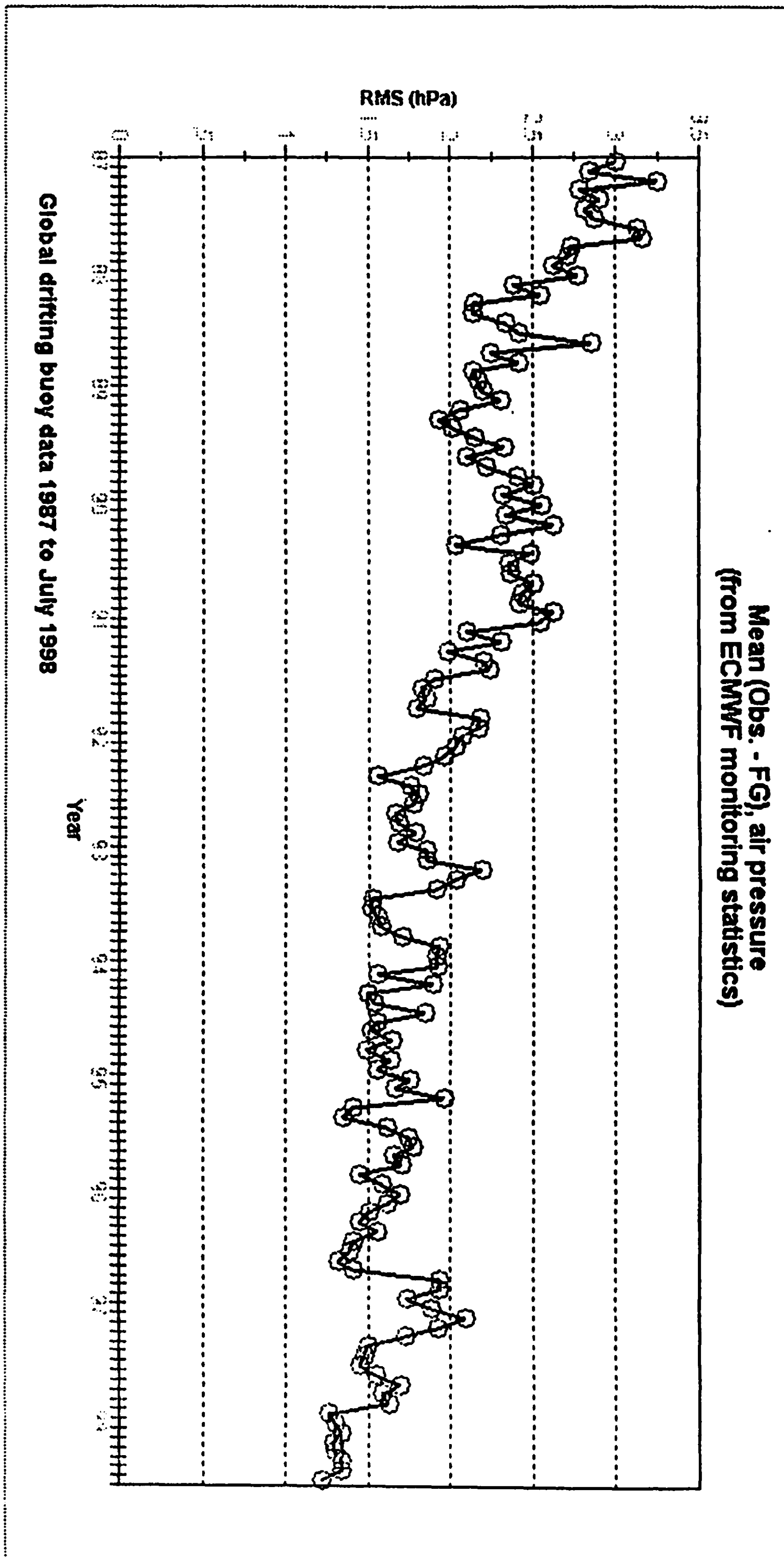
Distribution of GTS buoy reports by country and variable (cut off time 3 hours):



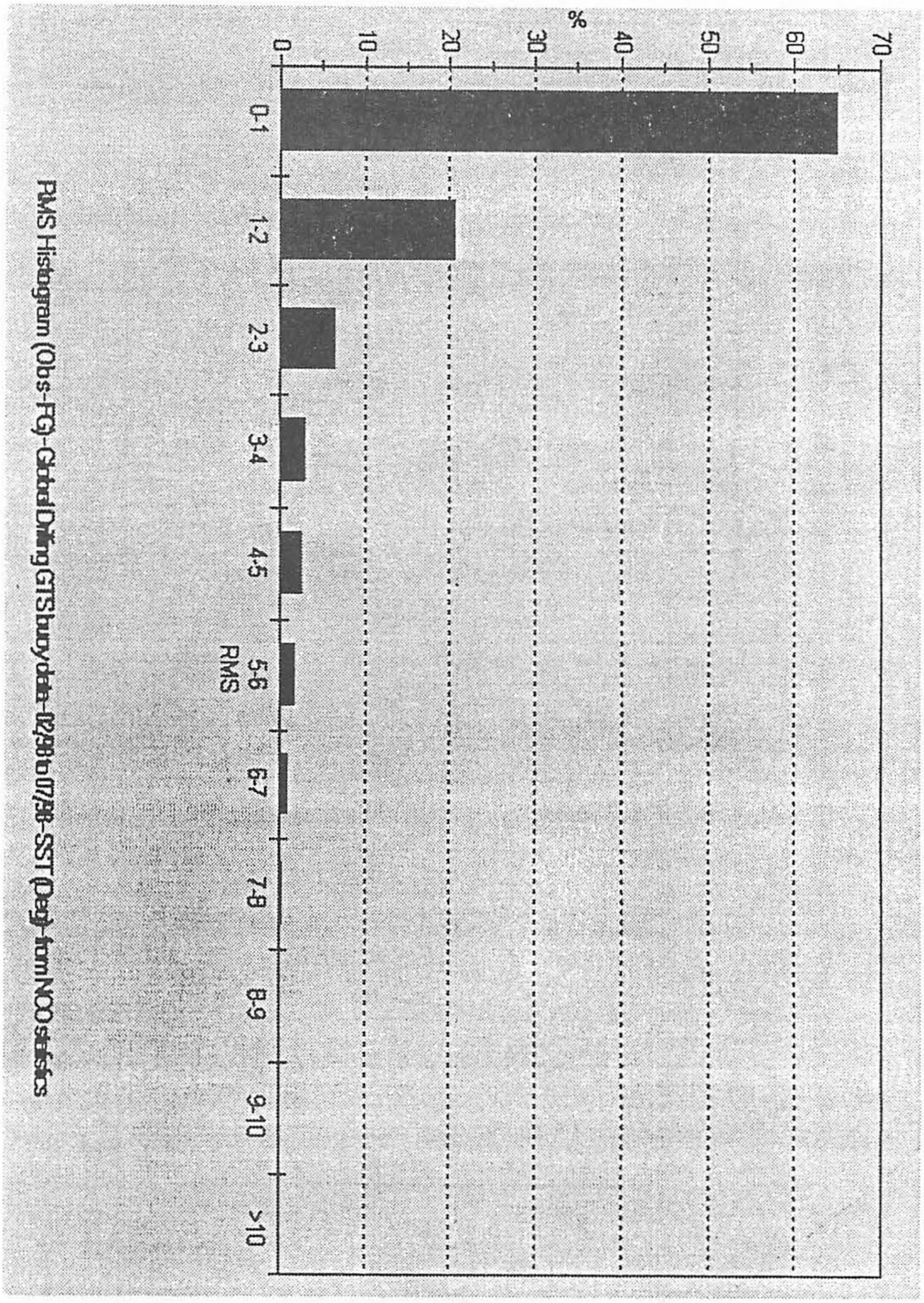
ANNEX VI

Annex E: Graphs regarding quality of drifting buoy data

Graph 1: Evolution of mean RMS (Obs-FG) per month for DB air pressure data (from ECMWF statistics)

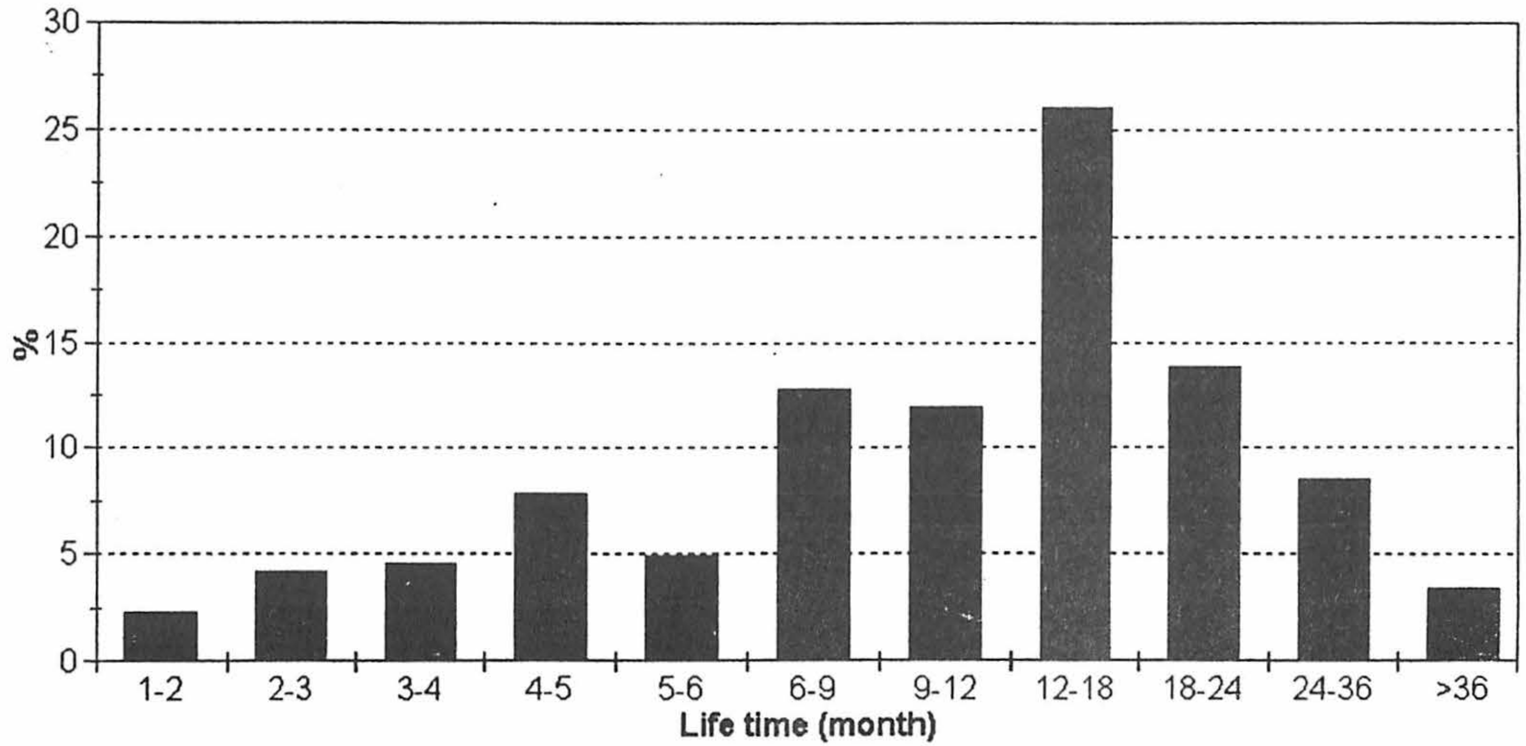


Graph 6: Distribution of RMS (Obs-FG) for DB SST data (from NCO statistics)



ANNEX VII

Distribution of the Life Time of the Air Pressure sensor



Life time distribution, Global Air Pressure buoy data - 07/98 (based on ECMWFstats.)

SVP-B DRIFTER MANUFACTURING EXPERIMENT IN THE SOUTH ATLANTIC

MARLIN Ltd. COMPANY

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Sergey Motyzhev - Marine Hydrophysical Institute of National Academy of Science of Ukraine
Piet Le Roux - South African Weather Bureau
Louis Vermaak - South African Weather Bureau

SVP-B drifter manufacturing experiment in the South Atlantic

1. History of MARLIN Ltd. Company

MARLIN Ltd. company is a product of the new economic and political situation in Ukraine after 1991. MARLIN company is an independent venture which was founded by the group of the experts of very high qualification with various professional orientation. This team have the wide experience of development, creation and using the sea buoys with space communication. The main directions of the investigations were presented at the Eleventh Session of the DBCP (RSA, Pretoria, 1995). The large significance had also that the new electronic components of the west manufacturers became accessible in the new conditions. It has allowed to create the buoys on the most modern technological basis.

In 1994-98 the MARLIN company became the main manufacturer of test instrumentation for the space emergency radiobuoys COSPAS/SARSAT. Practically the all seaports of the former USSR are equipped with our instrumentation today. On the one hand these jobs have improved the our qualification as PTT manufacturers and on the other hand they have given the own financial support for the our jobs, when we have no practically the state support.

2. Development of family ARGOS platforms. Creation of the experimental SVP-B drifters

The mechanical part of SVP drifter (Fig.1) was developed in the beginning 90. It was tested in the marine department of institute and has shown the high reliability of operation in the real marine conditions. The buoy's electronics was not developed in that time. The Piet Le Roux visit in Sevastopol was happened just then, when we already had the all necessary conditions for the further successful development of the modern drifter's activity. The agreement about manufacturing and shipping in SA of three SVP-B experimental drifters was reached during the visit.

The jobs for the SVPB drifter creation were begun by MARLIN company at the end of 1996. The main efforts were directed on creation of the modern PTT, which could be used in the various autonomous platforms with space communication. The developed PTT includes the transmitter with a numerical control by modulation of a signal, that completely has excluded the dependence of the PTT operation from the outside temperature. The used transmitter has the type approval as COSPAS/SARSAT transmitter. We made some updating of PTT. The new quartz generator with very small power was developed. The new microprocessor controller provided the control by the transmitter and processing of signals from sensors. The adaptation of the terminal under various types of platforms could be made by means off change only the software of the controller.

The portable test device was developed to check up the characteristics of the transmitter (carrier frequency, level of phase modulation, duration non-modulated carrier, etc.) before deployment. Besides that the other information (ID, data from sensors, etc.) could be accessible with the help of this device.

As result of MARLIN company jobs the family of various platforms with a new electronics engineering was created (Fig.2). These platforms can work through ARGOS and COURSE systems of communication. The family of developed platforms contains two kinds of PTT, the marker for balloons, the diving drifter, the terminal for stationary observing stations and SVPB drifter. Certainly the SVPB drifter was a main outcome of the executed jobs.

The main parts of the SVP-B drifter (transmitter, controller, sensors of temperature and air pressure, battery powers and mechanical parts) were developed in August 1997. When we were working with the packing of an electronics in the surface float we had information only about 1/3 duty cycle. However SAWB drifters have a continuous cycle. This information we received later. The developed vertical construction of an electronics engineering has not allowed to place the additional batteries in the surface floats of the experimental drifters. Thus the calculated life-time of the experimental SVPB drifters was approximately 5 months.

These drifters had different batteries for PTT and sensors. The life-time of PTT battery was more then life-time of sensors battery. It was correct because the data transmission should have more priority when all parts of buoy are working. If the sensors of buoy are working, but we have no information from it, this buoy is useless one. The control of sensor's battery voltage was made via ARGOS and we knew the condition of this battery in any time.

The laboratory testing of drifters was done in September 1997. The successful testing of electronics via ARGOS system were conducted in September - October. And at last, the three experimental buoys were shipped in November to SAWB for operation in ISABP.

3. The organizing of drifters testing in the South Atlantic

The developed SVPB drifter and its sensors completely correspond to the DBCP Technical Documents (Fig.3). ID 17674, 17675, 17676 were allocated for experimental buoys. The format of message completely corresponded to the SAWB standard. Thus, the information accepted from buoys 17674, 17675, 17676 did not require the any additional processing neither in CLS ARGOS, nor in SAWB and the contents of messages from MARLIN drifters were identical to data from buoys of other manufacturers.

Drifter 17674 was deployed in the position 38 South 15 East on 7 February 1998. Drifter 17676 was deployed at 48 South 8 East on 9 February (Fig.4). The RSA scientific vessel OUTENIQUA was used for the buoys deployments. Buoy 17675 was remained in SAWB for the future deployment in ISABP.

The information, which was arriving from CLS ARGOS, has allowed to inspect some characteristics of drifters. The solution about operation of the main parts of drifter could be made taking into account this information.

Both buoys were working without the remarks during February - March. The data from sensors and PTT were showing that the buoys instrumentation were completely efficient. Therefore the disappearance of buoy 17676 on March 29 was unexpected. It is possible only to suppose, what could happen because the all previous information showed that 17676 had no problems. The full technological analysis of the drifter configuration was executed for detection of the probable reasons of failure.

The testing on vibrator of surface float together with electronics and batteries showed that two places with non-strength were in experimental drifters. First place was the point of antenna connection to transmitter. Second one was the method of batteries parking inside the surface float. These defects were removed for the serial SVP-B drifters.

Buoy 17674 was working OK up to the full ending of the energy in its batteries. The battery of sensors was working during 168 days from 7/02/98 to 24/07/98. The real life-time of sensors was equal to guaranteed (calculated) life-time of experimental drifters. The decreasing of battery voltage after 5 months of 17674 work is presented on Fig.5. PTT was continuing to work after 24/07/98. We had no the data from 17674's sensors from one hand, but from other hand the drifter was working as tracer, and we had possibility of testing of the drifter's mechanical part.

All characteristics of 17674 were remaining stable, what is possible to see on Fig.6. The nominal significance of the carrier frequency of transmitter was close to central significance of the frequency band of the NOAA satellites. General Specification and Certification ARGOS PTT say that long-term stability could not be more than 400 Hz during 3 hours. On Fig.5 it is visible that maximum difference of frequency was no more 50 Hz. The generator of PTT has good short-term stability, that is confirmed by the class of accuracy of the buoys locations. Fig.5 shows, that during one pass the calculated locations had 3 and 2 classes of accuracy mainly. At last, the last schedule demonstrates the amount of messages which were received onboard of the satellites during one pass. The maximum amount achieved 11, that was greatest from the possible during one pass for the 90 sec interval between messages . Thus, there are no doubts, that the developed PTT has excellent characteristics. We had no the any problems with CLS ARGOS as result .

However, the testing of sensors (SST and air pressure) was more interesting problem. The data of measuring channels which were obtained via ARGOS (for one pass per day approximately in 00 GMT) are presented on Fig.7. The three points are marked on air pressure line of 17674. These points characterize the three values of air pressure (medium, maximum and minimum), which were used for the air pressure sensor testing when buoy 17674 was in real ocean.

The sensitive elements of measuring channels were produced by ANALOG DEVICES and MOTOROLA companies (USA). The developed electrical circuits and algorithms of data processing from sensors have allowed essentially to increase the accuracy and stability of the data from these rather inexpensive sensors. The experimental drifters had the error of sensors: 1 hPa for air pressure; 0,5°C for SST. In serial buoys these errors will be reduced up to 0,5 hPa for air pressure and 0,1°C for SST. There were no doubts in the reliability of the SST channel. The our wide experience of SST measuring channels creation for the marine devices was used for it.

The development of air pressure channel had some additional complexities. The electronics of air pressure channel was made from components of West manufacturing. The barometric port should been produced from materials which are available in Ukraine. Therefore the problem of the air pressure channel creation was divided onto two separate problems. Creation of an electronics engineering of air pressure, its testing and certification were the first problem. Choice of materials, manufacture and testing of barometric port were the second problem.

The electronics engineering for the air pressure channel was developed and tested in MARLIN company. The certification of the channel was made in the certified laboratory of State meteorological center of Ukraine. Choice of materials, development, manufacture and testing of the barometric port was made in laboratory of MARLIN company.

However, the testing in laboratory and job in the real ocean are completely different things. Therefore method of testing of the air pressure channel for the buoy, which are floating in the real ocean, was developed for this. The air pressure data from other SVPB drifters, which were deployed in ISABP were used for it. The essence of the method consists in the following (Fig.8).

The air pressure was accepted as "frozen" during the time equal approximately three hours. The instantaneous data of air pressure from other ISABP SVPB drifters were obtained during this time. This data were used for creation of the field of isobars on the electronic map of ISABP area. Then the position of buoy 17674 was placed on this map. After that the air pressure data from buoy 17674 were compared with position of the isobar which had the identical significance of the air pressure. If the difference between the buoy's data and calculated isobar was within the limits of 1 hPa, the significance of air pressure sensor of buoy was correct. Taking into account the errors of method, errors of the sensors on each buoy and temporary variability of the air pressure field the theoretical probabilistic difference could be no more 2-2,5 hPa.

The results of experiences for the three values of air pressure are shown on Fig.9. In the any case the real difference between the data of air pressure sensor and calculated isobar was within the limits 0,6-1,6 hPa. Such testing were repeated via each ten days and never difference between calculated and measured significance of air pressure has not exceeded this value. Thus, the developed channel of air pressure which includes the barometric port and electronics engineering of the sensor have shown reliable operation in the real ocean. The independent GTS buoy data quality control confirmed it (http://mozart.shom.fr/meteo/rechstst).

These results allow to do two important conclusions:
1. Similar quality control could be organized not only for air pressure sensors but also for other sensors.
2. The increasing of drifters constellation life-time could be done.

Some more about second proposal. This method is working when quantity of drifters in ISABP area is more then necessary. From one side this situation is OK, from other side the situation is not good. Positive is that we could use the method of buoys testing which was described above. Negative is that users have the additional financial and other expenses.

Our proposal is that decrease the negative sides of superfluous buoys in the drifter's constellation. For this the new two-way possibilities of ARGOS-3 should be used. The essence of method is:
- the testing of all buoys sensors should be done every ten days;
- if all buoys are OK, we found the superfluous buoys in the drifters constellation. The criterion of the superfluous buoy may be for example when the field of created isolines (isobar, isotherm, etc.) with or without data from testing buoy is approximately constant;
- after that the technical coordinator of program switch off the superfluous buoys by means off two-way ARGOS-3;
- the next ten days the drifters constellation continue to work without buoys which were switched off. The superfluous buoys don't work during these days, the batteries of these drifters are resting and as result we have the increasing of the buoys life-time;
- this procedure should be repeated every ten days and we switch off one group of the superfluous buoys then other and so on.

Of course, this method was described very schematic and it is necessary to develop it more carefully. But good result of this method utilization is that the technical coordinator of program could organized the control of drifter's constellation and to achieve the increasing of the drifters life-time.

4. The main results of the drifters testing

The information about possible reasons of buoys failures, which was received from DPCP Annual Report for 1997 is presented on Fig.10. This information together with main results of MARLIN drifters testing were used for updating of experimental drifters and creation of serial buoys.

No.	Action group	SVP	SVP-B	Failure
1.	EGOS		19	10 SVP-B drifters have average life-time 132 days
2.	IABP	No data about SVP and SVP-B drifters		
3.	IPAB	No data about SVP and SVP-B drifters		
4.	ISABP		25	Pressure sensors turned out in the previous drifters
5.	IBPIO	> 15	> 40	Only half drifters with air pressure were operating by the end of June 1997
6.	GDP	228	204	Some drifters had the PTT with unstable crystals. Some drifters had a problems with baroports. Some drifters quit the transmitter after 120 days.

The main results of MARLIN SVP-B drifters testing are below (Fig.11).

Positive results

1. Mechanical part of drifter – no problem.
2. Short-term, medium-term and long-term stability of crystals was many better then limits of «General Specification and Certification» of ARGOS PTT.
3. The accuracy of buoys locations were mainly of 3 and 2 classes (< 350 m). This fact has allowed to create very carefully the lines of buoys moving .
4. Transmitter with digital control of phase modulation was working very good and has allowed to receive up to 11 messages on board during one pass.
5. SST sensor - no problem.
6. Baroport - no problem.
7. Air pressure sensor - no problem.
8. All electronics worked reliability, when the battery voltage was from 14 to 7 V.
9. Messages from drifters was corresponded informational standards of ARGOS, DBCP and SAWB.
10. Real life-time of 17674 was more the calculated life-time in 5 months. Thus, the real life-time of serial drifter should be equal the calculated in one year.
11. Knowledge of minimum air pressure time (n*15 mn) was useful for prognosis.

Negative results

1. Small electric power of used battery source. Big power was necessary for the sensors working.
2. Mechanical durability was not enough probably for:
   point of antenna connection to transmitter;
   battery connection inside the surface float.

Questionable problem– method of battery using

Method	Plus	Minus
PTT and sensors have single battery	Easy and cheaper when drifter manufacturing Full power of battery is used.	Errors in messages on the final phase of battery life-time because electric communication between transmitter and controller (voltage is decreased during transmitter job)
PTT and sensors have different batteries	There is no electric communication between PTT and sensors	There are no data from sensors, when PTT continue to work. More complexities when drifter manufacturing.

The executed testing have shown that developed SVPB drifter is capable to work during the calculated life-time with reliability of data from the measuring channels. In the same time the outcomes of testing have allowed to define the main directions of experimental drifters updating which would be necessary made for serial buoys.

5. Development of the serial SVP-B drifters taking in to account the results of the experimental buoys testing.

The main jobs which are necessary for the buoys updating:

- Updating of the buoy's electronics engineering and software of the controller for the energy economy;
- Decrease of the error of measuring channels of SST and air pressure;
- Increase of the electrical power capacity, replacement of Lithium batteries on more inexpensive Alkaline Manganese Dioxide battery;
- Increase of mechanical strength of the electronics and batteries when montage inside the surface float.

These jobs were executed in the first half of 1998. Main efforts were done for updating the electronics of drifter. As fact the new electronics were created (Fig.12). The basic results of updating are on Fig.13:

- The errors of measuring channels were reduced up to 0,5 hPa for air pressure and up to 0,1°C for SST;
- The consumption of energy by the measuring channels of buoy has decreased in 5 times;
- The stock of batteries energy in 1140 VAh was established instead the stock of batteries energy in 760 VAh;
- The electronics packing inside the float was modified for best mechanical durability.

The life-time of serial SVP-B drifter is 1,2 - 1,3 years. Taking into account the executed modernizing the serial SVPB drifter represents the modern device which completely corresponds to the technical and informational standards DBCP.

6. Additional service conveniences and financial economies for the participants of the ISABP and other programs

During preparation of drifters shipping in RSA it became clear, that internal volume of the shipping packing is used on 40-50% (Fig.14). It is explained by the peculiarities of the buoy construction, laying of the underwater drogue, impossibility of the urethane carrot bending. Thus, the user pays the superfluous money for air transportation because the volume of payment is depend from outside sizes of packing. The reducing of container sizes is impossible because reasons which are indicated above.

The SVPB drifter with a separable underwater drogue was developed to reduce the transport payment (Fig.15). In this case the two underwater drogues are in one packing and two tether lines with floats are in other packing. As result the filling of internal volume of packing is increased up to 70-80% and outside sizes of packing are decreased.

The positive result from it is that the transport payments are essentially reduced. The consultation with UPS mail has shown, that cost of one buoy shipping from the airport Simferopol (Crimea, Ukraine) up to the airport Johannesburg (RSA) is reduced with 870 S up to 670 S, what is approximately 23%. The decreasing of common transported volume is convenient for the automobile shippings, for example from the airport to the warehouse.

The first defect of such shipping is that it is necessary to transport the buoys by pairs. The second defect is that it is necessary to connect a underwater drogue to the tether line by screw connection before drifter deployment.

However, the our opinion is that these defects are not essential. The buoys are practically never transported by one and one screw connection requires no more than 5 minutes. The positive effect is much more in this case .

7. Resume

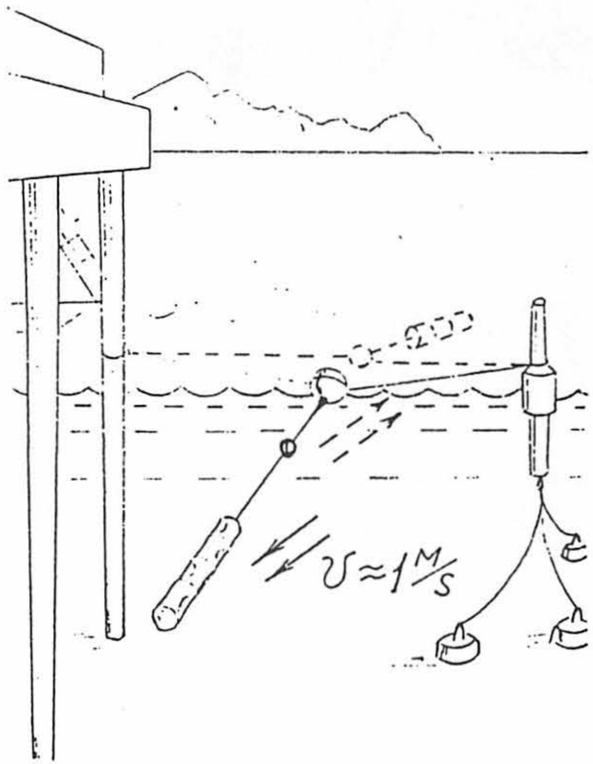
SVPB drifter which was developed in MARLIN company is modern device with technical and informational parameters which are fully corresponding to ARGOS, DBCP and SAWB standards. The results of testing in real ocean demonstrated that drifters have the good characteristics of PTT and sensors of air pressure and SST. The serial drifter, which was updated taking into account the results of experimental buoys testing in ISABP, is the buoy of very high quality with life-time more then one year.

The developed family of the data platforms and high qualification of MARLIN company experts give the possibilities for providing the different interesting and useful jobs with participants of ISABP and other programs. List of tasks and responsibilities to executed by ISABP participants during the inter-session period includes have the items which should be done by S. Motyzhev:

- Investigate more economic packaging of SVP-B drifters;
- Canvass ships of opportunities and identify deployment opportunities;
- Investigate use of Russian Satellite system COURSE together with ARGOS;
- Information on sensor quality control.

In closing the report, the authors offered their very heartfelt thanks to Mr. E. Charpentier - Technical co-ordinator of the WMO-IOC DBCP and Mr. Ch. Ortega - chief of the ARGOS department, Oceanographic applications CLS, for technical co-operation and rendered assistance when the SVPB drifter creation and International testing experiment in South Atlantic realization.

Creation and testing SVP drifter



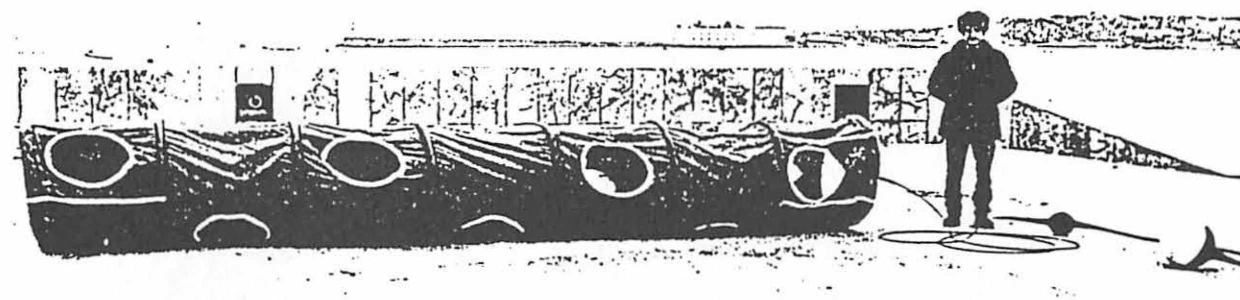
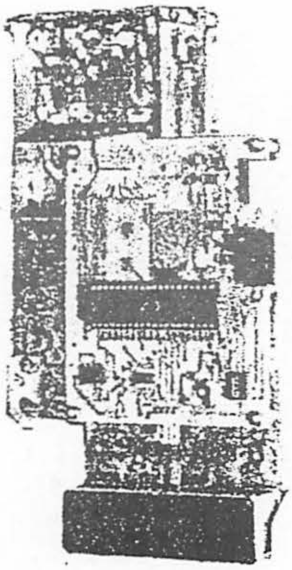


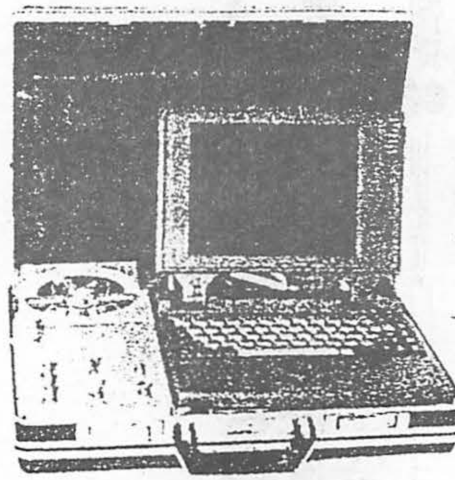
Fig.1

Fig.2

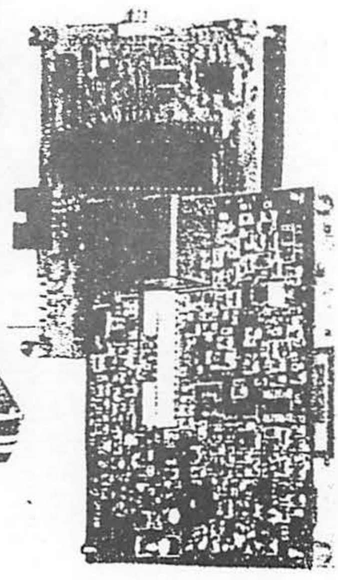
The family of various platforms with a new electronics engineering



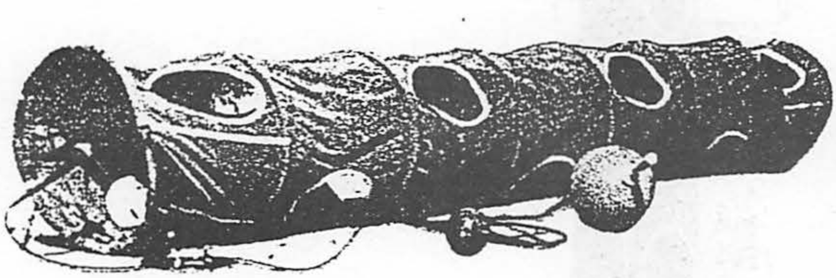
PTT MT9301



Checking device

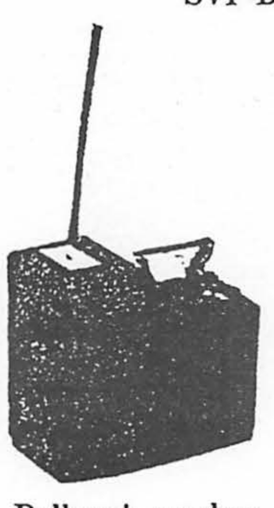


PTT MT9701

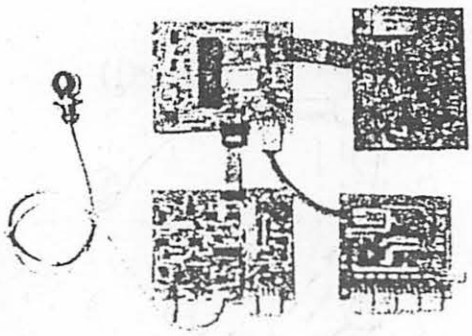


SVP-B drifter

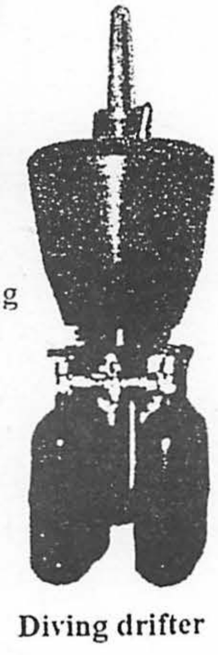
PTT for fixing station



Balloon's marker



Electronics of SVP-B drifter



Diving drifter

SVP-B DRIFTER

SAWB message format ARGOS

Sensors	Range	Accurate	Calibration curve	Bit
Air Pressure	900-1053,45 hPa	1 hPa	0,15*Np1+900	0-9
Battery Volt.	10,5-15,5 V	0,6 V	0,2*Nv+5	10-15
SST	-3-35,8 C	0,5 C	0,16*Nt-5	16-23
Checksum same message of E. Charpentier from 1 Aug 1997				24-31
Air Pr (H-3)	900-1053,45 hPa	1 hPa	0,15*Np2+900	32-41
Sub.count	0-100%	3%	100*Nk/63	42-47
Min. Air Pr.	900-1053,45 hPa	1 hPa	0,15*Np3+900	48-57
Free				58-59
Time of Minimum Barom.	0,25-3,0 h	15 minutes	0,25*Nt	60-63

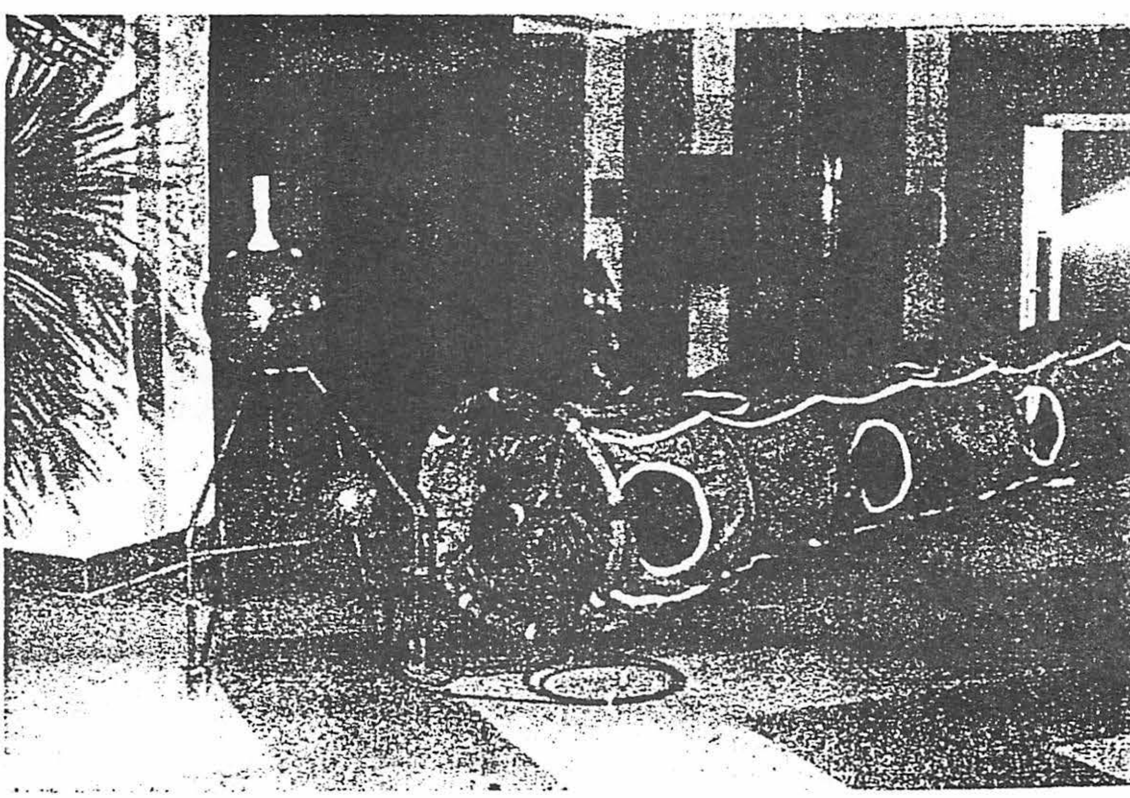
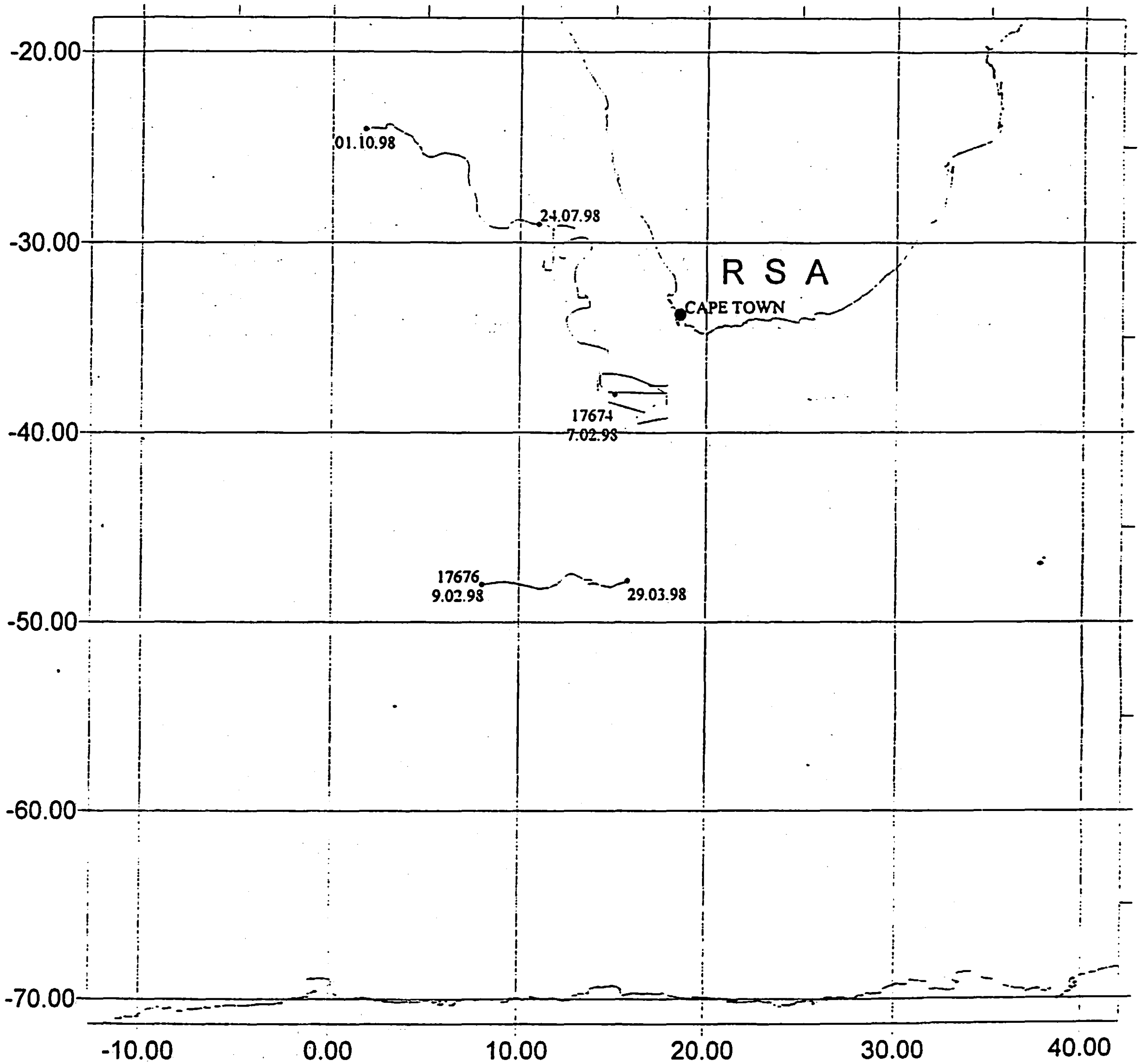


Fig.4


-20.00
-30.00
-40.00
-50.00
-60.00
-70.00
-10.00
0.00
10.00
20.00
30.00
40.00
01.10.98
24.07.98
R S A
CAPE TOWN
17674
7.02.98
17676
9.02.98
29.03.98

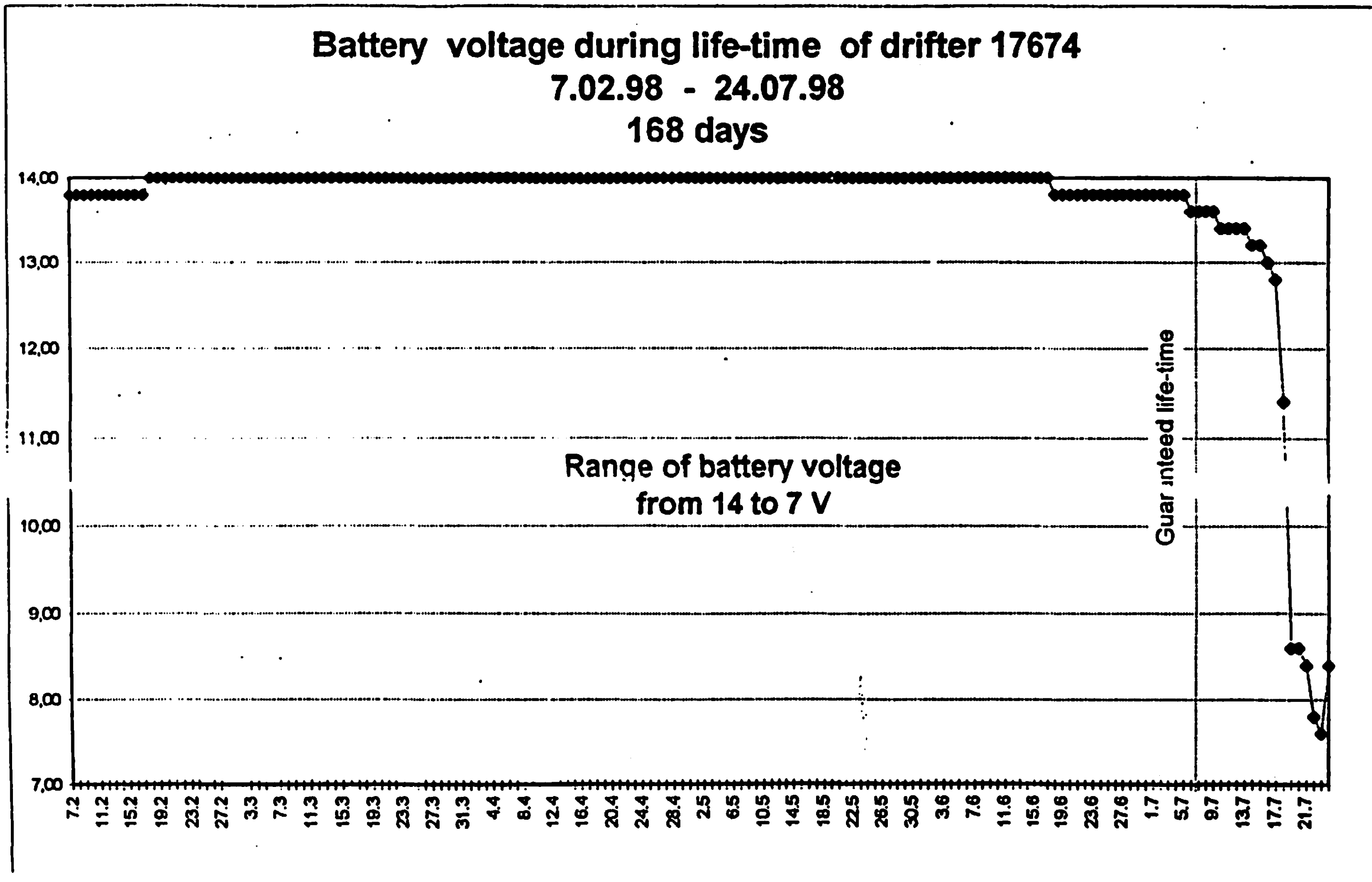
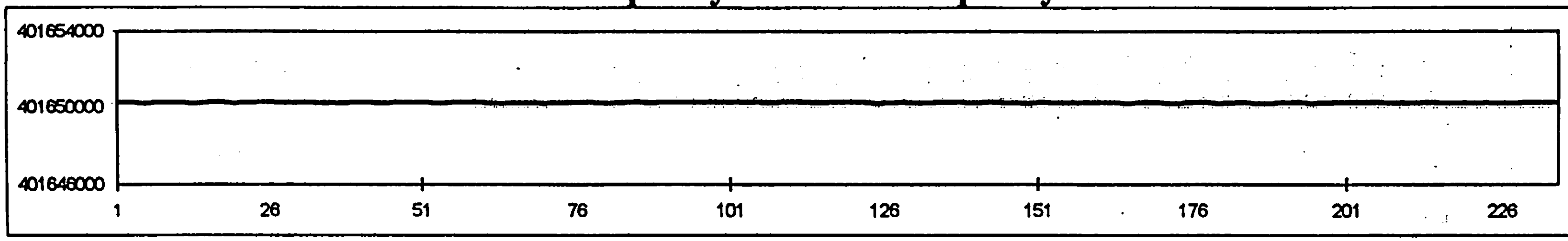

Battery voltage during life-time of drifter 17674
7.02.98 - 24.07.98
168 days
14,00
13,00
12,00
11,00
10,00
9,00
8,00
7,00
Range of battery voltage
from 14 to 7 V
Guar ınteed life-time
7.2
11.2
15.2
19.2
23.2
27.2
3.3
7.3
11.3
15.3
19.3
23.3
27.3
31.3
4.4
8.4
12.4
16.4
20.4
24.4
28.4
2.5
6.5
10.5
14.5
18.5
22.5
26.5
30.5
3.6
7.6
11.6
15.6
19.6
23.6
27.6
1.7
5.7
9.7
13.7
17.7
21.7

Fig.5

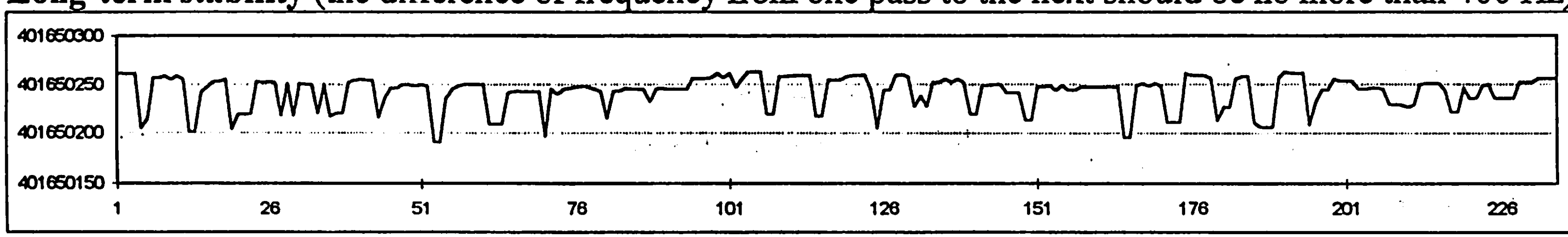
DRIFTER 17674 DATA from 9 Apr 98 to 8 May 98 (253 passes of NOAA J and D)

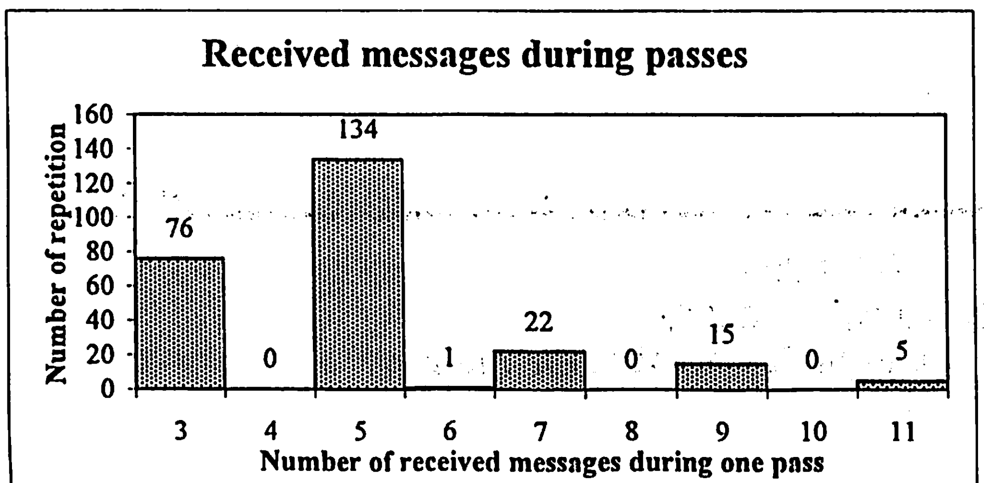
(The passes, when there are no locations, do not used)

PTT nominal transmission frequency within the frequency band of NOAA satellites



Long-term stability (the difference of frequency from one pass to the next should be no more than 400 Hz)





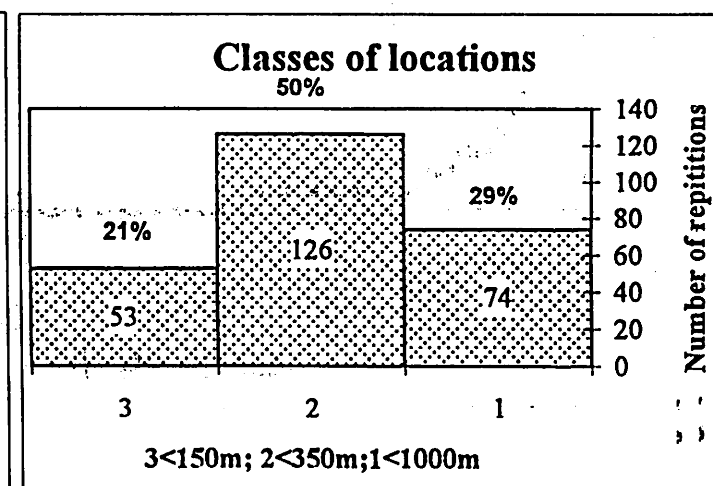


Fig.6

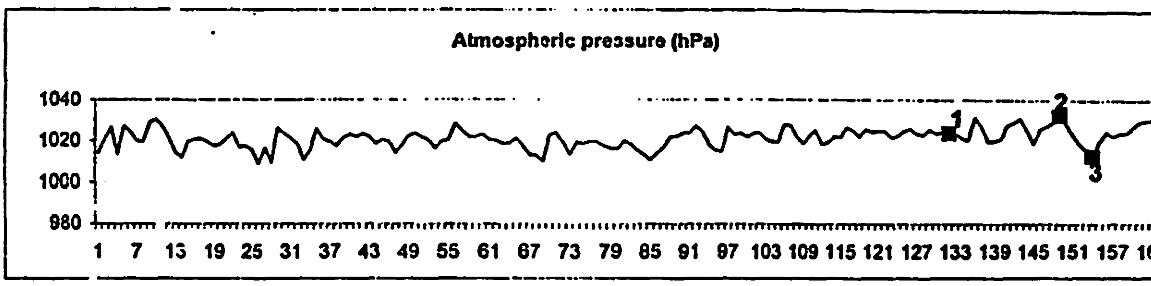
Fig.7

DRIFTERS TESTING in SOUTH ATLANTIC

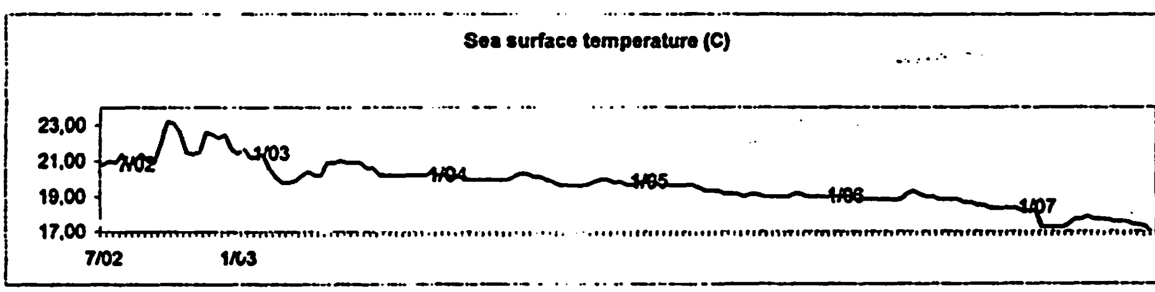
Start of testing: 7/02/98
Finish of testing: 24/07/98

Drifter №4 ID 1767[illegible] (1428B)

Deployed 7/02/98 in the position 38 South 15 East
Closed 24/07/98 in the position 29,009 South 10,887 East

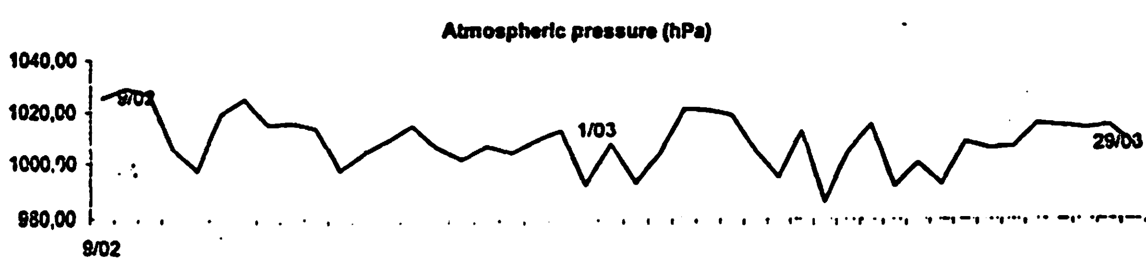


1, 2, 3 - Air pressure data for the comparisons with data from other drifters



Drifter №5 ID 17676 (14332)

Deployed 9/02/98 in the position 88 South 8 East
Closed 29/03/98 in the position 47,869 South 15,657 East



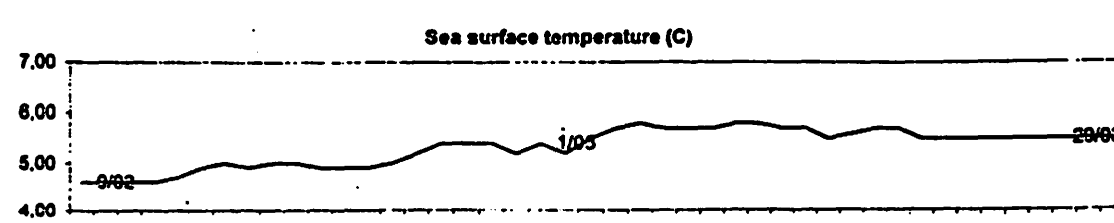
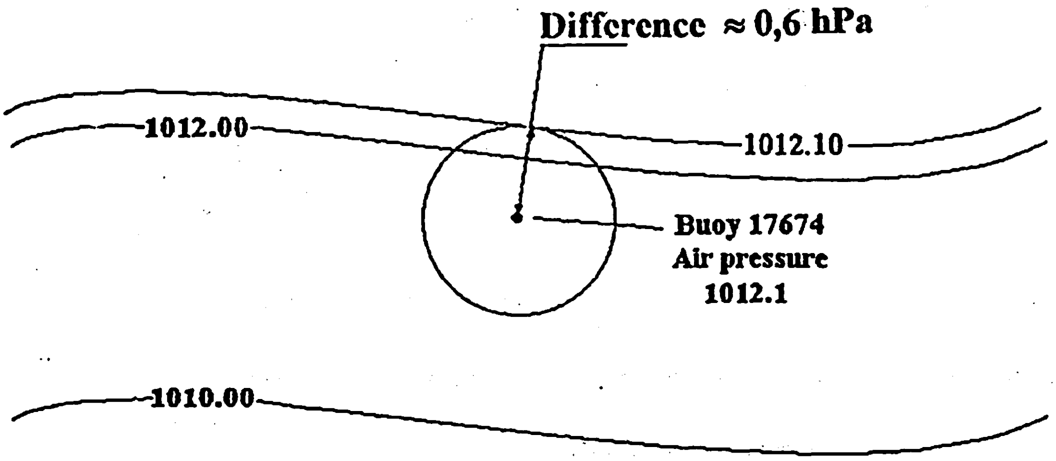


Fig.8

Method of the air pressure sensor testing when drifter is in the real ocean



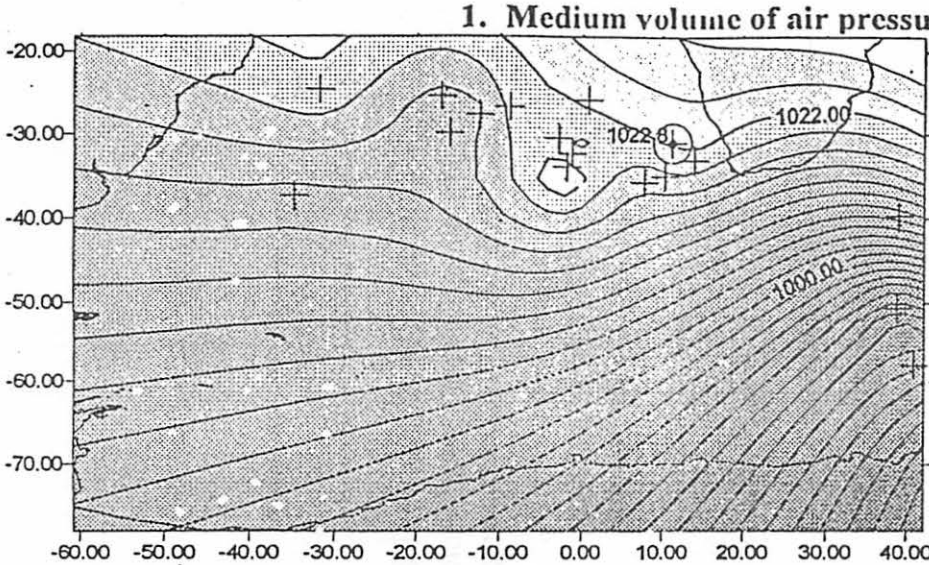
The essence of the method

1. The electronic map of South Atlantic is built.
2. The instantaneous data from the all buoys in this region are accepted as "frozen" during the time equal approximately three hours (2-4 passes of satellites for the data receiving from the all buoys).
3. The field of isobars is made on the electronic map using the air pressure data from all drifters but without data from the drifter 17674.
4. Every point of this field of isobars has now the own geographical position.
5. The position of drifter 17674 is placed on the electronic map.
6. Air pressure data of buoy 17674 is compared with the calculated position of the isobar with same data of air pressure.
7. The difference between the position of 17674 and isobar with same data of air pressure is the index of reliability of the air pressure sensor of drifter 17674.
8. The total error of method has three components:
   a) the error of air pressure sensor of each drifter (±1 hPa);
   b) the real air pressure is not "frozen";
   c) the error of the method of isobars creation.
9. Maximum of the difference could be no more then 2,5 hPa.

Fig.9

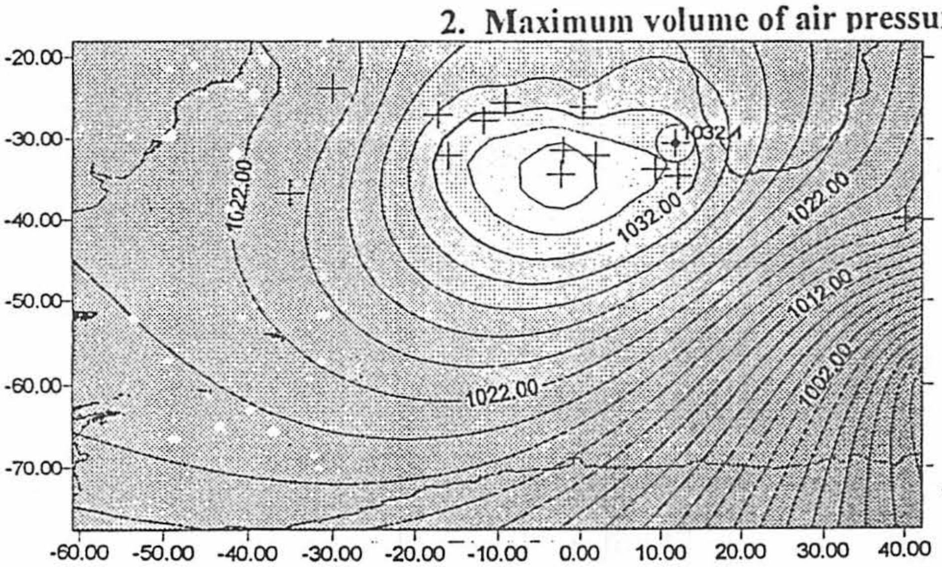
The testing of 17674 drifter air pressure sensor

1. Medium volume of air pressure



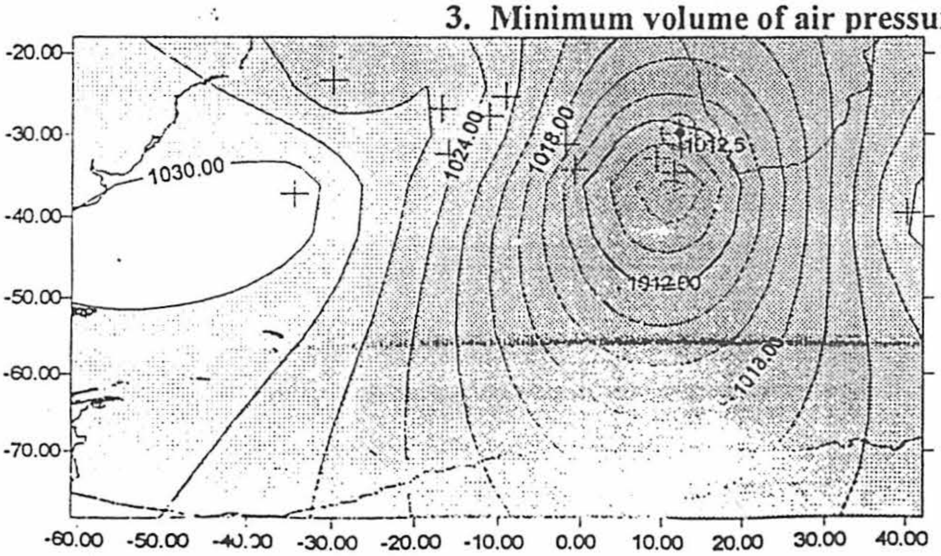
Date	23.06.98
Quantity of SVP-B drifters for the field of isobar constructing	16
Air pressure from 17674 (hPa)	1022,8
Difference with same volume isobar (hPa)	0,7

2. Maximum volume of air pressure



Date	10.07.98
Quantity of SVP-B drifters for the field of isobar constructing	13
Air pressure from 17674 (hPa)	1032,4
Difference with same volume isobar (hPa)	0,6

3. Minimum volume of air pressure



Date	15.07.98
Quantity of SVP-B drifters for the field of isobar constructing	12
Air pressure from 17674 (hPa)	1012,5
Difference with same volume isobar (hPa)	1,1

The analysis of the possible reasons of buoys failures in 1997

The information is from "DBCP Annual Report for 1997"

№	Action groups		SVP	SVP-B	Failure
1	European Group on Ocean Station	EGOS		19	10 SVP-B drifters have average life-time 132 days
2	International Arctic Buoy Programme	IABP	No data about SVP drifters		
3	International Programme for Antarctic Buoys	IPAB	No data about SVP drifters		
4	International South Atlantic Buoy Programme	ISABP		25	Pressure sensors turned out in the previous drifters
5	International Buoy Programme for the Indian Ocean	IBPIO	> 15	> 40	Only half drifters with air pressure were operating by the end of June 1997
6	Global Drifter Programme	GDP	228	204	Some drifters had the PTT with unstable crystals Some drifters had a problems with baroports Some drifters quit the transmitters after 120 days.

Fig.10

Fig.11

Marlin SVP-B drifter:

Main results of testing

Positive results

1. Mechanical part of drifter – no problem.
2. Short-term, medium-term and long-term stability of crystals was many better then limits of «General Specification and Certification» of ARGOS PTT.
3. The accuracy of buoys locations were mainly of 3 and 2 classes (< 350 m). This fact has allowed to have very carefully the lines of buoys moving .
4. Transmitter with digital control of phase modulation was working very good and has allowed to have up to 11 messages on board during one pass.
5. SST sensor - no problem.
6. Baroport - no problem.
7. Air pressure sensor - no problem.
8. All electronics worked reliability, when the battery voltage was from 14 to 7 V.
9. Message from drifter was corresponded informational standards of ARGOS, DBCP and SAWB.
10. Real life-time of 17674 was equal the calculated life-time in 5 months. Thus, the real life-time of serial drifter should be equal the calculated in one year.
11. Knowledge of minimum air pressure time (n*15 mn) was useful for prognosis.

Negative results

1. Small electric power of used battery source. Big power was necessary for the sensors working.
2. Mechanical durability was not enough probably for:
   point of antenna connection to transmitter;
   battery connection inside the surface float.

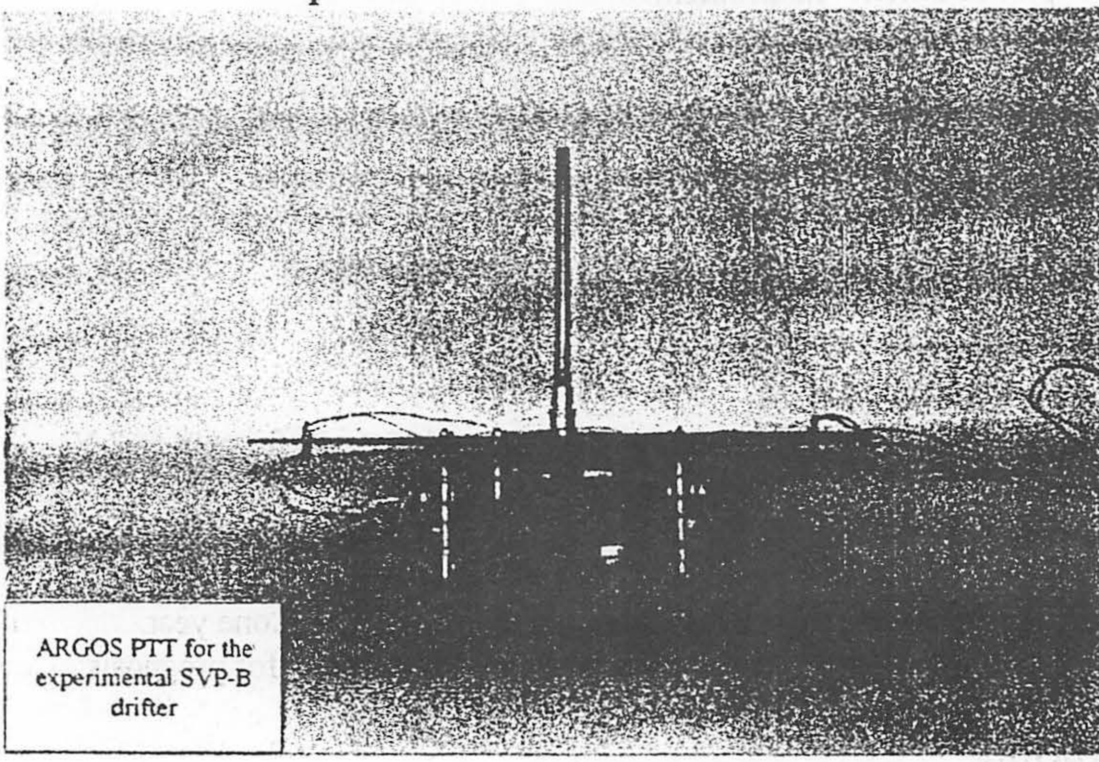
Unsolved problem– method of battery using

Method	Plus	Minus
PTT and sensors have single battery	Easy and cheaper when drifter manufacturing Full power of battery is used.	Errors in messages on the final phase of battery life-time because electric communication between PTT and sensors (voltage is decreased during transfer)
PTT and sensors have different batteries	There is no electric communication between PTT and sensors	Power of battery is not used fully. More complexities when drifter manufacturing.

Fig.12

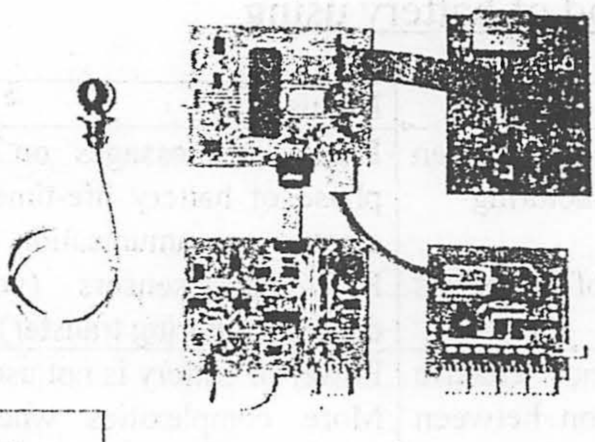
Up-dating of ARGOS electronics for SVP-B drifters

Vertical configuration of ARGOS electronics for the experimental SVP-B drifters



ARGOS PTT for the experimental SVP-B drifter

New ARGOS electronics for the serial SVP-B drifters of horizontal configuration



ARGOS PTT for the serial SVP-B drifter

Up-dating of the experimental SVP-B drifter

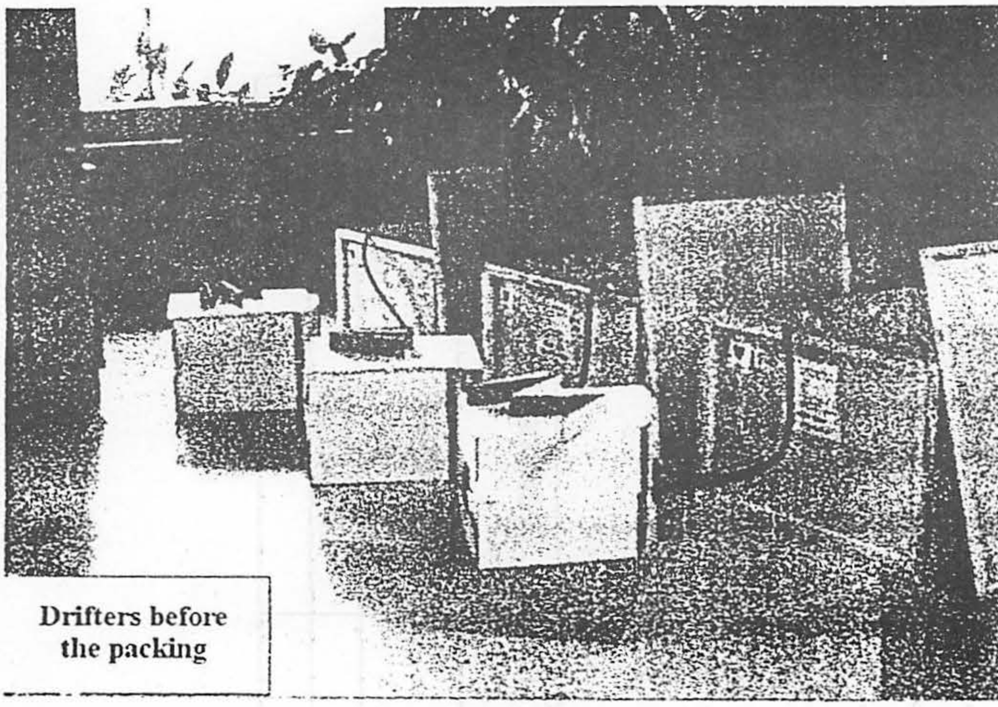
(the jobs were done in the first part of 1998)

№	Characteristics of buoys	Experimental	Serial
1	Error of air pressure sensor	1,0 hPa	0,5 hPa
2	Error of SST sensor	0,5°C	0,1°C
3	Stock of batteries energy	760 VAh	1140 VAh
4	Decreasing of the consumption of energy by the sensors of drifter		5 times
5	Kind of batteries	Lithium	Alkaline Manganese Dioxide
6	Method of electronics parking inside the surface float (for the mechanical durability of buoy)	Vertical	Horizontal
7	Life-time	5 months	More then one year
8	Cost of drifter (when number >10 buoys)	~US$ 3600	US$ 2900
9	Time of manufacturing		4 months

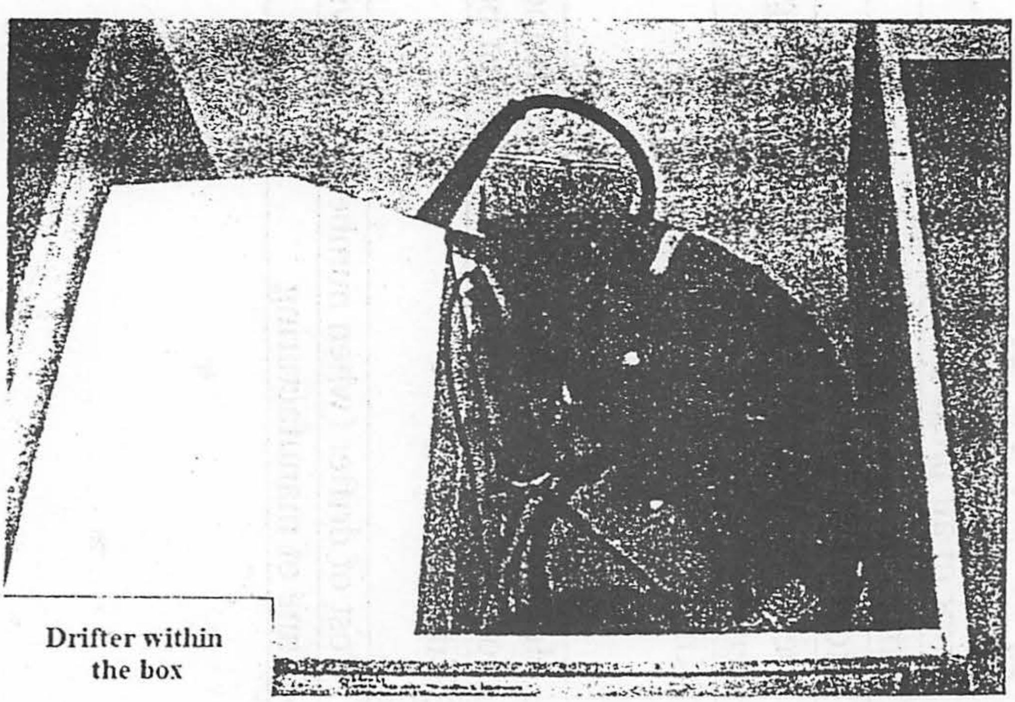
Fig.13

Fig.14

SVP-B drifters before shipping in SAWB



Drifters before the packing



Drifter within the box

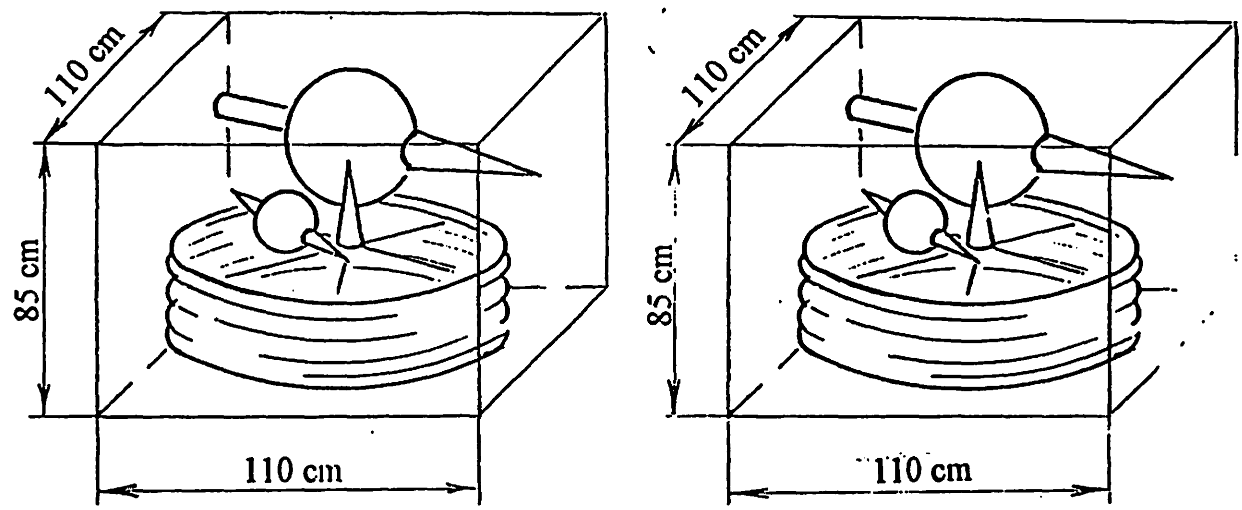
Fig.15

New packing of drifters before shipping

Usual packing of two drifters

$V_\Sigma = 2 \times 1{,}03\ m^3 = 2{,}06\ m^3$

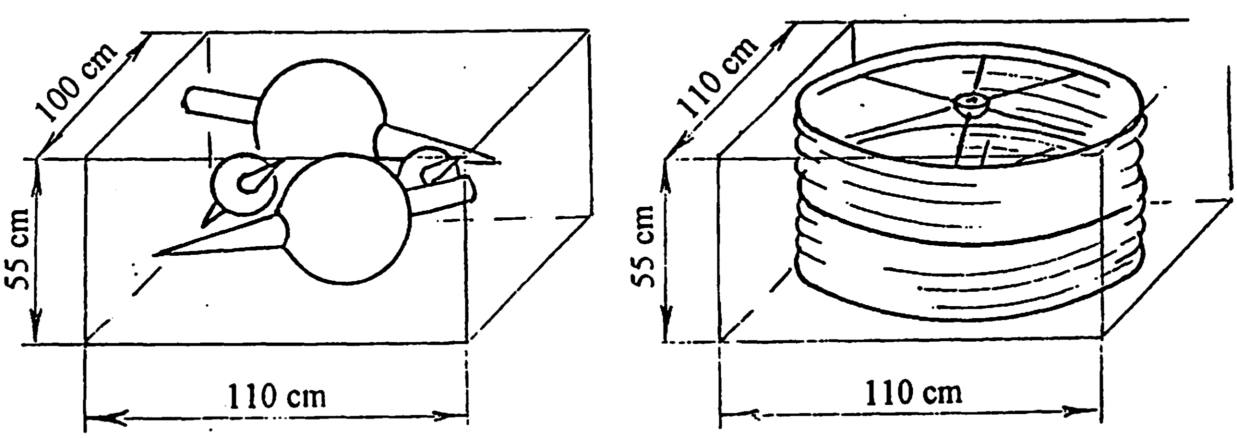
Cost of shipping = 2 × 870 US$ ≈ 1750 US$



New packing of two drifters

$V_\Sigma = 0{,}67\ m^3 + 0{,}61\ m^3 = 1{,}28\ m^3$

Cost of shipping ≈ 2 × 670 US$ ≈ 1350 US$



Positive effects

1. Decrease of cost of shipping - 23%.

2. Decrease of shipping volume - 38%

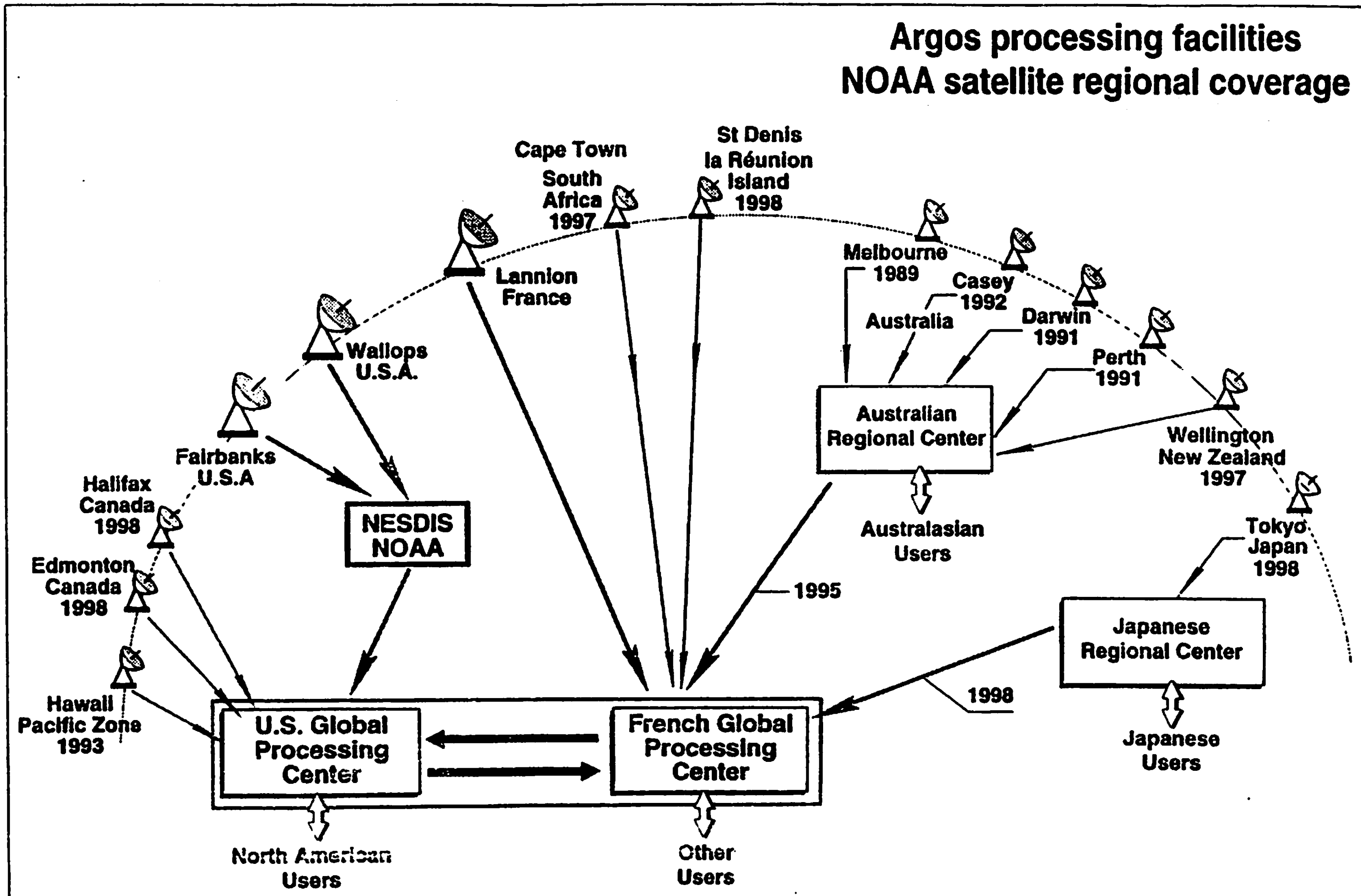


Fig. 1.1.2 a - Regional receiving station network

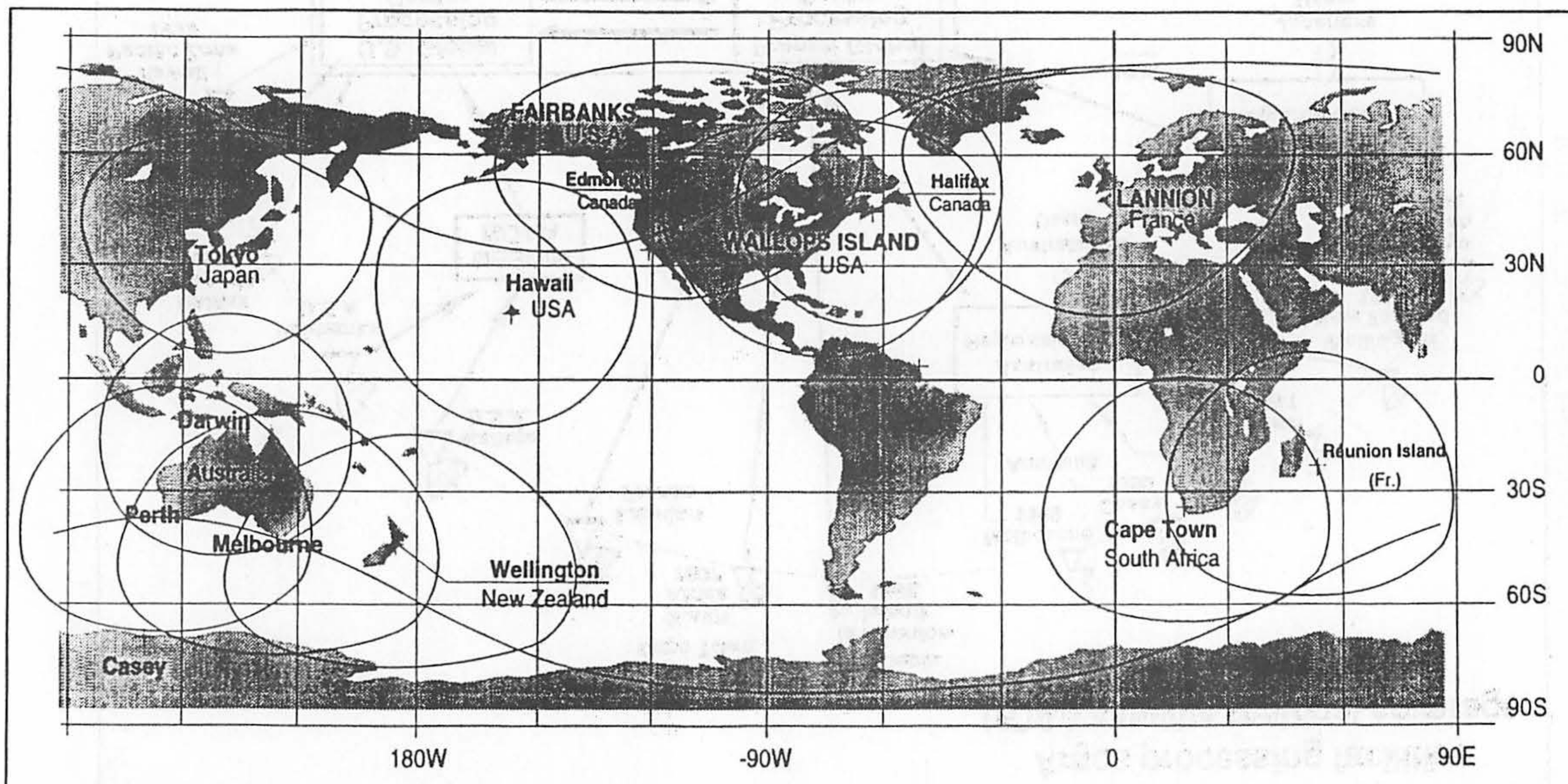


Fig. 1.1.2 b - Regional receiving station coverage

ANNEX X

Financial Statement by IOC
for the year 1 June 1997 to 31 May 1998

(all amounts in US $ unless otherwise specified)

BALANCE (from previous year)			**$ 25 562**
FUNDS TRANSFERRED FROM WMO (relevant to the period)			
105 000	(05.05.97)		
15 000	(09.07.97)		**$ 120 000**
TOTAL RECEIPTS			**$ 145 562**
EXPENDITURES			
Technical Co-ordinator's employment:			
- Salary:		65 361	
- Allowances:		19 978	
- Relocation (yearly provision):		3 803	**$ 89 142**
Technical Co-ordinator's missions:			
- Saint-Petersburg (3-5 June 1997)		2 434	
- Perth & Melbourne (21-25 July 1997)		3 334	
- La Réunion (13-22 October 1997)		3 189	
- Reading (4-5 November 1997)		1 083	
- Paris (2-3 December 1997)		900	
- Naples (11-13 May 1998)		1 692	**$ 12 632**
Contract with CLS/Service Argos:		FF 80 000	**$ 13 201**
TOTAL EXPENDITURES			**$ 114 975**
BALANCE (at 1 June 1998)			**$ 30 587**

World Meteorological Organization

Data Buoy Co-operation Panel
Interim Account as at 30 September 1998

	US$		US$
Balance from 1997			33'645
Contributions Paid for Current Biennium			112'052
Total Funds Available			145'697
Obligations Incurred			
Technical Co-ordinator	118'400		
Experts	3'983		
Travel	7'372		
Reports	1'954		
			131'709
Balance of Fund		US $	13'988
Represented by.			
Cash at Bank			22'406
Unliquidated obligations			8'418
		US $	13'988

Contributions	Received 1998
Australia	12'500
Canada	10'000
France	11'400
Greece	2'200
Iceland	1'500
Ireland	1'377
Netherlands	1'575
New Zealand	500
South Africa	3'000
USA	68'000
TOTAL	112'052

ANNEX XI

NATIONAL FOCAL POINTS FOR THE DBCP
(as of 6 October 1998)

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