INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

WORLD METEOROLOGICAL ORGANIZATION

DATA BUOY COOPERATION PANEL

ANNUAL REPORT FOR 1996

DBCP Technical Document No. 9

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NOTE

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FOREWORD

I am pleased to present this 1996 Annual Report for the Data Buoy Cooperation Panel.

The panel has had another successful year, with a considerable amount of work being undertaken. The four action groups have operated very well, with the new South Atlantic action group proving particularly successful.

During the year another action group covering the Indian Ocean was formed; the group called the International Buoy Programme for the Indian Ocean (IBPIO), held its first meeting in La Réunion in September 1996.

I would like to thank all those people who have participated in the work of the panel and contributed to this tenth annual report.

Graeme Brough
Chairman, DBCP

SUMMARY

Introduction

The Drifting Buoy Cooperation Panel (DBCP) 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 c-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**

Eleven countries, four action groups and two data management centres submitted reports on their data buoy activities. A new action group, the International Buoy Programme for the Indian Ocean (IBPIO) was established during the intersessional period; the IBPIO held its first meeting in September 1996.

2. **Real-time data flow**

The data from buoys available in real-time on the GTS is increased slightly over the past year, in September 1996 638 buoys (54.1% of the total operational buoys) were reporting on the GTS. The total number of active buoys decreased by 17.4% compared to the same period last year, however the number of buoys reporting via the GTS increased by 10.1%.

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 approx 93,000 in 1995 to approx 121,000 during 1996. 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 success of the SVP barometer drifter, developed by the Scripps Institution of Oceanography (SIO), has continued during the previous twelve months. Results from the DBCP/SIO Workshop on the SVP barometer drifter held in Bonas, in May 1996, were discussed during the panel's sessions.

The technical coordinator significantly enhanced the features of the DBCP's World Wide Web Internet server located at the NOAA/NOS headquarters in Washington DC. The server is proving to be extremely popular and is a valuable source of buoy information.

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 future developments of the system were discussed at the meeting.

7. Publications

The panel produced three technical documents in the DBCP series, covering the DBCP/SIO Workshop on SVP barometer drifter evaluation, the Technical Presentations made at the eleventh session and the Annual Report for 1995.

8. Administrative matters

The panel now has five 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); and the International Buoy Programme for the Indian Ocean (IBPIO). The Panel agreed in principle with a proposal from the Global Drifter Programme (GDP), formerly the TOGA/WOCE Surface Velocity Programme (SVP), to be formally associated with the DBCP.

Twelve countries contributing on a voluntary basis to the financial support of the panel in 1996 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 1997 to 31 May 1998), a total budget of USD144,137, is planned to be allocated as follows:

	USD
IOC salary of technical coordinator	90,000
Travel of technical coordinator	15,000
CLS/Service Argos contract	15,000
WMO Costs	100
Travel of Chairman/vice-chairmen	10,000
Publications	9,000
Consultancies and other small items	3,000
Contingencies	2,037
	144,137

RÉSUMÉ

Introduction

Le Groupe de coopération pour la mise en oeuvre des programmes de bouées dérivantes (DBCP) 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 grands 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

Onze pays, quatre groupes d'action et deux centres de gestion des données ont présenté des rapports sur leurs activités concernant les bouées de mesure. Un nouveau groupe d'action, le Programme international de bouées pour l'océan Indien (PIBOI), a été créé pendant l'intersession et a tenu sa première réunion en septembre 1996.

2. Acheminement des données en temps réel

Le nombre de données en provenance de bouées disponibles en temps réel sur le SMT a légèrement augmenté par rapport à l'année précédente. En septembre 1996, les bouées transmettant des messages sur le SMT étaient au nombre de 638 (54,1% de l'ensemble des bouées en service). Le nombre total de bouées communiquant des messages a diminué de 17,4% par rapport à la période correspondante de l'année précédente; toutefois, le nombre de bouées communiquant des messages via le SMT a augmenté de 10,1%.

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 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 Environnemental 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 93 000 en 1995 à environ 121 000 en 1996. 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 succès des bouées dérivantes SVP équipées de baromètres, mises au point par la Scripps Institution of Oceanography (SIO), s'est maintenu tout au long des douze derniers mois. Les résultats des travaux de l'Atelier DBCP/SIO sur les bouées dérivantes SVP équipées de baromètres qui a eu lieu à Bonas, en mai 1996, ont été examinés au cours des sessions du Groupe de coopération.

Le coordonnateur technique a nettement amélioré les caractéristiques du serveur World Wide Web du DBCP, situé au siège de la NOAA/NOS à Washington. Ce serveur se révèle être extrêmement utile et constitue une précieuse source d'information concernant les bouées.

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. Les participants à la réunion ont examiné plusieurs possibilités d'évolution future du système.

7. Publications

Le Groupe de coopération a produit trois documents techniques dans la série DBCP, concernant l'Atelier DBCP/SIO sur l'évaluation des bouées dérivantes SVP équipées de baromètres, les communications techniques faites à la onzième session et le rapport annuel pour 1995.

8. Questions administratives

Le Groupe de coopération compte désormais cinq 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) et le Programme international de bouées pour l'océan Indien (PIBOI). Il a accepté en principe une proposition du Programme mondial pour les bouées dérivantes (GDP), ancien programme TOGA/WOCE concernant la vitesse des courants en surface (SVP), qui doit être associé officiellement au DBCP.

Les douze pays ayant fourni une contribution financière volontaire au Groupe de coopération en 1996 sont les suivants : Afrique du Sud, Australie, Canada, Etats-Unis d'Amérique, France, Grèce, Islande, Irlande, Nouvelle-Zélande, Norvège, 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 1997 au 31 mai 1998), il est prévu un budget total de 144 137 dollars E.-U., répartis comme suit :

	(en dollars E.-U.)
Salaire versé par la COI au coordonnateur technique	90 000
Voyage du coordonnateur technique	15 000
Contrat CLS/Service Argos	15 000
Frais OMM	100
Voyage du président/vice-président	10 000
Publications	9 000
Frais de consultants et divers	3 000
Imprévus	2 037
	144 137

РЕЗЮМЕ

Введение

В 1985 г. в соответствии с резолюцией 10 (ИС-XXXVII) ВМО и резолюцией ИС-XIX.7 МОК была создана группа экспертов по сотрудничеству в области Программы по дрейфующим буям (ГЭСДБ) В 1993 г. руководящие органы МОК и ВМО согласились изменить название этой группы на: группа экспертов по сотрудничеству в области буев для сбора данных (ГСБД), а также незначительно измененить круг ее обязанностей, с тем чтобы группа экспертов 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 (ИС-XLV) ВМО).

1. Текущие и планируемые программы

Одиннадцать стран, четыре группы действий и два центра управления данными представили отчеты о своей деятельности в области буев для сбора данных. В течение межсессионного периода была создана новая группа действий по Международной программе по буям для Индийского океана (МПБИО), которая провела свое первое совещание в сентябре 1996 г.

2. Оперативный поток данных

За последний год количество поступающих с буев данных, имеющихся в режиме реального времени в ГСТ, увеличилось незначительно; в сентябре 1996 г. по ГСТ передавались сводки с 638 буев (54,1 % от общего количества оперативных буев). В сравнении с тем же периодом прошлого года общее число действующих буев уменьшилось на 17,4 %, однако количество буев, передающих данные через ГСТ, увеличилось на 10,1 %.

3. Качество данных

Методы контроля качества (КК), применяемые группой экспертов, продолжают оставаться чрезвычайно эффективными в обеспечении поддержания качества данных на самом высоком уровне. Система контроля качества, которая функционирует через список адресатов Интернет в режиме, близком к реальному времени, широко используется и оказалась наиболее удачной. В настоящее время в данной системе участвуют двенадцать главных метеорологических или океанографических центров (ГМОЦ), ответственных за контроль качества данных с буев в ГСТ.

4. Архивация данных

С 1986 г. Канадская служба данных по морской окружающей среде (МЕДС) от имени МОК и ВМО выступает в качестве ответственного национального центра океанографических данных (ОНЦОД), работающего с данными дрейфующих буев. Приблизительное количество сообщений, ежемесячно помещаемых МЕДС в архив, увеличилось с 93 000 в 1995 г. до 121 000 в 1996 г. Специализированный океанографический центр ОГСОС по дрефующим буям (СОЦ), эксплуатируемый 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 буев, с данными о ветре, давлении, температуре воздуха и температуре поверхности моря.

5. Техническое развитие

В течение предыдущих двенадцати месяцев с успехом продолжалось применение барометрического дрейфующего буя СВП, разработанного Институтом океанографии Скриппс (СИО). В ходе сессии группы экспертов были обсуждены результаты научно-практического семинара ГСБД/СИО по барометрическим дрейфующим буям СВП, проведенного в мае 1996 г. в Бонасе.

Технический координатор значительно расширил характеристики сервера ГСБД в World Wide Web Интернет, который располагается в штаб-квартире НОС/НУОА в Вашингтоне, О.К. Сервер пользуется огромной популярностью и является ценным источником информации с буев.

6. Состояние системы связи

Система Аргос продолжала предоставлять надежное обслуживание, обеспечивая сбор и обработку оперативных данных с дрейфующих буев. На совещании были обсуждены различные вопросы будущего развития системы.

7. Публикации

Группа экспертов опубликовала в серии публикаций ГСБД три технических документа: документ, касающийся научно-практического семинара ГСБД/СИО по оценке барометрических дрейфующих буев СВП; технические сообщения, представленные во время одиннадцатой сессии, и ежегодный отчет за 1995 г.

8. Административные вопросы

В настоящее время в группе экспертов имеется пять групп действий: Европейская группа по океаническим станциям (ЕГОС); по Международной программе по арктическим буям (МПАБ); по Международной программе по антарктическим буям (МПАнБ); по Международной программе по буям для Южной Атлантики (МПБЮА) и по Международной программе по буям для Индийского океана (МПБИО). Группа экспертов в принципе согласилась с предложением Глобальной программы по дрейфующим буям (ГПДБ), прежде - программа ТОГА/ВОСЕ по скорости поверхностных течений (СВП), об официальном сотрудничестве с ГСБД.

В 1996 г. на добровольной основе вносили свой вклад в финансовую поддержку группы экспертов двенадцать следующих стран: Австралия, Канада, Франция, Греция, Исландия, Ирландия, Нидерланды, Новая Зеландия, Норвегия, Южная Африка, Соединенное Королевство и США.

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

В следующем финансовом году (1 июня 1997 г. - 31 мая 1998 г.) планируется распределить общий бюджет группы экспертов в сумме 144 137 долл. США следующим образом:

	долл. США
Заработная плата технического координатора, выплачиваемая по линии МОК	90 000
Транспортные расходы технического координатора	15 000
Контракт с СМС/Службой Аргос	15 000
Расходы ВМО	100
Транспортные расходы председателя/заместителя председателя	10 000
Публикации	9 000
Консультации и прочие малые статьи расходов	3 000
Резерв для непредвиденных расходов	2 037
	144 137

RESUMEN

Introducción

El Grupo de cooperación sobre boyas a la deriva (GCBD) fue establecido en 1985 por la Resolución 10 de la OMM (EC-XXXVII) y la Resolución EC-XIX.7 de la COI. Los órganos rectores de la COI y de la OMM decidieron, en 1993, cambiar el nombre de dicho grupo, denominándolo en adelante Grupo de cooperación sobre boyas de acopio de datos (GCBD) y modificar ligeramente sus atribuciones, para que el Grupo de expertos pudiera también proporcionar cualquier coordinación internacional que exijan 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

Once países, cuatro grupos de acción y dos centros de gestión de datos presentaron informes sobre sus actividades sobre el acopio de datos procedentes de boyas. Durante el período entre las reuniones se creó un nuevo grupo de acción denominado Programa Internacional de Boyas para el Océano Índico (PIBOI), que celebró su primera reunión en septiembre de 1996.

2. Flujo de datos en tiempo real

Durante el año pasado, aumentó ligeramente el número de datos procedentes de boyas y disponibles en tiempo real por el Sistema Mundial de Telecomunicación (SMT) y en septiembre de 1996 638 boyas (un 54,1% del total de las boyas en funcionamiento) transmitían sus datos por SMT. El número total de boyas en funcionamiento disminuyó de 17,4% en comparación con el mismo período del año anterior, aunque el número de boyas que transmiten datos a través del SMT aumentó del 10,1 %.

3. Calidad de los datos

El Grupo que se ocupa de los métodos de control de calidad continúa siendo sumamente eficaz como garantía de que la calidad de los datos se mantiene al nivel más elevado posible. El sistema de control de la calidad, que funciona casi en tiempo real a través de una lista de direcciones de Internet, es un sistema muy generalizado y está teniendo mucho éxito. Participan actualmente en ese sistema doce Centros principales meteorológicos u oceanográficos (PMOC) 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) de Canadá ha actuado de Centro nacional responsable de la concentración de los datos oceanográficos (RNODC) para las boyas a la deriva, en nombre del COI y de la OMM. El número de mensajes archivados mensualmente por el MEDS aumentó pasando de aproximadamente 93.000 en 1995 a unos 121.000 en 1996. El Centro Oceanográfico Especializado (SOC) del Sistema Global Integrado de Servicios Oceánicos (SGISO) para las boyas a la deriva, que corre a cargo de las "Météo France", recopila y archiva diariamente todos los informes transmitidos por boyas. El SOC francés elabora diversos productos, tales como 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

El éxito de los barómetros a la deriva del Programa de medida de la velocidad de las corrientes en superficie (SVP), elaborado por la Institución Scripps de Oceanografía (SIO), ha continuado durante los últimos doce meses. Los resultados del cursillo de trabajos prácticos del Grupo de cooperación sobre boyas a la deriva y el SIO sobre los barómetros a la deriva del SVP, que tuvo lugar en Bonas (mayo de 1996), fueron examinados durante las reuniones del Grupo de expertos.

El coordinador técnico puso de relieve las características del servidor del World Wide Web de Internet del DBCP, ubicado en la sede de la NOAA/NOS en Washington DC. El servidor tiene mucho éxito y constituye una fuente valiosa de información sobre los datos procedentes de boyas.

6. Situación en que se encuentra el sistema de comunicaciones

El sistema Argos ha continuado proporcionando un servicio fiable para la recuperación y el proceso de datos en tiempo real procedentes de las boyas a la deriva. En la reunión se debatieron diferentes evoluciones futuras del sistema.

7. Publicaciones

El Grupo presentó tres documentos técnicos en las series del DBCP sobre la evaluación del Cursillo de trabajos prácticos DBCP/SIO sobre los barómetros a la deriva del SVP, las ponencias técnicas que se hicieron en la undécima reunión y el Informe anual para 1995.

8. Cuestiones administrativas

El Grupo cuenta ahora con cinco grupos de acción, a saber: el Grupo europeo para las estaciones oceánicas (EGOS); el Grupo internacional de boyas del Ártico (PIBA); el Programa internacional de boyas en el Antártico (PIBAn); el Programa internacional de boyas del Atlántico sur (PIBAS) y el Programa internacional de boyas para el Océano Índico (PIBOI). El Grupo aprobó en principio una propuesta del Programa mundial de boyas a la deriva (GDP), anteriormente el Programa de medida de la velocidad de las corrientes en superficie (SVP) del WOCE/TOGA para asociarse oficialmente con el DBCP.

Los doce países que en 1996 facilitaron apoyo financiero voluntario al Grupo de expertos son los siguientes: Australia, Canadá, Francia, Grecia, Islandia, Irlanda, Países Bajos, Nueva Zelanda, Noruega, Sudáfrica, Reino Unido y Estados Unidos de América.

El coordinador técnico del Grupo, Sr. Etienne Charpentier, continúa trabajando para la UNESCO/COI como experto de **asignación especial**, destacado en el CLS del Servicio Argos de Toulouse (Francia).

El presupuesto total del Grupo para el próximo año financiero (del primero de junio de 1997 al 31 de mayo de 1998) alcanza 144.137 dólares estadounidenses, desglosado de la manera siguiente:

	$ estadounidenses
Salario del coordinador técnico de la COI	90.000
Gastos de viaje del coordinador técnico	15.000
Contrato con el CLS/Servicio Argos	15.000
Gastos de la OMM	100
Viajes del presidente o de los vicepresidentes	10.000
Publicaciones	9.000
Asesoramiento y varios	3.000
Imprevistos	2.037
	144.137

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 boys reporting over the Global Telecommunication System (GTS)

During September 1996, data from a total of 1180 buoys were collected and processed at the Argos Global Processing Centres of Toulouse, France, and Landover, Maryland, USA, for distribution in real-time and delayed mode to the respective Principal Investigators. These buoys were operated by seventeen countries. A detailed breakdown by programmes, organizations and countries is given for the month of June 1996 in Annex IV.

Some 54% (638) of the 1180 buoys transmit their data over the GTS in real- or quasi real-time. At the same time, in 1995 the total number of buoys was 1429 and 44% of them (631) were transmitting data over the GTS.(The number and location of BUOY reports received in Toulouse during October 1996 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 to identify data sparse areas for each kind of geophysical variable. The index is representative of how the requirements (such as of WWW, WCRP or GOOS) 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 Gilmore, Wallops Island and Lannion. No changes have been made in the Japanese and Australian centres. They are periodically upgraded to have the same capabilities as the global centres in terms of access to data dissemination. It is planned to receive the regional data acquired by an antenna (Météo France-Orstom) in La Réunion Island.

Roughly 60% of Argos platforms are within the real-time coverage of Gilmore, Wallops Island and Lannion. For these platforms, over 95% of the reports are provided in under one hour (see Figure 1). For the other 40% of the transmitters, more than 80% of the data are available to the users within three hours (see Figure 2).

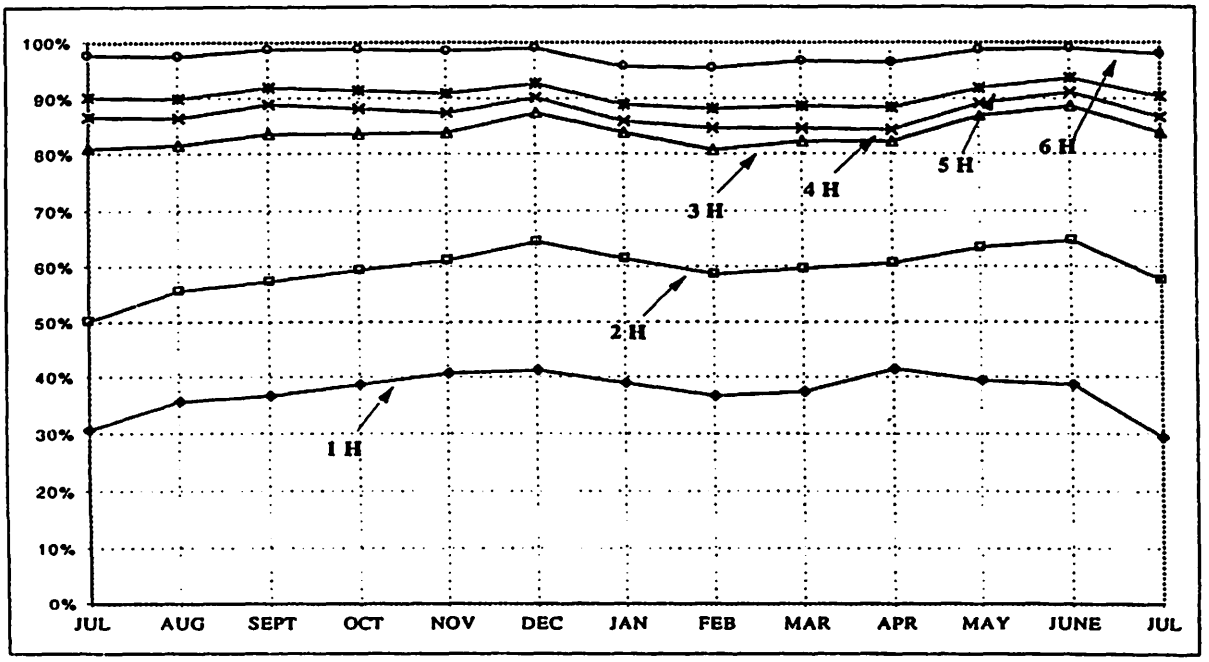

Figure 1 - Real-time coverage

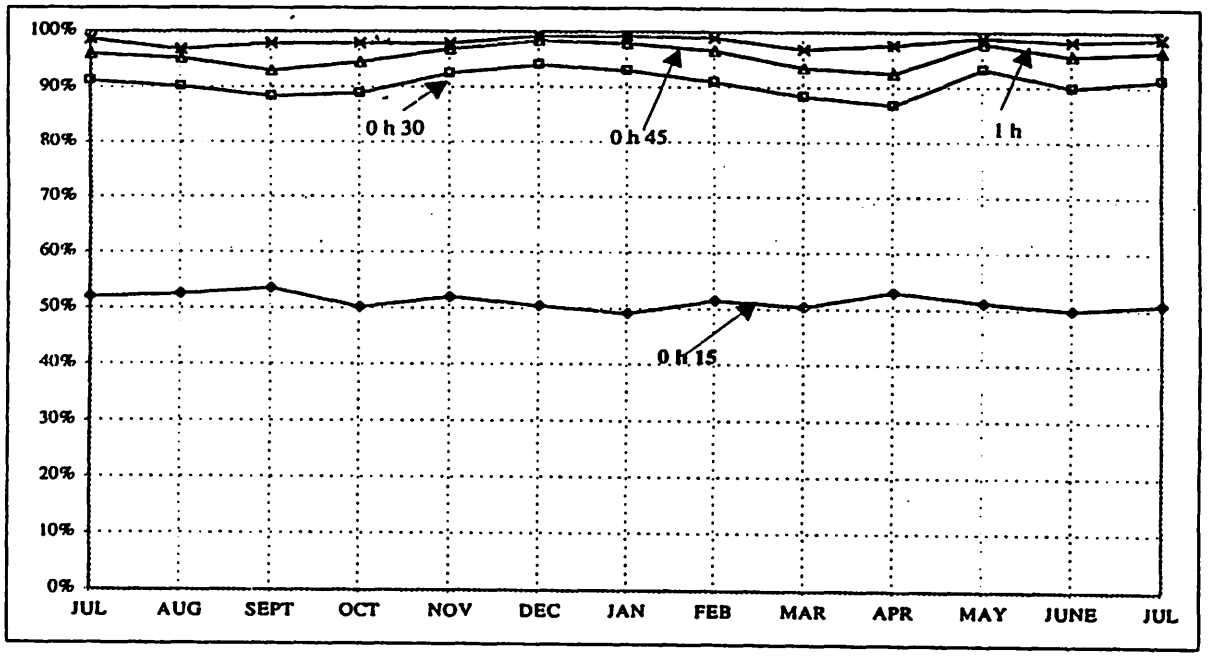

Figure 2 - Global coverage

3. DATA QUALITY

One of the principal aims of the Panel is to encourage operators of drifting buoys and users of buoy data to improve the quality of data at source and through the processing chain. The statistics gathered throughout the year show that the improvement in quality of surface pressure data disseminated over the GTS noted last year has been maintained and mean RMS differences of the data compared with ECMWF analyses have stabilized at around 1.2 hPa (see Annex VI).

Such a result is likely attributable, at least in part, to the implementation of the quality control guidelines for GTS data. These guidelines were adopted by the Panel at its seventh session (Toulouse, October 1991) for implementation on a trial basis as from 1 January 1992. They are based on an electronic distribution list maintained through Internet, where principal meteorological

or oceanographic centres responsible for GTS buoy data quality control deposit status change proposals.The quality control guidelines for GTS data was updated and approved by the eleventh session of the DBCP. These updated guidelines are attached as Annex VII.

The panel also decided to established a World Wide Web server dedicated to the DBCP. The server is maintained at the NOAA National Ocean Service (NOS) since February 1995. It has been substantially upgraded during the intersessional period in cooperation between the technical coordinator and the NOS.

4. DATA ARCHIVAL

The Marine Environmental Data Service (MEDS) in Canada became a 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. In addition, Annex VIII contains the drifting buoy track charts prepared by MEDS for the months of July to October 1996.

5. TECHNICAL DEVELOPMENTS

5.1 Combined meteorological/oceanographic drifting buoys

Since its third session, the DBCP has been increasingly involved in efforts to persuade meteorologists and oceanographers to collaborate on combined meteorological and oceanographic drifting buoys. The Global Drifter Centre (GDC) at the Scrips Institution of Oceanography, La Jolla, of the WOCE and TOGA Global Surface Velocity Programme (SVP) was responsible for the development of a low-cost Lagrangian drifter equipped with a barometer port.

At its twelfth session (Henley-on-Thames, October 1996), the Panel reviewed the results of the second DBCP-SIO Workshop on SVP Barometer Drifter Evaluation (New Orleans, May 1995). It recognized that the SVP-B drifter had now become an established and largely reliable technology, and was already in widespread use. It welcomed this situation, urged continuing analysis and refinement of the drifter, and also urged that meteorologists and oceanographers should cooperate in the use of the platform wherever possible, to the benefit of all programme requirements. At the same time, the Panel noted from the preceding technical workshop the development work now underway to obtain other types of data, such as wind speed and direction, from the SVP-B drifter. It expressed considerable interest in this work, in view of the potential value to operational meteorology and global climate studies, urged that it should continue, and requested that an update on the work should be provided to DBCP-XIII.

A list of current SVP-B manufacturers is given in Annex IX for information.

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 sensors. The histogram reproduced in Annex X shows the results of this study.

5.3 Requirements for GTS distribution of BUOY data

On the basis of the DBCP eleventh session request, its sub-group on codes met in Geneva (May, 1996) and undertook a study of the requirements for GTS distribution of buoy data in BUFR. This work is ongoing.

5.4 Impacts of buoy data on Numerical Weather Prediction

The DBCP at its eleventh session requested that further studies should be considered on the impact of buoy data on operational meteorological analyses and forecasts. In this context a study had been undertaken on its behalf by NCEP, NOOA,USA, involving parallel runs of its global atmospheric model, with and without buoy data, for particular months. The study had shown overall no significant negative or positive impact of the buoy data on the 1000 hPa and 500 hPa height, which was a not unexpected result and similar to that for other observational data, including from satellites, under the same conditions.

The technical note reproduced in Annex XI shows the results of this study in detail.

6. COMMUNICATION SYSTEM STATUS

6.1 Argos system

6.1.1 *Space segment*

Two satellites are operational: NOAA-12(D) (launched, 14 may 1991) and NOAA-14(G) (launched, 30 December 1994). Since the failure of NOAA-9 in August 1995, NOAA-11 partially became the third satellite. NOAA-10(G) (launched, 17 September 1987) with the on-board Argos equipment could be operational again in case of failure of NOAA-12 or NOAA-14.

6.1.2 *Ground segment*

The ground stations Gilmore Creek, Wallops Island and Lannion are fully operational and give complete satisfaction for NOAA-12 and NOAA-14. Australian ground stations (Perth, Darwin, Casey and Melbourne) operated by the Bureau of Meteorology are also tracking these satellites in terms of local area coverage. Thanks to the good telecommunication link between France and USA, the Argos centres are receiving and processing the real time telemetry acquired by the ground station Lannion and issued by NOAA-11.

The Argos Global Processing Centres in Toulouse and Landover were operational over 99.5% of the time because of the mutual redundancy of the centres.

6.1.3 *Argos improvements*

After implementing a new, distributed, computer architecture, CLS/Service Argos has begun to replace the VAX computers by the new generation of DEC 64-bit machines, which should decrease the processing time of the Argos data. A special effort has been made to improve the local area network. New bridges and gateways have been installed.

CLS/Argos service has a plan to use the Meteo France and Orstom antennas in La Réunion, which would greatly improve the coverage of the Indian ocean and would reduce the delays. Argos also intends to implement its own S-band antenna in Landover in order to get the local coverage of the American east coast from the third satellite.

The French processing centre is now connected to the Internet network and users, through TELMET (interactive session), can access Argos dissemination and their platform data and also send messages via e-mail. All Argos centres continue to be connected to the public network and can be accessed as previously.

7. ADMINISTRATIVE MATTERS

7.1 Action groups

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	Deutscher Wetterdienst
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

EGOS maintains an operational drifting buoy programme in the North Atlantic. Drifting buoys are deployed in two areas, north of 50°N referred to as EGOS North and an area to the south of 50°N referred as EGOS South. About 20-30 new deployments are made annually. As at 1 August 1996 (for example) a total of 22 EGOS drifting and seven moored buoys were operational.

The full report by EGOS is attached as part of 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 (October 1991). The following organizations are participating in IABP:

Canada	Environment Canada, Canadian Coast Guard, Institute of Ocean Science, Marine Environmental Data Service
Finland	Arctic Centre, 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. Michelsen Research AS, Nansen Environmental and Remote Sensing Centre, Norske Polarinstitutt, Norwegian Meteorological Institute
Russian Federation	Arctic and Antarctic Research Institute, Russian Federal Service for 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 National Science Foundation, the National Oceanic and Atmospheric Administration, the Office of

	Naval Research and the US Coast Guard),Pacific Marine Environmental Laboratory, Polar Science Centre of the Applied Physics Laboratory of the University of Washington, Naval Oceanographic Office, Naval Meteorology and Oceanography Command.
International organizations	World Climate Research Programme of ICSU, IOC and WMO.

7.1.3 *International Programme for Antarctic Buoys (IPAB)* - IAPB was established in 1994 and become an action group of the DBCP in October 1994.The third session of the IPAB took place in Cambridge, August 1996 and discussed programme implementation.

The minutes of IPAB-I are reproduced in Annex II.

7.1.4 *International South Atlantic Buoy Programme (ISABP)* - Following an initiative by the DBCP in 1993, an International South Atlantic Buoy Programme was formally established, and held its first meeting in October 1994. Eleven institutions or agencies, from five countries (Argentina, Brazil, South Africa, United Kingdom, USA) are participants in the programme, whose technical co-ordination is undertaken by the South African Weather Bureau. The ISABP held its third session in Rio de Janeiro in October 1996. The programme is activelz seeking new participants, and plans its fourth session in 1997 to be held in the Caribbean area.

The report by the ISABP is reproduced in Annex II.

7.1.5 *International Buoy Programme for the Indian Ocean (IBPIO)* - At the initiative of the DBCP the IBPIO was formally established during 1996 and held its first meeting in La Réunion, September 1996. Nine institutions or agencies, from five countries (Australia, France, India, South Africa and USA) have agreed to be participants in the programme.

A fuller report on the IBPIO activities is to be found 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 recent sessions of the Panel:

- Eighth session (Paris, October 1992) - Australia, Canada, China, France, Iceland, Madagascar, Mexico, United Kingdom, USA
- Ninth session (Athens, October 1993) - Australia, Canada, France, Greece, Iceland, Netherlands, United Kingdom, USA
- Tenth session (La Jolla, November 1994) - Australia, Brazil, Canada, China, France, Greece, Iceland, Netherlands, South Africa, United Kingdom, USA.
- Eleventh session (Pretoria, 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

7.2.2 *National focal points* - The present list of national focal points for the DBCP is attached as Annex XII.

7.3 Technical coordinator

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 1996, while IOC/UNESCO has arranged contracts for the employment of the technical co-ordinator as well as for his logistic support.

Annex XIII contains financial statements as follows:

(a) Interium WMO Statement of Account 1996;

(b) Finalized IOC Statement of Account for the period 1 June 1995 to 31 May 1996.

For the financial year 1997-1998, the panel agreed the following draft budget, to which contributions will be made by eleven countries (Australia, Canada, France, Greece, Iceland, Ireland, Netherlands, New Zealand, Norway, South Africa, United Kingdom, USA):

EXPENDITURES	USD
IOC salary	90,000
Travel of technical coordinator	15,000
CLS/Service Argos	15,000
WMO costs	100
Travel of chairman/vice-chairman	10,000
Publications	9,000
Consultancies and other small items	3,000
Contingencies	2,037
TOTAL	144,137
INCOME	
Contributions	136,350
Carry-over 1996-1997	7,787
TOTAL	144,137

ANNEX I

NATIONAL REPORTS ON DATA BUOY ACTIVITIES

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

AUSTRALIA

Background

1. During the TOGA programme (1985 - 1994), the Bureau annually deployed up to six drifting buoys purchased from its capital program, plus another six supplied by the U.S. National Data Buoy Center (NDBC) as part of the Bureau's logistics support for TOGA . Since the cessation of TOGA, our objective has been to continue to deploy an equivalent number (ie. 12 buoys). Since 1994/95 FY, the capital allocation for buoy procurement has been increased to allow for this.

2. However, the actual number of deployments the Bureau is able to accomplish each year is also determined by the availability of Argos communication funding. The effect of current limitations on Argos funding is that the objective of twelve deployments will not be met this year. The 1996/97 program will be limited to a maximum of nine buoy deployments, as was the case last year (refer Attachment 2), plus the replacement of the Heard Island station.

Draft Deployment Plan for 96/97

3. A detailed outline of the proposed deployment plan is at Attachment 1.

4. This season's shipping opportunities offer key deployments for up to four buoys considered to be a high priority. They are:
(i) two routine deployments by the Japanese research vessel Shirase in the Southern Ocean,
(ii) a Heard Island voyage by RV Aurora Australis. This opportunity is unlikely to be available again for several years, and will enable deployment of up to two buoys below 50 degS, well to the west of Australia in the Southern Ocean. These deployments will be standard FGGE/TOGA style weighted-line drogued drifters, with pressure, and sea and air temperature sensors. Their natural lifetimes may be expected to exceed two years.

5. The remaining five possible deployments are discretionary, and will be a mix of standard FGGE/TOGA buoys, and WOCE/SVP drifters. Wind speed and wind direction sensors will be available on up to two buoys planned for deployment to the north west of Australia.

6. There is no plan to replace the moored buoy in the Gulf of Carpentaria. The buoy currently in the gulf (52623) will soon have operated for a full year and survived two cyclones. There is a small possibility it could fail this season. However, because of the limitation on Argos communications, a new deployment is not planned this year unless, or until the existing one fails. A replacement will be kept in readiness for this event, with approximately a 1 to 2 months outage estimated, subject to Australian Navy shipping availability.

7. The voyage to Heard Island by Aurora Australis also provides an opportunity to replace at least one of the Argos DCPs at either, or both Atlas Cove and Spit Bay. These have been an important contribution to Southern Ocean observations for over a decade. They use drifting buoy technology, and measure pressure and temperature only.

8. The draft plan also includes deployment of buoys on behalf of AOML. The Bureau has agreed to provide deployment support for the NOAA Atlantic Oceanographic and Meteorological Laboratories (AOML) in Miami USA. AOML is delivering approximately six barometer buoys per annum for deployment in pre-determined areas.

9. Actual deployment locations, as in the past, will be dependent on the availability of suitable shipping travelling near the preferred deployment areas.

Attachment 1
Draft Deployment Plan for 1996/97

1. Bureau Buoys

The proposed deployment plan for Bureau buoys is as follows:

No	DATE	LAT	LONG	SHIP
1	Sep 96	19 S	109 E	ENCOUNTER BAY
2	Oct 96	13 S	120 E	still to be advised
3	Nov 96		32 S	100 E still to be advised
4	Nov 96		30 S	90 E still to be advised
5	Dec 96	43 S	110 E	RV SHIRASE
6	Dec 96	47 S	110 E	RV SHIRASE
7	Jan 97	19 S	109 E	still to be advised
8	Mar 97	61 S	74 E	AURORA AUSTRALIS
9	Mar 97	54 S	74 E	AURORA AUSTRALIS

Note:

Deployments No 8 and 9 will occur enroute to Heard Island. Future visits cannot be guaranteed.

2. Deployment Support for NOAA/AOML (USA) Drifters

The AOML request their buoys be deployed south of 35 S, essentially in the Southern Ocean. A tentative deployment plan is as follows:

No	DATE	LAT	LONG	SHIP
1	Dec 96	50 S	120 E	AURORA AUSTRALIS
2	Dec 96	57 S	90 E	AURORA AUSTRALIS
3	Dec 96	51 S	110 E	RV SHIRASE
4	Dec 96	55 S	110 E	RV SHIRASE
5	Feb 97	45 S	90 E	still to be advised
6	Feb 97	45 S	80 E	still to be advised

1. Thirteen deployments were completed during 1995/96, comprising nine Bureau buoys, and four AOML (Atlantic Oceanographic and Meteorological Laboratory), USA. buoys. Two of the Bureau buoys were fitted with wind speed and wind direction sensors and one each was deployed in the Gulf of Carpentaria and in the Indian Ocean to the north west of Australia.

2. The list below shows the details of all buoys deployed during the 1995/96 season. Of the nine Bureau buoys, buoy 56527 failed soon after deployment and, 53547 (ex TOGA) lasted only a couple of months. The remaining buoys are all still transmitting.

No	WMO	OWNER	DATE	LAT	LONG	SHIP
1	56523	BoM	23/7/95	19.06 S	109.03 E	ANRO AUSTRALIA
2	53547	BoM	05/9/95	13.00 S	121.00 E	HMAS DUBBO
3	52623	BoM	19/10/95	13.00 S	139.00 E	HMAS BENDIGO
4	56601	AOML	06/12/94	43.14 S	79.14 E	AUSTRALIAN VENTURE
5	56524	BoM	05/12/95	41.99 S	108.87 E	RV SHIRASE
6	56525	BoM	06/12/95	46.52 S	106.40 E	RV SHIRASE
7	56919	AOML	08/12/95	54.99 S	99.98 E	RV SHIRASE
8	53548	BoM	29/1/96	13.07 S	120.05 E	HMAS WOLLONGONG
9	56602	AOML	29/1/96	27.00 S	90.00 E	PRIMERA PEAK
10	56526	BoM	15/2/96	19.60 S	109.50 E	ANRO AUSTRALIA
11	56527	BoM	27/2/96	49.85 S	88.78 E	AUSTRALIAN VENTURE
12	56606	AOML	29/4/96	55.00 S	128.04 E	AURORA AUSTRALIS
13	56528	BoM	24/5/96	40.50 S	90.00 E	AUSTRALIAN VENTURE

CANADA

Year: **1996 (Sept. 1/95 - Aug. 31/96)**

CURRENT PROGRAMS:

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

Number and type of buoys:

a) Deployed during year:	3 Standard Metocean drifters 27 WOCE drifters (provided by the Global Drifter Centre NOAA/AOML)
a) Operational (31/08/96):	3 moored Six Metre NOMAD buoys 13 moored Three Metre Discus buoys 5 Standard drifters WOCE drifters will be included in NOAA/AOML report
a) Reporting on GTS (31/08/96):	16 moored buoys 5 drifters
Main deployment area:	North Eastern Pacific Ocean

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

a) Deployed during year:	3 moored buoys (open water season) 4 arctic drifters (Arctic Basin Ice)
a) Operational (31/08/96):	3 moored buoys 2 drifters
a) Reporting on GTS (31/08/96):	3 moored buoys 2 drifters
Main deployment area:	one 3-metre buoy Great Slave Lake deployed (annually) July, retrieved (annually) October. two buoys Lake Winnipeg (WD drifter buoy South Basin and Hexoid buoy North Basin) deployed (annually) in June, retrieved (annually) in October. 4 drifters on Arctic Ice Basin.

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

a) Deployed during year:	1 Metocean Standard CALIB in Beaufort sea for the IABP. 3 Metocean Standard CALIB in NWRN Baffin Bay. 1 Metocean Lithium with Pressure CALIB in Beaufort Sea. 3 Metocean Standard CALIB in Gulf of St-Lawrence.
a) Operational (31/08/96):	1 Lithium battery CALIB with Pressure sensor
a) Reporting on GTS (31/08/96):	1 Lithium battery CALIB
Main deployment area:	Arctic waters - Beaufort Sea

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

Number and type of buoys:

a) Deployed during year:	two 3 meters DISCUS
a) Operational (31/08/96):	six 6 meter NOMADS one 3 meter DISCUS
a) Reporting on GTS (31/08/96):	all

Main deployment area: **North West Atlantic**

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

Number and type of buoys:

a) Deployed during year: 5 three metre buoys
1 twelve metre buoy

a) Operational (31/08/96): 6 buoys

a) Reporting on GTS (31/08/96): all

Main deployment area:

PLANNED PROGRAMS:

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

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

Purpose of programme :

a) Operational: 0 Moored buoys
5 Standard drifters

a) Developmental: 1 Six metre NOMAD moored buoy - (Continuation of Severe Wave Study)
1 Three metre discus buoy - (Optical sensors for Biological monitoring)

a) Met/Ocean research: As above.

Main deployment area: North Eastern Pacific Ocean

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

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

Purpose of programme :

a) Moored buoys

« The annual open water season deployment and retrieval of buoys in Great Slave lake and lake Winnipeg will continue ».

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

a) Operational: 1 moored
1 WD drifter (moored)
1 hexoid

a) Developmental: nil

a) Met/Ocean research: nil.

Main deployment area: Great Slave Lake (3-metre buoy) and Lake Winnipeg (WD drifter and hexoid).

a) Drifting buoys on Arctic Basin ice

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

a) **Operational:** From 4 to 6 buoys depending on 'holes' in the buoy array across the southeastern Arctic Ocean / the Beaufort and deployment opportunities comprised of: 2 or 3 CALIB buoys via air-drop (September 1996, and February 1997) plus 1 or 2 in-house assembled buoys and 1

U.S. National Ice Centre Zeno via landing on ice operating Twin Otter from Mould Bay or perhaps Tuktoyaktuk.

b) **Developmental:** will continue to experiment with the design of inhouse buoys including making combination battery / solar panel power supply as one done with the inhouse buoy deployed March 1996 but lost July 1996

c) **Met/Ocean research:** nil

Main deployment area: on ice southeastern Arctic Ocean and the Canadian Beaufort east of 141W

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

a)**Operational:** 3 Metocean Standard CALIB.
2 Metocean Lithium Battery CALIB.
1 Metocean Lithium Battery with Press. sensor.
Up to 7 Metocean Standard CALIB.

a)**Developmental:** 1 CALIB with Pressure sensor in Western Baffin Bay.

a)**Met/Ocean research:** Possibly 1 Standard CALIB to be deployed on an Iceberg in Southern Davis Strait this Fall.

Main deployment area: Eastern Arctic and Gulf/Nfld 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: none

a) Developmental: none

a) 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: 7 add one additional 12 metre
(full complement in 1997 five 3D and two 12D)

a) Developmental: none

a) Met/Ocean research: 1 if the 7 will carry approximately 4 scientific experiments

Main deployment area:

TECHNICAL DEVELOPMENTS:

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

a) **Buoy design:** Second solar powered buoy deployed May/96
Improvements to wind mast design to simplify exchange of anemometers at sea.

a) **Instrumentation:** Global Positioning Systems on all moored buoys.

B Moored Buoy Systems : **CANADA** - Prairie and Northern Region

a) **Buoy design**: Environment Canada, Prairie and Northern Region personnel expect to 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 Ocean environment and will have a power system that will last 2 or 3 years

a) **Instrumentation:** Great Slave Lake and Lake Winnipeg North Basin buoys provide air pressure, air temperature, water surface temperature, wind speed and direction, and wave height. Lake Winnipeg South Basin buoy provides meteorological but no wave data.

B Drifting Buoy system : **CANADA** - Prairie and Northern Region

a) **Buoy design:** one CALIB (Beaufort Sea for EC deployed by DND Feb.1996
one GPS equipped /in-house assembled EC buoy deployed off Prince Patrick Island via landing on ice in Twin Otter March 1996
one ZENO buoy deployed for U.S. NIC by EC personnel - same flight as GPS buoy deployment March 1996
one CALIB surface deployed for EC by Institute of Ocean Sciences personnel April 1996

a) **Instrumentation:**
b) **Others** :

1. Ice movement April through July was not kind to our buoys. Nor has the ice motion been according to the climatological Beaufort gyre. Late June 1996 we lost the Calib buoy which was deployed in April off Banks Island due, it is speculated. to melt and breakup of the ice on which it resided and late July 1996 we lost, to the southwest of Prince Patrick Island, the GPS and battery/solar panel equipped buoy which was deployed March 1996 about 130 nm northwest of Prince Patrick Island.

2. 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 and Canadian Meteorological Centre. The data is also used operationally by Canadian Ice Service to provide general ice motion data.

3. 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.

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

a) **Beacon design:** Using mostly Lithium Batteries for northern beacons.

b) **Instrumentation:** Pressure and temperature sensors on 1 CALIB in NW BaffinBay (temperature may be unreliable due to proximity of sensor to the ice surface).

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

a) **Buoy design:**

a) **Instrumentation**: no changes in systems

D Drifting Buoy system : **CANADA - ATLANTIC REGION**

a) **Buoy design:** No drifters
a) **Instrumentation:**
b) **Others** :

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

a) **Buoy design:**

a) **Instrumentation**: two buoys have been fitted with EC new buoy payload the AXYS WATCHMAN 100 (REPACES THE ZENO)

PUBLICATIONS:

A CANADA - Pacific and Yukon Region - North East Pacific

Monthly Moored Buoy Status Reports
Monthly Drifting buoy Status Report and Drift Track Map
Annual ODAS Buoy Service Reports - Pacific and Yukon Region

B CANADA - Prairie and Northern Region

nil.

C CANADA - Canadian Ice Services

None to date but we are being acknowledged for our participation in the Arctic Basin Buoys and the IAPB. First report to come by end of fiscal year.

D CANADA - Atlantic Region

none

E CANADA - Ontario Region

none

SPECIAL COMMENTS:

A CANADA - Pacific and Yukon Region - North East Pacific

a) **Quality of buoy data:**	Good
b) **Communication:**	Good. Over 91% of all possible moored buoy data delivered to users
c) **Buoy Lifetimes**:	Moored buoys - up to 3 years between battery changes Drifting buoys - Over 2 years
d) **Other:**	Nil

B CANADA - Prairie and Northern Region

a) **Quality of buoy data:** No longer put temperature as provide by the CALIB buoys on circuit. The temperatures from the CALIBs are an internal temperature that is neither a representative air temperature nor a representative ice surface temperature.

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:** CALIBs with lithium batteries have life of about 1 year I- if they survive summer melt and breakup of the ice.

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.

C CANADA - Canadian Ice Services

a) **Quality of buoy data:** Good and reliable.

b) **Communication**: Good and reliable.

c) **Buoy Lifetimes:** 3 months for Standard, 1 year for Lithium batteries.

d) **Other**. Nil.

D CANADA - Atlantic Region

a) **Quality of buoy data:** Some sensor failures.

b) **Communication:** Power failures have caused data transmissions to shift to ARGOS backup system. Three buoys are now reporting via ARGOS , 44137, 44138, 44139.

c) **Buoy Lifetimes:**
d) **Other:**

E **CANADA - Ontario Region**

a) **Quality of buoy data:**
b) **Communication:**
c) **Buoy Lifetimes:**
d) **Other:**

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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K1A 0H3
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D **CANADA - Atlantic Region**

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attn : Mike McNeil

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E **CANADA - Ontario Region**

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F **CANADA - National Marine Focal Point**

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G **INTERNATIONAL - WMO**

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CHINA

Report on Current and Planned Programmes for the People's Republic of China State Oceanic Administration.

Country: People's Republic of China

Year: November 1994 - September 1996

In support of marine weather forecasts, ocean, coastal, and marine climate studies, the People's Republic of China pay more attention to data buoys. The development study begins in the middle 60s, and it has made a great progress during these 30 years, especially in these two years. For example, we reconstructed the section of sensors and power, now they are much better than before. Data of the buoy are widely used in the field of public forecast service and special forecast service. In 1995 all the data buoys were equiped solar power, in the same year the first drifting buoy was deployed and successfully worked 6 month in the sea.

1. Current Programmes

1.1 Number and Main Deployment Areas:

State Oceanic Administration has 10 sets of mooring buoys, 9 of them are using in these two years, two large size buoys and one small size buoy in each branch. It also has 11 data buoy stations, which are mainly distributed over the North China Sea, the East China Sea and the South China Sea. Among them there are 3 buoy stations working continuously during the period of November 1994 to September 1996. Other stations are for provisional use.

1.2 Type of Buoys

The State Oceanic Administration deployed three style data

buoys for operational use in the last two years: the small size buoy with 3m diameter, large size buoy with 10m diameter and Marex. All these buoys were manufacctured by Institute of Marine Technology, SOA and Shandong Institute of Marine Instrument and were instrumented for wind, air temperature, air pressure, sea surface temperature, wave hight and wave period, and current etc.. By the end of last year, the solar power technics had been used for additional power supply.

1.3 Communication

Of the three working moored buoys, there are one transmitting data through INMARSAT , two through short wave communication and positioning with Argos.

1.4 Agency of programmes

The People's Republic of China sponsors of the programs supporting these data buoys include:

State Oceanic Administration
North China Sea, East China Sea and South China Sea Branch, SOA
National Marine Forecasting Center
National Marine Data Center
Institute of Marine Technology, SOA
Shandong Institute of Marine Instrument

1.5 Publications

Papers of general development of marine monitoring and data buoy made by SOA; Journal of Marine Technology ; Handbook of working marine data buoy; The specification of communication of data buoy ect..

2. Planning Programmes

To maintain the existing network, the State Oceanic Administration plans to build 6 sets of mooring buoys and deploy them in the next few years. At the same time, we'll pay more attention to the field of drifting buoy. If it is possible we'll develop new sensors such as salinity, dissolved oxygen and current.

3. Special Comments

We hope to strengthen international cooperation, especially assist the developing countries. It will not only do good to the national network, but also make great progress to GOOS.

FRANCE

Year: **1 September 1996 - 31 August 1997**

CURRENT PROGRAMMES

A. MÉTÉO-FRANCE

Number and type of buoys:

(a) 15 drifting buoys (most of them drogued) were deployed in last 12 months:
- 4 Marisonde B (air pressure + barometric tendancy + SST),
- 4 Marisonde's G (as B + wind),
- 1 Marisonde BT (as B + subsurface temperature) and
- 6 SVP barometer drifters;

(b) 14 buoys[1] were operational at 31 August;

(c) 14 buoys[1] were reporting on GTS at 31 August.

Purposes of programme:

(a) to provide oceanographical and meteorological observations in real time to Weather Forecast Centres (SIMBAD network, French West Indies, Indian Ocean...);

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

Main deployment area:

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

B. LODYC (CARIOCA programme)

Number and type of buoys:

(a) Three prototypes of CARIOCA drifting buoy were deployed in last 12 months.

(b) 2 buoys were operational at 31 August;

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

Purpose of programme:

(c) To develope a buoy able to measure CO_2 concentrations at the ocean-atmosphere interface (see Technical developments). Such buoys will be used in the frame of GOOS.

Deployment area:

North Atlantic and Mediterranean Sea.

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[1] Including the UK/French moored buoy « Brittany » and two DATAWELL waveriders in French West Indies.

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

Number and type of buoys:

(a) STNMTE operates a Network of 6 omnidirectional wave moored buoys (DATAWELL) and 2 directional ones (SEATEX WAVESCAN and DATAWELL).

(b) 6 buoys were operational at 31 August (4 omnidirectional + 2 directional);

(c) none was reporting on GTS.

Purpose of programme:

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

Main deployment area:

French coasts.

PLANNED PROGRAMMES (next 12 months)

A. MÉTÉO-FRANCE

Number and type of buoys:

About 22 buoys will be deployed in next 12 months:

- 8 CEIS Marisonde's and/or SVP-Barometer drifters for operational purposes in SIMBAD network;
- 5 SVP-Barometer drifters in the frame of FASTEX experiment;
- 6 CEIS Marisonde's and/or SVP-Barometer in the Indian Ocean;
- one moored buoy in the Biscay Bay (off France);
- 2 waveriders in West Indies and 2 or 3 buoys for technical tests.

Purposes of programme:

(a) to provide oceanographical and meteorological observations in real time to Weather Forecast Centres (SIMBAD project, West Indies, Indian Ocean...);

(c) to test and validate new equipments.

Main deployment areas:

North Atlantic (Off Europe) and Indian Ocean

TECHNICAL DEVELOPMENTS

(b) Instrumentation

(i) Meteo-France continues to participate to the evaluation of SVP pressure drifters developed by the Global Drifter Center (USA). Six drifters from 2 manufacturers were deployed off France in February 1996. Some problems of reliability on air pressure measurements occured for one of the buoys provided

by Technocean and 3 drifters (over 4 provided by Metocean) ceased to emit for an unknown reason. It is planned to deploy 3 additional drifters in September and 9 new drifters were ordered to Metocean.

(ii) Air temperature measurements continue to be evaluated on Marisonde G buoys.

(iii) Meteo-France will participate in the next months to the evaluation of wind measurements on SVP drifters. One prototype was ordered.

(iv) A project of CO_2 concentrations measurements (inside the water and the atmosphere) from drifting buoys is managed by LODYC in co-operation with IFREMER and a French manufacturer in the frame of a EUROMAR programme. Three prototypes of this buoy called CARIOCA (CARbon Interface OCéan Atmosphère) were deployed in last 12 months (2 moored and one drifting). At present they only measure CO_2 dissolved in water, fluorimetry and sea temperature but the buoy will be soon equiped with a Young anemometer and a sensor to measure CO_2 concentrations in the atmosphere.

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

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).

SPECIAL COMMENTS

(a) Buoy QC

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.html*.

(d) Other

In 1996, Meteo-France funded 10 barometers to be added to the SVP drifters fated to be deployed in the Indian Ocean. This action will be renewed in 1997.

ICELAND

Year: 1996

CURRENT PROGRAMMES

Tvo Icelandic institutions are currently using data buoys for operational and research purposes:

The Icelandic Meteorological Office participates in the European Group on Ocean Stations - EGOS, an Action Group of DBCP. A majority of EGOS drifting buoys are deployed from Icelandic ships sailing from Iceland to USA. A predeployment test is given to these buoys in Reykjavik with special emphasis on the pressure sensor and the satellite communication. One PTT-year is provided for use for refurbished EGOS buoys.

Considerable near-real-time quality control of buoys in the EGOS Programme is carried out by the Icelandic Meteorological Office, including comparison of the data received via the three LUTs used in the Programme. Errors and malfunctioning of EGOS buoys are reported to the Technical Secretary of EGOS for further action.

The Icelandic Meteorological Office operates an automatic Internet mail distribution list: "Buoy-qc@vedur.is" for distribution of information and comments on buoy data quality. Monthly statistics on data quality are also distributed to subscribers. To put your name on the distribution list you send an e-mail to the Internet address "Buoy-qc-request@vedur.is" with the text "Subscribe". To get further information you send the text "Help" to the above Internet address.

The Marine Research Institute in Reykjavik has in co-operation with Scripps Institution of Oceanography in La Jolla, USA, an ongoing Programme for deployment of surface velocity drifters in Icelandic Waters during each of the years 1995, 1996 and 1997. The program includes 10 locations for quarterly deployment of 40 drifters per year over a period of three years, or totally 120 drifters.

Year: **1995, 1996, 1997**

CURRENT PROGRAMMES

A. Agency or programme:

Number and type of buoys: (a) deployed during year:
40 Clear Water and Technocean drifters

(b) operational at 31 August: 33

(c) reporting on GTS at 31 August: 16

Purpose of programme: (a) operational:

(b) met/ocean research: x

(c) developmental:

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

B. Agency or programme: Marine Research Institute 1119
Scripps Institute of Oceanography 1325
(as above, repeat as often as necessary)

PLANNED PROGRAMMES

A. Agency or programme:

Number and type of buoys planned for deployment in next 12 months:
40 Clear Water and Technocean drifters

Purpose of programme: (a) operational:

(b) met/ocean research: x

(c) developmental:

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

B. Agency or programme: Marine Research Institute 1119
Scripps Institute of Oceanography 1325

(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.)*

SPECIAL COMMENTS (if any)

(a) Quality of buoy data: OK

(b) Communications: OK

(c) Buoy lifetimes: A few months up to one and half year. Failures mainly due to drift-ice

(d) Other:

JAPAN

Year: 1996

CURRENT PROGRAMME

A. Maritime Safety Agency

Number and type of buoys:

(a) deployed during year: 15 surface drifters with holey sock drogues and SST sensors

(b) operational at 31 August: 10

(c) reporting on GTS at 31 August: None

Purpose of programme: ocean research (ocean circulation)

Main deployment areas: North Pacific, Indian and Antarctic Oceans

B. Japan Meteorological Agency

Number and type of buoys:

(a) deployed during year:
- 2 surface drifters with holey sock drogues, SST sensors and crystal barometers
- 3 moored buoys with 13 maritime meteorological/oceanographic sensors

(b) operational at 31 August:
drifters: None
moored buoys: 3

(c) reporting on GTS at 31 August:
drifters: None
moored buoys: 3

Purpose of programme:
drifters: ocean research and development of a crystal barometer
moored buoys: operational meteorological/oceanographic observation

Main deployment areas:
drifters: North Pacific
moored buoys: seas around Japan

C. Japan Marine Science and Technology Center

Number and type of buoys:

(a) deployed during year:
(Type 1) 1 drifter (Ice-Ocean Environmental Buoy)
(Type 2) 2 acoustic tomography moorings (200 Hz type)
(Type 3) 1 subsurface current meter mooring
(Type 4) 6 subsurface ADCP moorings

(b) operational at 31 August:
(Type1) 1
(Type 2) 2
(Type 3) 1
(Type 4) 6

(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

Main deployment area:

(Type 1)	Arctic Ocean (Beaufort Gyre)
(Type 2)	western tropical Pacific
(Type 3)	south of Japan (Kuroshio recirculation area)
(Type 4)	western tropical Pacific

D. Japan Fishery Agency

Number and type of buoys:

(a) deployed during year:
- 1 surface drifter with upward underwater radiance, downward air irradiance and SST sensors, without drogue
- 4 surface drifters without instruments, with drogues
- 5 moored buoys with current meters and/or sediment traps

(b) operational at 31 August: 4 surface drifters and 5 moored buoys

(c) reporting on GTS at 31 August: None

Purpose of programme:

drifters:	ocean research (ocean circulation and sea surface optics for remote sensing)
moored buoys:	ocean research (ocean circulation and transport of materials)

Main deployment areas:

drifters:	seas around Japan and western North Pacific
moored buoys:	seas around Japan

E. University of Tokyo

Number and type of buoys:

(a) deployed during year: 9 compact surface drifters with drogues

(b) operational at 31 August: None

(c) reporting on GTS at 31 August: None

Purpose of programme: ocean research (Kuroshio warm water and transport processes of larva of eels)

Main deployment areas: Kuroshio extension area (6 drifters) and North Equatorial Current (3 drifters)

F. Tokai University

Number and type of buoys:

(a) deployed during year:	4 surface drifters with SST sensors, without drogues
(b) operational at 31 August:	4
(c) reporting on GTS at 31 August:	None
Purpose of programme:	ocean research to trace the flow of ocean debris
Main deployment areas:	North Pacific

G. National Space Development Agency of Japan

Number and type of buoys:	
(a) deployed during year:	1 moored buoy. Observation items are wave height and period, wave direction, wind speed and direction, air pressure, water temperature, amount of chlorophyll-a, radiance and irradiance under water, and radiance from sky.
(b) operational at 31 August:	1
(c) reporting on GTS at 31 August:	None
Purpose of programme:	ocean and atmosphere research (calibration and validation for ADEOS satellite)
Main deployment areas:	Yamato bank (in the Japan Sea)

PLANNED PROGRAMME

A. Maritime Safety Agency

Number and type of buoys planned for deployment in next 12 months:	15 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

B. Japan Meteorological Agency

Number and type of buoys planned for deployment in next 12 months:	3 moored buoys with 13 maritime meteorological/oceanographic sensors
Purpose of programme:	operational meteorological/oceanographic observation
Main deployment areas:	seas around Japan

C. Japan Marine Science and Technology Center

Number and type of buoys planned for deployment in next 12 months:	(Type 1)	1 drifter (Ice-Ocean Environmental Buoy)
	(Type 3)	1 subsurface current meter mooring

	(Type 4)	7 subsurface ADCP moorings
	(Type 5)	3 acoustic tomography moorings (400 Hz type)
	(Type 6)	4 surface meteorological and subsurface oceanographic moorings
Purpose of programme:	(Type 1)	met/sea-ice/ocean research
	(Type 3)	ocean research
	(Type 4)	ocean research
	(Type 5)	ocean research
	(Type 6)	met/ocean research
Main deployment area:	(Type 1)	Arctic Ocean (Beaufort Gyre)
	(Type 3)	south of Japan (Kuroshio recirculation area)
	(Type 4)	western tropical Pacific
	(Type 5)	south of Japan
	(Type 6)	western tropical Pacific

D. Japan Fishery Agency

Number and type of buoys planned for deployment in next 12 months:	- 2 surface drifters with upward underwater radiance, downward air irradiance and SST sensors, without drogues - 4 surface drifters without instruments, with drogues - 5 moored buoys with current meters and/or sediment traps	
Purpose of programme:	drifters:	ocean research (ocean circulation and sea surface optics for remote sensing)
	moored buoys:	ocean research (ocean circulation and transport of materials)
Main deployment areas:	drifters:	seas around Japan and western North Pacific
	moored buoys:	seas around Japan

E. 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 area

F. Tokai University

TBD

G. National Space Development Agency of Japan

Number and types of buoys planned for deployment in next 12 months:	1 moored buoy (until June 1997)
Purpose of programme:	ocean and atmosphere research (calibration and validation for ADEOS satellite)

Main deployment areas: Yamato bank (in the Japan Sea)

TECHNICAL DEVELOPMENTS

A. National Space Development Agency of Japan

(b) Instrumentation: Development of ocean color sensors for ADEOS satellite sensor (OCTS)

NETHERLANDS

Year: 1996

CURRENT PROGRAMMES

A. **Agency or programme:** Royal Netherlands Meteorological Institute (KNMI)

Number and type of buoys:
(a) deployed during year: 2 (CS)
(b) operational at 31 August: 1
(c) reporting on GTS at 31 August: 1

Participation 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 (FGGE type)
(b) operational at 31 August: 2
(c) reporting on GTS at 31 August: 2

Purpose of programme: Study of the North Atlantic surface circulation under the terms of WOCE programme. For that reason, the kinematics of the inflow of warm and salinity Atlantic water into the Norwegian Sea is monitored, in order to identify the mean flow together with the eddy characteristics of the flow.
In a later stage, the research area was shifted towards the Bay of Biscay, where the attention was focussed on the properties of the Eastern Boundary Current along the continental slope.

Main deployment areas: North Atlantic

PLANNED PROGRAMMES

A. **Agency or programme:** KNMI

Number and type of buoys planned for deployment in next 12 months: 5

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: 5

Purpose of programme: Study of surface circulation

Main deployment areas: North Atlantic

TECHNICAL DEVELOPMENTS

(a) Buoy design:

(b) Instrumentation:

(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)

2. Otto L. and H.M. Van Aken (1996) - Surface circulation in the northeast Atlantic as observed with drifters. *Deep-Sea Research I, 43, 467-499*

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: -

NEW ZEALAND

Year 1996

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

Number and type of buoys:
(a) deployed during the year : 3 Drifters - 2 basic, 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

B. Agency : Meteorological Service of New Zealand Ltd (MSNZ)

Number and type of buoys:
(a) deployed during the year : 6 SVP-B drifters
(b) operational at 31 August : 6 SVP-B drifters
(c) reporting on GTS as at 31 August : 6 SVP-B, only 3 with AP data still on

Purpose of programme: To assist AOML Drifter Centre with deployments in the Southern Ocean.

Main deployment areas: Southern Pacific Ocean

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

Number and type of buoys planned for deployment in next 12 months: 4 drifters, or as many as required to maximise 7 PTT years of contracted time.

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

Main deployment areas: Tasman Sea

PUBLICATIONS
Report on examination of Technocean SVP-B buoys revealing Gore-tex breathing problem, February 1996, by John Burman.

SPECIAL COMMENTS

A. Quality of buoy data: see recovered buoys below

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

C. Buoy Lifetimes: Buoys deployed in recent years have achieved very good lifetimes. MSNZ buoys are deployed in the Tasman Sea, where the prevailing westerly currents eventually carry buoys back towards New Zealand making recovery of buoys possible. MSNZ has achieved about an 80% recovery rate and has been able to recycle buoys. Over the last seven years the same 16 buoys have been used to make 32 deployments, whilst maintaining a network of 7 operational buoys. Of the seven operational buoys MSNZ buoys, one is on its first deployment, two buoys are on their second deployment, three buoys are on their third deployment and one buoy is on its fourth deployment.
The high number of recoveries shortens individual buoy lifetimes. In MSNZ'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 7 operational buoys is 36.3 months. In the case of one buoy, #6439 its cumulative service over three deployments is 70 months.

D. Other: RECOVERED BUOYS

In the twelve months to 1 September 1996 MSNZ successfully recovered four buoys. Three of these were MSNZ WSD drifters and the fourth was a NDBC TOGA buoy. All four buoys were still fully operational and their positions were monitored daily as they neared the coastline. Two of the buoys were recovered off the coast by fishermen and boat operators using the latest Argos positions supplied by MSNZ. The other two buoys were recovered from the beach after coming ashore. The length of time each of the recovered buoys had been at sea was; 12months, 16 months, 20 months and 22 months. Three of the buoys were recovered from the New Zealand coastline and one from the Queensland coast of Australia. This buoy was returned to New Zealand on board a friendly Voluntary Reporting ship.

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 sensors flagged as defective during operational data monitoring.
Pressure Sensors : Post recovery calibrations on the four buoys showed their barometers (Paroscientific) were still within ± 0.1hPa over the pressure range 900 to 1050 hPa.
Temperature Sensors : One buoy had lost its air temperature housing on beaching. The air temperature output on another buoy had failed after 15 months at sea and examination of this buoy revealed that the anemometer support pillar containing the air temperature cable had been severed. The air and sea temperature sensors on the remaining buoys were checked and found to be satisfactory.
Wind Sensors : The wind speed data for one buoy had failed after 8 months and post recovery examination found the anemometer magnetic pick-off coil had gone open circuit. On another buoy the wind speed sensor failed after 15 months, but restored itself after one week. This was the same buoy that had suffered the severed support pillar and it is thought that for a short time the debris which had broken the pillar had interfered with the anemometer rotor. On the third WSD buoy, the wind speed and direction output had locked up one week after deployment. Post recovery examination confirmed eeprom failure on the wind board. Mechanically the anemometer bearings were still good. The bearings on these buoys were modified pre-deployment to give bearing surfaces of 4 x upper and 2 x lower compared to original design. Post recovery examination of the Digicourse compass sensors found all to be within spec.

All four buoys are suitable for refurbishment and will be re-deployed as required in the Tasman Sea. The deployment position for the TOGA buoy will be decided after consultation with NDBC.

SOUTH AFRICA

Past and planned activities

The purpose of the SAWB buoy programme

The South African Weather Bureau (SAWB) drifter programme is maintained only 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 South African drifter data is made available to AOML for archiving. The vast majority of deployments done by the SAWB are a mixture of SAWB and AOML SVP-B drifters.

SAWB activities for 1995/96

Twenty SAWB owned SVP-B drifters were deployed in the past year. In addition to these drifters, many drifters for AOML were also deployed in the past year.

- Seventeen drifters were deployed in the South Atlantic Ocean from an SA Navy vessels returning from the Antarctic.
- Five drifters were deployed during May on the annual voyage from Cape Town to Marion Island.
- In June 1996 two drifters were deployed on an VOS ship sailing between Cape Town and Rio de Janeiro.
- Six drifters were deployed between Cape Town and 50°South 15°West during the annual voyage between Cape Town and Gough Island.

Planned activities in 1996/97

The SAWB will during the 1996/1997 period contribute to both the Indian ocean and Atlantic ocean buoy programmes.

Drifters

The SAWB will deploy 25 SAWB owned drifters in 1997. Of these, 17 will b deployed in the Atlantic ocean, and 8 in the Indian Ocean.

Area	Number of drifters
Atlantic ocean	17
South Indian Ocean	8
Tropical Indian Ocean (Tropical cyclone season)	2
Total	25

All of these drifters will be of the SVP-B type, and with the exception of 5 drifters, all will be non duty cycle drifters.

Deployment opportunities

Several routine deployment opportunities are available for SAWB and other

participant use. These are:

- A Voyage in September/October 1996 from Cape Town to Gough Island (40°South, 010°West). Five day's dedicated buoy deployment time is available during this voyage.
- A voyage from Cape Town to 70°South, 002°West (Antarctic) in December 1996. This voyage will be used this year to deploy buoy's as indicated on the attached map.
- A voyage from Cape Town in October 1997 to 58°South 28°West. The positions for this deployment have not yet been determined.
- In January/February 1997 there will be two more voyages to the Antarctic. Deployments will be done during these voyages depending on the data gaps that exist at the time.
- In May 1997 there will be a voyage from Cape Town to Marion Island, during which deployments will be done.

The SAWB maintains close liaison with the SA Navy, and often deployment opportunities are available during navy cruises, which could be used to deploy drifters in areas as required by the SAWB.

The SAWB will continue, as in the past, continue to provide support by means of the Port Meteorological Officer in Durban, support to the NOAA SEAS programme.

Close liaison will be maintained with the IBPIO and IPAB. The SAWB is represented on both the steering committees of these programme's.

UNITED KINGDOM

CURRENT PROGRAMMES

Institute: **Meteorological Office**

Programme: EGOS

Number & type of buoys:

a) deployed during year: 15 TOGA style drifters + 13 moored

b) operational at 31 August: 20 TOGA style drifters + 13 moored

c) reporting on GTS at 31 August: 20 TOGA style drifters + 13 moored

Note: One of the moored buoys is a joint project between the UK Meteorological Office and Météo-France.

Purpose of programme: Operational meteorology, oceanography and climate research

Main deployment areas: North Atlantic and North Sea

Institute: **Meteorological Office**

Programme: IABP

Number & type of buoys:

a) deployed during year: 1 ice buoy (air-dropped)

b) operational at 31 August: 2

c) reporting on GTS at 31 August: 2

Purpose of programme: Operational meteorology, oceanography and climate research

Main deployment areas: Arctic Ocean

Institute: **Meteorological Office**

Programme: Low cost drifter evaluation

Number & type of buoys:

a) deployed during year: 1 SVP-B barometer drifters

b) operational at 31 August: 1

c) reporting on GTS at 31 August: 1

Purpose of programme: Evaluation: during the next year it is planned that these buoys will become operational

Main deployment areas: Central north Atlantic

Institute: Southampton Oceanography Centre

Programme: Surface currents

Number & type of buoys:

a) deployed during year: 1

b) operational at 31 August:

c) reporting on GTS at 31 August:

Purpose of programme: Met/ocean research

Main deployment areas:

Institute: Plymouth Marine Laboratory

Programme:

Number & type of buoys:

a) deployed during year: 2 drogued drifters, 2 ALACE floats

b) operational at 31 August:

c) reporting on GTS at 31 August:

Purpose of programme: Measurement of lagrangian flow

Main deployment areas: North Atlantic

Institute: Proudman Oceanographic Laboratory

Programme: MYRTLE

Number & type of buoys:

a) deployed during year: 1 data capsule with 6 IDs, active for 1 month

b) operational at 31 August:

c) reporting on GTS at 31 August:

Purpose of programme: Operational deep-sea tide gauge

Main deployment areas: South Atlantic / Drake Passage

Institute: Dunstaffnage Marine Laboratory

Programme: LOIS Shelf Edge Study

Number & type of buoys:

a) deployed during year: 43 SVP-type drifters

b) operational at 31 August: 30

c) reporting on GTS at 31 August:

Purpose of programme: Physical oceanography

Main deployment areas: Shelf edge west of Scotland

Institute: Ministry of Agriculture, Fisheries and Food

Programme: Irish Sea gyre

Number & type of buoys:

a) deployed during year: 12 drogued drifters

b) operational at 31 August: 2

c) reporting on GTS at 31 August:

Purpose of programme: Fisheries research

Main deployment areas: Irish Sea and North Sea

Institute: University College of North Wales

Programme: Seasonal gyres in shelf seas

Number & type of buoys:

a) deployed during year: 10 drogued drifters

b) operational at 31 August:

c) reporting on GTS at 31 August:

Purpose of programme: Shelf oceanography

Main deployment areas: Irish Sea and North Sea

Institute: University College of North Wales / Napier University

Programme: Biological oceanography

Number & type of buoys:

a) deployed during year: 2 optical drifters

b) operational at 31 August:

c) reporting on GTS at 31 August:

Purpose of programme: Oceanographic research

Main deployment areas: North Atlantic

PLANNED PROGRAMMES

Institute: **Meteorological Office**

Programme: EGOS

Number & type of buoys planned for deployment in next 12 months: 20+ drifters (including 5+ SVP-B drifters), 13 moored

Purpose of programme: Operational met/ocean and climate research

Main deployment areas: North Atlantic, seas around the British Isles, including the North Sea

Note: One of the 13 moored buoys is a joint project between the UK Meteorological Office and Météo-France.

Institute: **Meteorological Office**

Programme: IABP

Number & type of buoys planned for deployment in next 12 months: 1 ice drifter

Purpose of programme: Operational met/ocean and climate research

Main deployment areas: Arctic Ocean

Institute: **Meteorological Office**

Programme: IPAB

Number & type of buoys planned for deployment in next 12 months: 2 PTT-yr contribution to IPAB

Purpose of programme: Met/ocean research

Main deployment areas: Antarctic

Institute: **Plymouth Marine Laboratory**

Programme:

Number & type of buoys planned for deployment in next 12 months: 2 drogued drifters

Purpose of programme: Oceanographic research

Main deployment areas: North Atlantic

Institute: **Proudman Oceanographic Laboratory**

Programme: MYRTLE

Number & type of buoys planned for deployment in next 12 months: 1 data capsule with 6 IDs

Purpose of programme: Operational deep-sea tide gauge

Main deployment areas: South Atlantic / Drake Passage

Institute: **Dunstaffnage Marine Laboratory**

Programme: Developments in buoy technology

Number & type of buoys planned for deployment in next 12 months: 2 enhanced SVP drifters, including DGPS, ORBCOMM and SAFIR variants

Purpose of programme: Met/ocean research

Main deployment areas: North Atlantic

Institute: Ministry of Agriculture, Fisheries and Food

Programme:

Number & type of buoys planned for deployment in next 12 months: 16 drogued drifters

Purpose of programme: Fisheries research

Main deployment areas: North Channel and North Sea

Institute: University of Cambridge, Scott Polar Research Institute

Programme: Greenland Sea Ice Dynamics

Number & type of buoys planned for deployment in next 12 months: 3 GPS drifters

Purpose of programme: Oceanographic and sea ice research

Main deployment areas: Greenland Sea

Institute: University College of North Wales

Programme: Seasonal gyres in shelf seas

Number & type of buoys planned for deployment in next 12 months: 10 drogued drifters

Purpose of programme: Shelf oceanography

Main deployment areas: North Sea

Institute: University College of North Wales / Napier University

Programme: Biological oceanography

Number & type of buoys planned for deployment in next 12 months: 2 optical drifters

Purpose of programme: Oceanographic research

Main deployment areas: North Atlantic

TECHNICAL DEVELOPMENTS

The TOGA style drifters have been fitted with Gill temperature screens to improve the exposure of the temperature sensor. The result has been much more representative values for air temperatures. (Meteorological Office)

The drifter programs have been modified to observe and transmit :
a) the latest asynoptic data

b) synoptic data at the main and intermediate synoptic hours *ie* 00Z, 03Z, 06Z .....
c) an intermediate observation offset in time by 90 minutes *ie* 01:30Z, 04:30Z, 07:30Z..... (Meteorological Office)

2 UK TOGA style drifters were air deployed by the US Naval Meteorology and Oceanography Command following their kind offer to air drop drifting buoys on behalf of EGOS. (Meteorological Office)

Addition of GPS and DGPS capabilities to SVP-style drifters to improve track resolution in time and space, and to allow intelligent scheduling of transmissions using known position and time (Dunstaffnage Marine Laboratory).

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

Use of GPS and DGPS ice drifters for fine-scale studies of ice dynamics (Scott Polar Research Institute and Dunstaffnage Marine Laboratory).

PUBLICATIONS

Development of a multi-year deep-sea bottom pressure recorder. Spencer, R and Foden, P, 1994. IEE 394, 175-180. (Proudman Oceanographic Laboratory).

A releasable data capsule for the deep ocean. Foden, P and Spencer, R, 1995. In: The Proceedings of Oceans '95, MTS/IEEE, San Diego. (Proudman Oceanographic Laboratory).

Integration of GPS and Argos for drifting buoys. Meldrum, D, 1996. In: WOCE/CLIVAR Surface Velocity Programme - Report of the Eighth Meeting. WOCE Report No 146/96, pp 17-20. (Dunstaffnage Marine Laboratory).

The western Irish Sea gyre: a retention system for the Norway lobster *Nephrops norvegicus*. Hill, A E, Brown, J and Fernand, L. Oceanologica Acta, 19, 3-4, 357-368. (Ministry of Agriculture, Fisheries and Food, and University College of North Wales).

Observations of diffuse upwelling irradiance and chlorophyll in case 1 waters near the Canary Islands (Spain). Wild-Allen, K A, Tett, P and Bowers, D, 1996. Optics and Laser Technology (in press). (University College of North Wales and Napier University).

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 3141 Argos platforms for the 12 month period ending September 1996. Of this total, 2546 were drifting buoys, 1246 of which reported on the GTS. More than 40 of the drifting buoys were air deployed in the Atlantic and Pacific Ocean by the U.S. Navy for scientific and operational ocean and marine weather applications. The United States also maintains a network of 125 moored data buoys located in waters around the continental United States, Alaska, Hawaii, Guam and the tropical Pacific. All of the moored data buoys are reported on GTS. Of the moored buoys 65 transmitted data through GOES and 60 transmitted data through ARGOS. The United States sponsors of the programs supporting these data buoys include the National Science Foundation, the National Oceanic and Atmospheric Administration, the Department of Transportation, the Department of Defense, the Department of Interior, the Department of Energy and numerous state institutions.

In 1997, as shown in the accompanying tables, about 1700 drifting buoys are planned for deployment. The distribution of these buoys by ocean basin is: 670 - Pacific, 500 - Atlantic, 350 - Indian, 65 - Arctic, 97 - Gulf of Mexico, 1 - Great Lakes, and 20 at locations in coastal waters to be determined. In addition, over 220 moored buoys are slated for deployment as follows: 131 - Pacific, 20 - Atlantic, 6 - Indian, 16 - Arctic, 1 - Great Lakes and 48 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:

Atlantic - 39
Pacific - 11
Emergency Response - 5

(b) Moorings:

Coastal U.S. - 43

2. Pacific Marine Environmental Laboratory

Purpose: To study biological and physical processes which cause variability of recruitment to commercially valuable fish.

Location and No.: (a) Drifters:

Arctic - 4
Pacific - 6

(b) Moorings:

Arctic - 4

3. **Great Lakes Environmental Research Laboratory**
Purpose: Surface wave and current measurements in the Great Lakes.
Location and No.: (a) Drifters:
Great Lakes - 1
(b) Moorings:
Great Lakes - 1

4. **Office of Global Programs**
(Funding for Pacific Marine Environmental Laboratory, Scripps Institution of Oceanography, and various Universities.)
Purpose: To provide meteorological and oceanographic observations for the monitoring and prediction of climate change and circulation studies.
Location and No.: (a) Drifters:
Atlantic - 70
Pacific - 388
Indian - 54
(b) Moorings:
Pacific - 109

5. **Office of Ocean and Earth Sciences, NOS**
(In collaboration with the Navy/NOAA Joint Ice Center)
Purpose: To provide meteorological and oceanographic observations for Arctic analysis and forecasting.
Location and No.: (a) Drifters:
Arctic - 18

6. **National Weather Service**
Purpose: To provide meteorological observations for weather analysis and forecasting.
Location and No.: (a) Drifters:
Pacific - 40

7. **National Marine Fisheries Service**
Purpose: To study biological and physical processes for fish and marine mammal research.
Location and No.: (a) Drifters:
Atlantic - 5
Pacific - 1

B. **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 - 50

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 - 77
- Pacific - 10
- Indian - 296

(b) Moorings:
- Atlantic - 5
- Indian - 6
- Arctic - 12

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 - 100
- Pacific - 111
- Arctic - 18

2. Office of Naval Research

Purpose: Physical oceanography studies.

Location and No.: (a) Drifters:
- Atlantic - 115
- Pacific - 50

(b) Moorings:
- Atlantic - 7
- Pacific - 8

3. Naval Research Laboratory

Purpose: Real-time meteorological/oceanographic data collection.

Location and No.: (a) Drifters:
- Atlantic/Mediterranean - 20
- Pacific - 20
- Arctic - 20

4. Navy Postgraduate School

Purpose: Study the surface currents of the Mediterranean Sea

Location and No.: (a) Drifters:
- Mediterranean - 11

E. DEPARTMENT OF AGRICULTURE, FOREST SERVICE

Purpose: To track the movement of log rafts in channels and ocean areas.
Location and No.: (a) Drifters:
Coastal - 4

F. DEPARTMENT OF INTERIOR, MINERALS MANAGEMENT SERVICE

Purpose: To study circulation patterns in the continental shelf areas.
Location and No.: (a) Drifters:
Pacific - 13
Gulf of Mexico - 98
(b) Moorings:
Pacific - 14

G. NON-PROFIT INSTITUTIONS/ORGANIZATIONS

1. Rosensteil School of Marine and Atmospheric Studies

Purpose: Determine the recruitment pathways of fish and lobster larvae in the offshore circulation and wind driven routes in the Straits of Florida.
Location and No.: (a) Drifters:
Straits of Florida - 12

2. Scripps Institution of Oceanography

Purpose: Shallow water oceanographic studies.
Location and No.: (a) Moorings:
Coastal - 4

3. University of South Florida

Purpose: Observations in the Southern Ocean
Location and No.: (a) Moorings:
Gulf of Mexico - 2

4. University of Washington

Purpose: Physical Oceanography of Exuma Bay
Location and No.: (a) Drifters:
Caribbean - 15

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 DBCP 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 five action groups, the reports of which follow:

- 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)

EUROPEAN GROUP ON OCEAN STATIONS

1. General information

EGOS

EGOS - The European Group on Ocean Stations - is one of the Action Groups of the DBCP. It was created in 1988. EGOS maintains an operational network of drifting and moored buoys in data sparse areas in the North Atlantic and co-ordinates the deployment of drifting buoys provided by EGOS members, whenever needed. It co-ordinates data dissemination and secures that data quality is monitored. Information on the operational status of the buoys is provided to members and co-operating parties on a regular basis.

The management of EGOS

The EGOS programme is managed by a committee, composed of one member from each of the participating states. The programme is based on voluntary contributions. The EGOS group has established a Technical Secretariat to coordinate the Programme. A common fund to support its administrative activities is managed by the World Meteorological Organization (WMO) on behalf of the EGOS management committee. The project is based on an exchange of Letters of Intent between the directors of the participating institutions or services.

As at July 1996 EGOS consists of the following members:

- Denmark: Danish Meteorological Institute
- Germany: German Weather Service
- Iceland: Icelandic Meteorological Office
- Ireland: Irish Meteorological Service
- The Netherlands Royal Netherlands Meteorological Institute
- Norway: Norwegian Meteorological Institute
- Sweden: Swedish Meteorological and Hydol. Institute
- United Kingdom: United Kingdom Meteorological Office

Co-operating organizations

EGOS co-operates closely with:
The Data Buoy Co-operation Panel, **DBCP**
World Meteorological Organization, **WMO**
Intergovernmental Oceanographic Commission, **IOC**

The operational programme

EGOS maintains a continuous operational network of drifting buoys at a level of about 15 to 25. To achieve this, a total of 20-30 buoys are deployed each year. the buoys are expendable, and are not intended for recovery and reuse. The average operational lifetime for buoys in the EGOS Programme is in excess of 200 days, as is indicated by Table 1.

Table 1
Average operational lifetime for EGOS Drifting Buoys during the years 1990-1995. The lifetime is the period that operational data are available on the Global Telecommunications System (GTS).

YEAR	LIFETIME	YEAR	LIFETIME
1990	128 days	1993	218 days
1991 -	123 days	1994	186 days
1992	273 days	1995	279 days

In addition to the drifting buoys 7 moored buoys are operated in the North Atlantic to the west of the British Isles.

Area of operation

EGOS drifting buoys are deployed and operated in an area bounded by 25°N and 66°N latitude and usually between 45°W longitude and the European continent. The buoys are deployed by ships of opportunity sailing from Iceland to the eastern coast of the United States, by ships en route from Denmark to the Cape Farewell and by ships sailing from United Kingdom to the Caribbean. In 1996 drifting buoys have also been deployed from aircraft. The EGOS Programme is divided into two sub-programmes: EGOS North, for buoys deployed north of 50°N and EGOS South, for buoys deployed south of 50°N. Because of its importance as a development area for cyclonic weather systems most of the Programme activity is in the EGOS North area.

Data Reception and Dissemination

The drifting buoys transmit the data via the Argos System and the data are received at the Local Users Terminals (LUTs) in Oslo, Søndre Strømfjord and Toulouse and further disseminated via the GTS.

By utilizing these three LUTs the data reception rate for the EGOS buoys is increased by more than 50%, relative to data reception based on a single LUT. Furthermore the time-gap with no data received because of the orbit configuration is substantially reduced.

The time-lag between observation and data reception at the operational centre varies considerably. Approximately 90% of all observations are received within 90 minutes with a mean time lag of approximately 30 minutes.

Data retrieval for the moored buoys is via the Meteosat geostationary satellite operated by EUMETSAT.

Data Quality and Data Control

Data quality is monitored by the Icelandic Meteorological Office on a day to day basis.

Weekly and monthly analyses and statistics are produced by at the UK Meteorological Office and are included in the EGOS Monthly Report.

Information on dubious data and monthly quality statistics are distributed according to DBCP guidelines. The Icelandic Meteorological Office operates an automatic INTERNET mail service "buoy-qc@vedur.is" to facilitate the exchange of data quality information among users.

If a buoy produces doubtful or erroneous data the Technical Secretary will, after a consultation with the data quality services, act to have these sensor data removed from the GTS.

Technical developments

Some examples of recent activities are:

- The evaluation of lower cost barometers for drifting buoys through laboratory tests and operational deployments.
- The incorporation of a GPS receiver into a drifting buoy to provide buoy position as an inherrent part of the data message.
- The development and implementation of a comprehensive set of pre-deployment tests and calibration checks for drifting buoys.
- Evaluation of alternative observing programmes.
- Evaluating and performing deployments of drifting buoys from aircraft as an alternative to deployment from ships.

2. Activities and Status

Meetings

EGOS held its 1995 winter meetings of the Management Committee and the Technical Subgroup respectively in Copenhagen on January 16-17 1996. These meetings were scheduled to take place in early December 1995 at the IOC headquarters in Paris, but had to be cancelled on short notice due to industrial unrest at that moment in Paris.

The summer meetings of EGOS were held at the UK Met. Office at Beaufort Park, near Bracknell on June 4-6, 1996. These meetings were arranged in parallell with the annual meeting of the IABP. Two successful joint seminars between EGOS and IABP were also arranged, where several persons from each of the two Groups gave talks on technical and management issues.

The next winter meetings of EGOS are proposed to be held at the WMO HQ in Geneva on Dec. 3rd and 4th. 1996.

Publications

Monthly reports on the EGOS Drifting Buoy Programme are regularly issued in the EGOS Technical Document series. The following EGOS doccuments have been issued in the period of reporting:

Techn. Doc. No.	Title
131	Annual Report, 1995
132	Monthly Rep., Dec. 1995
133	Monthly Rep., Jan. 1996
134	Monthly Rep., Febr. 1996
135	Rep. Management Committee meeting, Copenhagen, Jan. 16-17, 1996.
136	Rep. Technical Subgroup Meeting, Copenhagen, Jan. 16-17, 1996.
137	Monthly Rep., March 1996
138	Monthly Rep., April 1996
139	Monthly Rep. May 1996
140	Monthly Rep. June 1996
141	Monthly Rep. July 1996
142	Rep. Management Committee meeting, UKMO, June 4-6, 1996, DRAFT
-	Euro-GOOS conference, Oct. 1996, ABSTRACT
-	Article on EGOS, Nord. Space Activities, DRAFT
-	EGOS Brochure

The EGOS Brochure came to its completion in May 1996. It was distributed among the participants of both the EGOS and IABP meetings in England. The intention is to update the brochure each second or third year, or whenever major events or changes within EGOS have taken place.

With the assistance of Mr. Pierre Blouch of Meteo France EGOS information have beed inserted on the WWW, under the address http://dbcp.nos.noaa.gov/. EGOS information may be acquired under the DBCP menu 'Regional Action Groups'. New items will be added, and on the long term also information such as monthly statistics may be inserted on a regular basis.

The Technical Secretary has registered to present the EGOS Programme at the Euro-GOOS conference in Haag, October 7-11 1996. A manuscript has been issued, to be included in the Conference Proceedings.

Deployments

The following buoys have been deployed during the period Jan. - June 1996.

Month	Date (on GTS)	ARGOS Id.	WMO No.	Owner	Depl. from
Jan.	-	-	-	-	-
Febr.	05	1251	44768	UK	Iceland
Febr.	07	3013	44767	UK	Iceland
March	06	2954	44771	UK	Iceland
March	19	3038	65595	IR	Denmark
April	24	6667	44772	G	Bergen (air depl)
May	15	1258	44778	UK	Iceland
May	21	3678	65598	N	Denmark
May	31	1249	44777	UK	Iceland
May	31	1260	44775	UK	Iceland
June	27	1256	44614	UK	Iceland

Drifting Buoys that ceased to operate

The following drifting buoys ceased to operate for various reasons during the period Jan. - June 1996:

Month	Date (off GTS)	ARGOS Id.	WMO No.	Owner	Depl.
Jan.	10	1299	65581	G	April 1995
Jan.	16	4625	65581	UK	Nov. 1993
Febr.	12 (wind only)	3318	44616	UK	March 1995
March	15	14733	44777	UK	May 1995
March	15 (AP only)	14736	44761	UK	Nov. 1995
March	28	2953	44742	UK	April 1995
April	1	14737	44779	UK	May 1995
May	14	9306	62694	NL	Nov. 1995
June	-	-	-	-	-

Development and Status of the Programme

During the first six months of 1996 the development of the Drifting Buoy Programme was satisfactory. Fig. 1 shows the number of drifting buoys in operation during the period January 1993 - July 1996.

On January 1st, 1996, 19 drifting buoys were operating in the Programme. See the map in Fig. 2. The lowest number of operating buoys was in February 1996, with 17 buoys. As at July 31, 1996, a total number of 22 buoys were in operation. See the map in Fig. 3.

One drifting buoy was deployed from aircraft in April 1996, and the buoy has operated continuously since then. Four new buoys are prepared for air deployment in August, in the Labrador Sea.

As per July 1996, six moored buoys were incorporated in the EGOS Programme, all in the area west of the British Isles (see the positions in Fig 3). These buoys have the WMO numbers 62029, 62081, 62105, 62106, 62108 and 64045.

EGOS will attempt to ensure that there is good coverage of drifting buoys in the usual EGOS area north of 50 N during Jan and Feb. 1997, in connection with the **FASTEX** experiment. 4 UK METOCEAN drifting buoys (2 with wind sensors) and 3-5 UK SVP-B drifters will be deployed to drift through the central FASTEX box in Jan. 1997.

In the inter-sessional period, an EGOS Working Group prepared estimates of costs of a **North Atlantic Met Buoy Programme** for the Chairman of the CGC, Steven Mildner, at his request. These were given to the CGC Chairman in March by the EGOS Chairman. In brief, the estimates was summarized as follows:

"Drifting Buoys:
As an average over a year, EGOS currently maintains 17 or 18 drifting buoys in the North Atlantic, the majority being deployed north of 50 deg North. To achieve this, approximately 25 buoys are deployed each year. Estimated costs for this operation, including capital expenditure, communications charges, technical and programme management and data quality evaluation and control is approximately £470,000, giving an approximate cost of **£26,000 per operational buoy year.** ....."

"Moored Buoys:
The annual cost of operating a network of moored buoys in the deep ocean is estimated at **£100,000 per buoy station per year.** This includes capital costs of the buoys, moorings, consumables, maintenance and development manpower and ships. Communications costs are not included as they are currently "free" through national contributions to EUMETSAT but would be additional if commercial communications are used."

DBCP has proposed to set up a **DBCP Global Programme**, now called the Global Implementation Programme (DBCP-GIP). The EGOS Chairman has written to the DBCP Chairman outlining the reservations expressed by EGOS members at its recent winter meeting. As an Action Group of the DBCP, EGOS had been asked to endorse the proposal.

The EGOS Technical Secretary, Mr. Lars G. Golmen, at the Christian Michelsen Research A/S in Bergen has continued its function along the lines drawn up by the Terms of Reference and the instructions given by the Management Committee. This work was carried out in close co-operation with the Chairmen of the Management Committee and the Technical Subgroup.

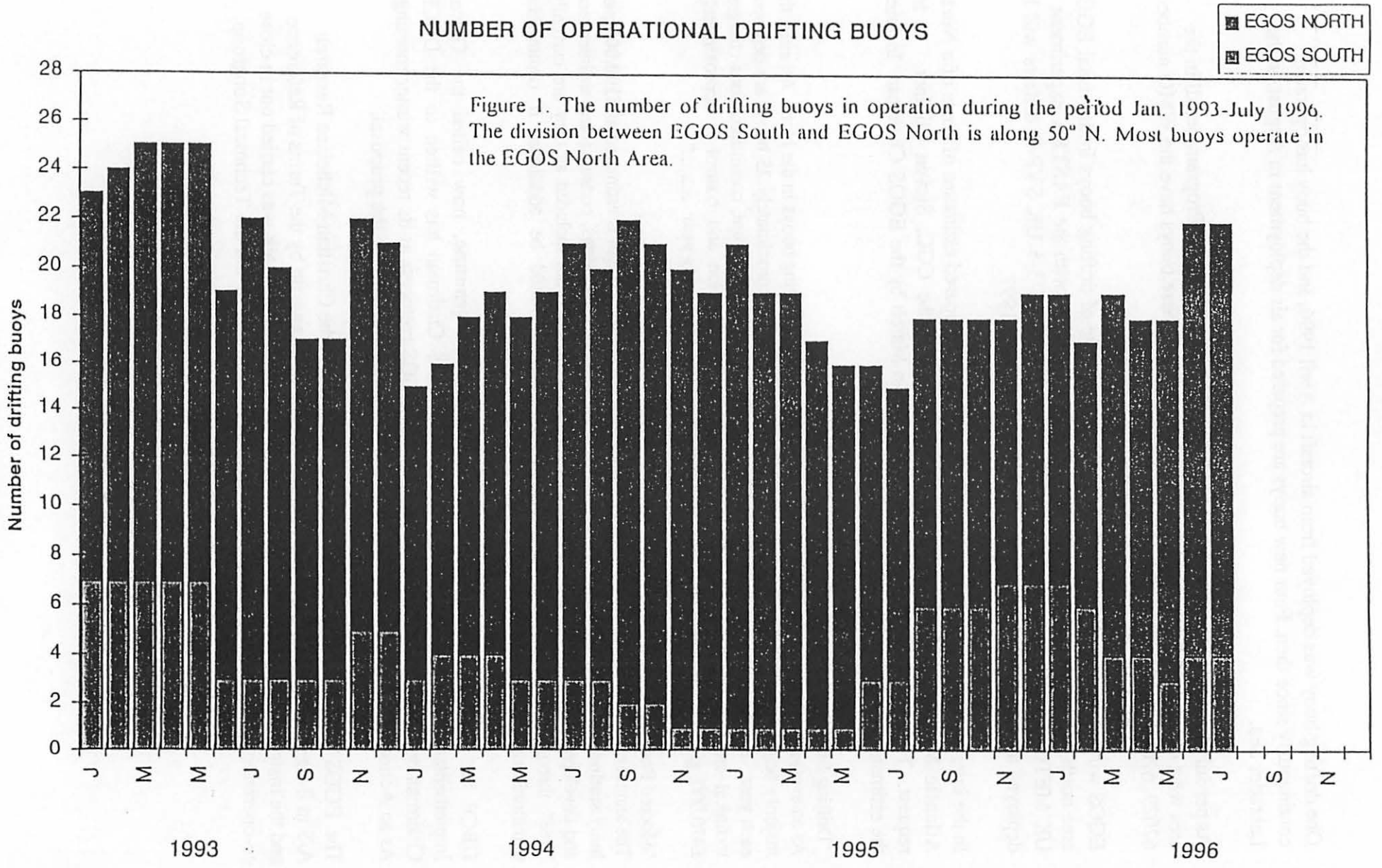

Figure 1. The number of drifting buoys in operation during the period Jan. 1993-July 1996. The division between EGOS South and EGOS North is along 50° N. Most buoys operate in the EGOS North Area.

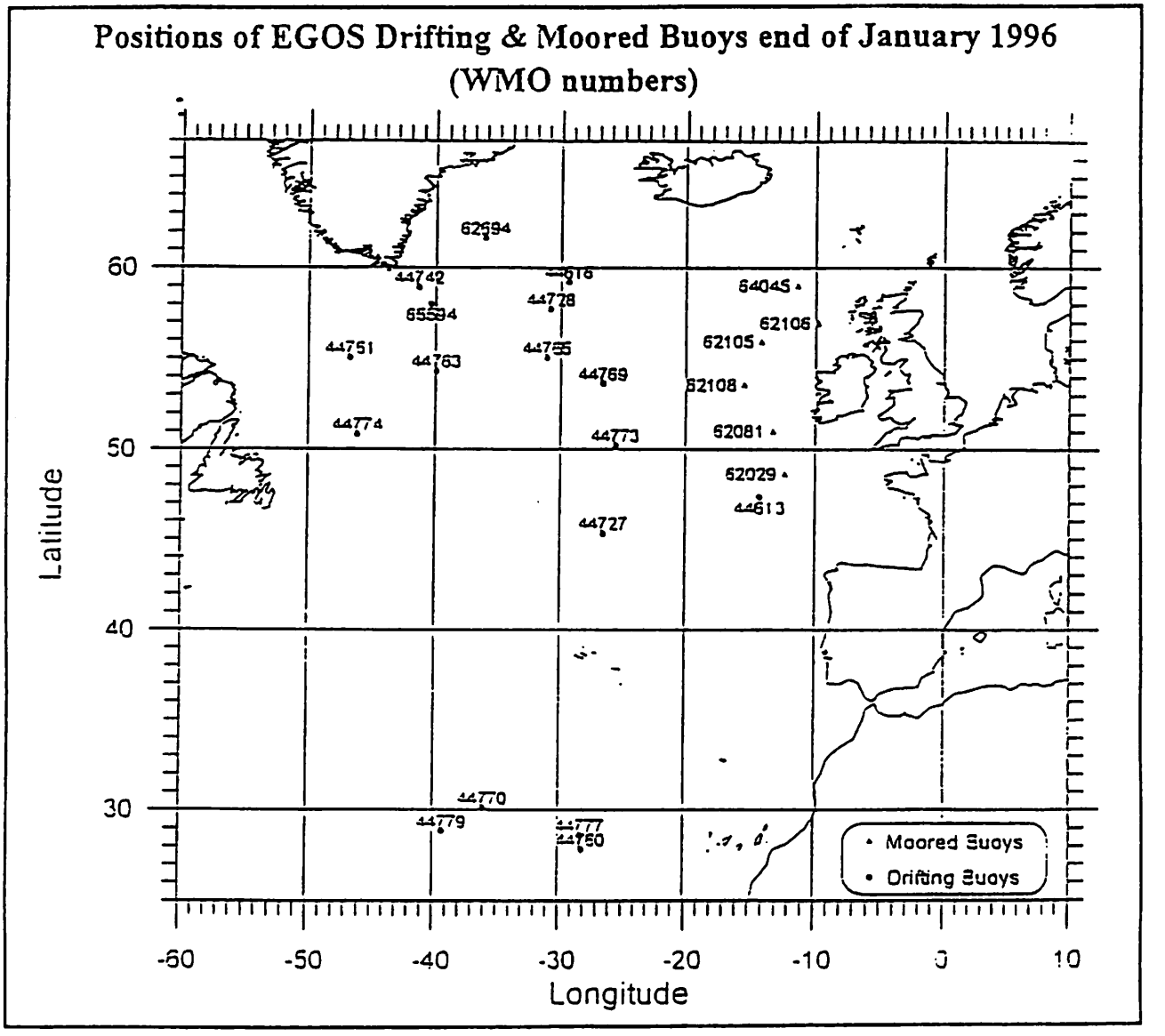

Fig. 2. Positions of EGOS drifting and moored buoys, as per January 31, 1996.

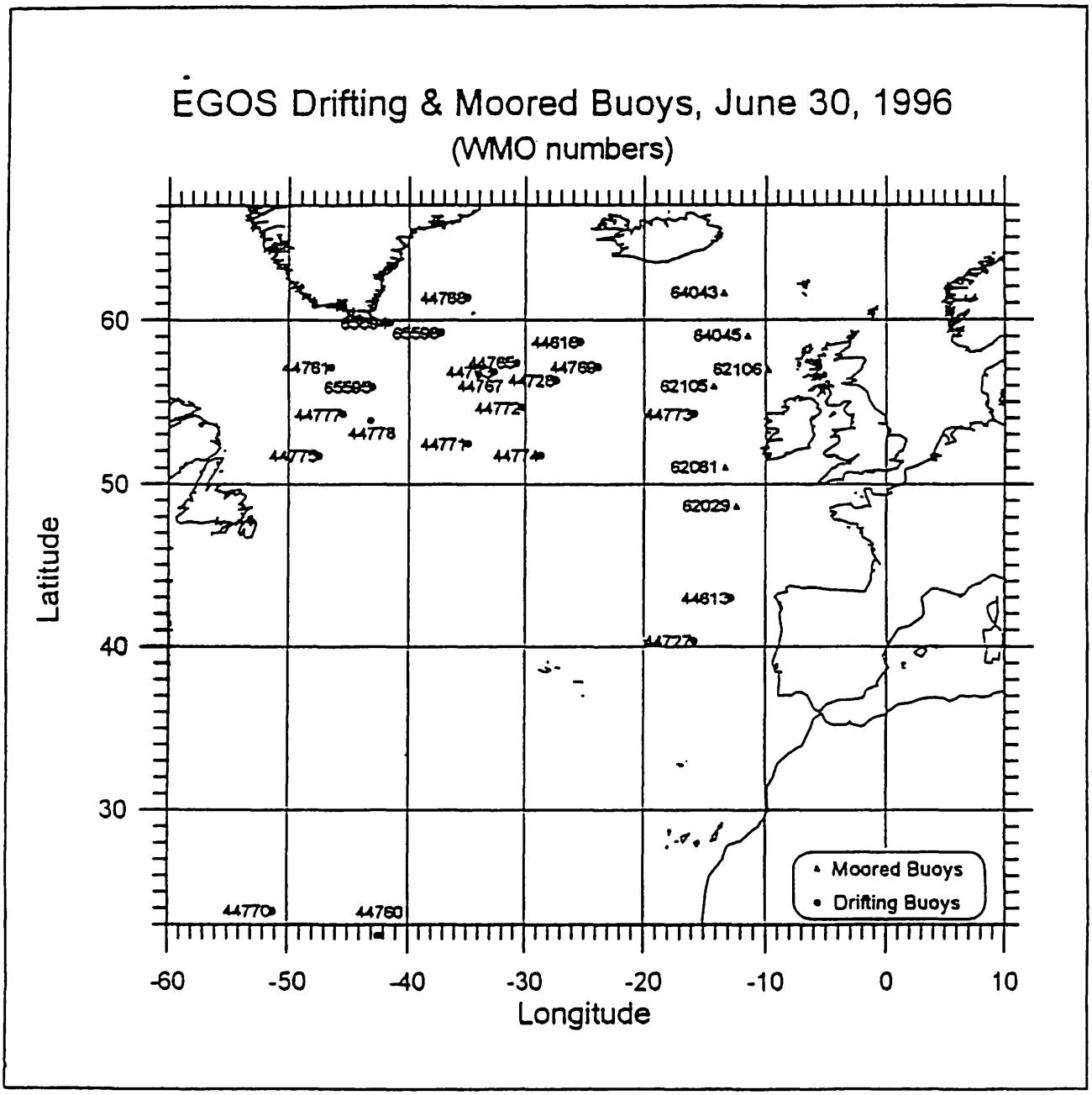

Fig. 3. Positions of EGOS drifting and moored buoys, as per June 30, 1996.

INTERNATIONAL ARCTIC BUOY PROGRAMME

INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP) SIXTH ANNUAL MEETING and JOINT TECHNICAL SESSION WITH THE EUROPEAN GROUP ON OCEAN STATIONS (EGOS), BRACKNELL, U. K., JUNE 1996

Members of the International Arctic Buoy Programme met 4-7June, 1996, in Bracknell, U.K. for the sixth annual business meeting of the programme and for joint technical sessions with the European Group on Ocean Stations. The meetings were hosted by the U.K. Meteorological Office at their Beaufort Park complex.

IABP 6th Annual Meeting

Key issues from the meeting included:

- **Russian deployments** - The Russians have successfully deployed 3 buoys in the Laptev Sea. The deployment was made possible with the assistance and cooperation of IABP members.
- **Annual deployments** - As it the case every year, there are several deployments to replenish the buoy array across the Arctic Basin - buoys fail due to battery power coming to an end, other buoys exit the Arctic Basin for the North Atlantic, and some buoys fall through the ice or get crushed as ice rafts and ridges. Deployments to date / deployments still to come 1996 include deployments from the vessels Polarstern and Oden, deployments from submarine, deployments via air drops, and surface deployments via landing on the ice. The deployments involve cooperation between agencies and institutions both within the same country and those in other countries. The White Trident deployment, for example, has a C-130 of the U.S. Naval Meteorological and Oceanography Command air-deploying a total of 5 Norwegian-made ICEX buoys made available to the IABP by the Norsk Polar Institute, the Norwegian Meteorological Institute, the U.S. Naval Oceanographic Office, and the U.S. National Ice Center. The Polarstern / Oden deployments involve cooperation between Germany, Russia and Norway.
- **Renewed life for IOEB buoys** - Two IOEB (Ice-Ocean Environmental Buoy) buoys which were deployed May 1992 north of Alaska and which 'circled' the Beaufort gyre were refurbished on ice to the northwest of Prince Patrick Island early April. The web page *http://ioeb.whoi.edu.* details the exercise. The buoys are a joint effort by the Japan Marine Science and Technology Center and Woods Hole Oceanographic Institution.
- **IABP web page** - The IABP web page - *http://iabp.apl.washington.edu* - is getting more and more 'visits'. The web page, which includes a list of participants, a monthly map showing the current buoy array across the Arctic Basin and a corresponding buoy status sheet, has been expanded to include, among other things, buoy diagrams and links to ice information. Attachment A is a composite of the 15 August 1996 buoy map and corresponding buoy status sheet. Some of the buoys that were deployed earlier 1996 have already 'disappeared'.
- **IABP brochure and poster** - In addition to maintaining/updating a web page, the IABP is committed to generating an updated brochure - potentially annually.
- **Commitment** - The IABP is committed to working closely with the Global Groups who are working on the impacts of oceans on climate change to ensure that the Arctic Ocean data is part of the broader global ocean analysis.
- **Variables monitored now** - Atmospheric pressure, 2 meter air temperature, and ocean temperature/ salinity remain the principal geophysical variables monitored by the IABP buoys.

- **Variables to be monitored** - Technology exists for the long term measurement of several additional variables, for example, snow, ice temperature and internal stress. The IABP recommends a feasibility study for the integration of ice stress sensors into drifting buoys.
- **Room for more buoys** - IABP members seek partners within their respective counties and internationally who are willing to supply additional buoys or sensors for existing buoys so that the IABP can grow.

IABP Executive and IABP Coordinator

In accordance with IABP Operating Principles, elections to the following offices took place at the Sixth Annual IABP Meeting:

Chairman - Brian O'Donnell, Canada
Vice Chairman - Thor Kvinge, Norway
Executive Member - Ivan Frolov, Russia
Executive Member - Dave Benner, U.S.A.

A vote of confidence and appreciation was expressed for Roger Colony to continue as the coordinator of the IABP.

Joint Technical Sessions (Presenters)

Topics at the Joint Technical Sessions included:

- Climate models (Howard Cattle);
- Arctic Basin temperatures (Ignatius Rigor);
- Global Ocean Observing System (GOOS) / European GOOS (Nick Flemming);
- EGOS history (Thor Kvinge);
- Meteorological data requirements for the North Atlantic (Flosi Sigurdsson);
- Oceanographic atlases (Sergy Priamokov);
- Argos enhancements (Chritian Ortega);
- Meteorological data quality control (Pierre Blouch);
- U.K. Data quality control (Christine Heasman);
- U.S. National Ice Center ice program (Dave Benner);
- Russian ice charts (Ivan Frolov);
- Ice thickness (Peter Wadhams);
- Northern (Russian) sea route (Lawson W. Brigham);
- Snow in the Arctic Basin (Roger Colony);
- Ice thickness and ice topography studies in the Beaufort Sea per Humfrey Melling (Ed Hudson)

Brian O'Donnell
Chairman, IABP
Environment Canada
Twin Atria Building - 2nd Floor
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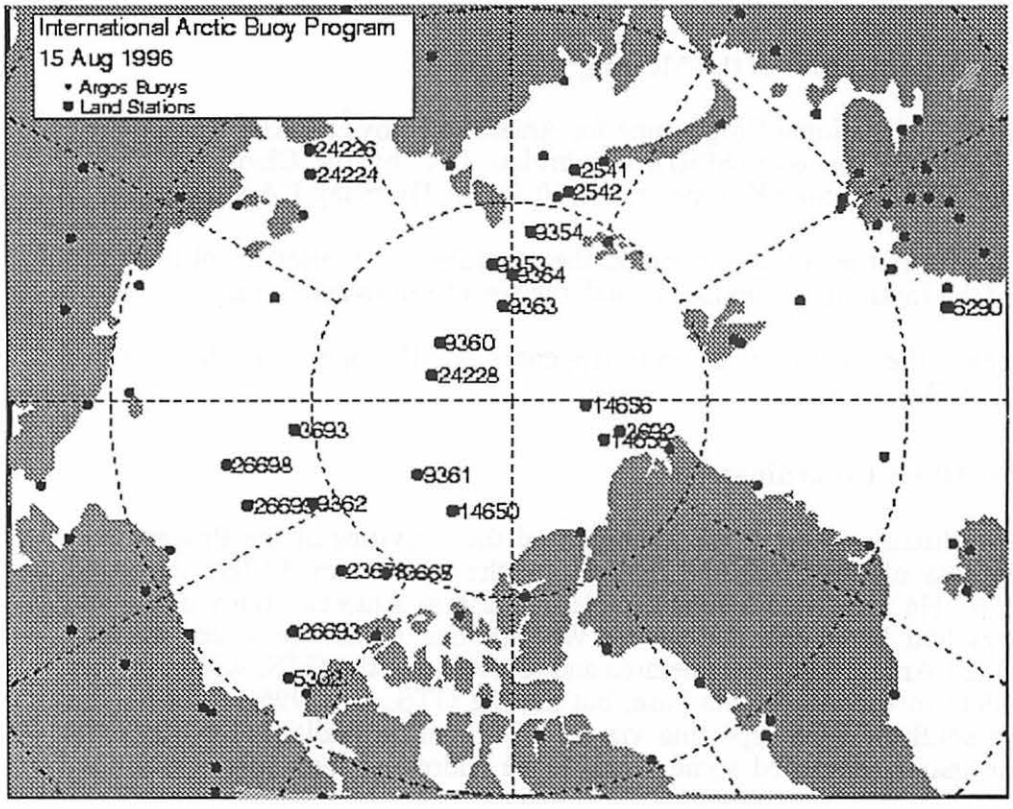
T6B 2X3
Canada

Roger Colony
Coordinator, IABP
ACSYS International Project Office
Post Office 5072 Majorstua
N-0301 Oslo
Norway

Attachment A
for IABP Report to 12th (1996) Session of DBCP



15 August 1996

DATE DEPLOYED	ARGOS ID	WMO ID	YPR NUMBER	GTS HEADER	POSITION LAT	POSITION LONG	DATA BYTES	P	T	BUOY DESCRIPTION
Aug 95	2541		1109		77.916	74.212				
Aug 95	2542		1109		79.086	74.493				
May 94	3692		314	SSVX01-LFPW	84.281	-15.289	16	Y	Y	ICEX-AIR
Aug 95	3693	48092	314	SSVX01-LFPW	79.049	-172.584	16	Y	Y	ICEX-AIR
Feb 96	5302	48525	627	SSVX02-CWEG	72.110	-128.510	4	Y		CALIB Buoy
Aug 95	6290		484		67.509	12.075	28	Y	Y	EGOS Driftg Buoy
Aug 96	9353	63666	919	SSVX01-LFPW	83.081	97.529	12	Y	Y	ICEX-AIR
Aug 96	9354	25569	919	SSVX01-LFPW	81.431	83.312	12	Y	Y	ICEX-AIR
Aug 95	9360	63662	919	SSVX01-LFPW	85.355	140.504	16	Y	Y	ICEX-AIR
Aug 95	9361	25571	919	SSVX01-LFPW	84.048	-141.812	20	Y	Y	ICEX-AIR
Aug 95	9362	25572	919	SSVX01-LFPW	78.851	-152.940	20	Y	Y	ICEX-AIR
Aug 95	9363	25573	919	SSVX01-LFPW	85.202	94.653	28	Y	Y	ICEX
Aug 95	9364	25574	919	SSVX01-LFPW	83.620	89.233	28	Y	Y	ICEX
May 92	10667	48531	1016		79.261	-125.595	32	Y	Y	IOEB
May 92	10668	48531	1016		79.258	-125.592	32			IOEB
May 94	14650	48520	282	SSVX16-KARS	83.772	-117.955	4	Y	Y	Tiros Air Drop
May 94	14656	25547	282	SSVX16-KARS	86.188	-2.917	4	Y	Y	Tiros Air Drop
May 94	14658	25564	282	SSVX16-KARS	84.908	-21.993	4	Y	Y	Tiros Air Drop
May 95	23678	48579	9053	SSVX02-CWEG	77.928	-134.684	32	Y	Y	Zeno Ice Buoy
May 96	24224		9053		74.810	131.083	32	Y	Y	AARIXAWI Buoy
May 96	24226		9053		73.791	128.281	32	Y	Y	AARIXAWI Buoy
Jul 96	24228		9053		85.822	161.684	32	Y	Y	Zeno Ice Buoy
Mar 96	26693	48578	1053	SSVX02-CWEG	74.031	-132.878	32	Y	Y	Zeno Ice Buoy
Jul 96	26698	48572	1053	SSVX02-CWEG	75.449	-167.401	32	Y	Y	Zeno Ice Buoy
Jul 96	26699	48573	1053	SSVX02-CWEG	75.872	-158.423	32	Y	Y	Zeno Ice Buoy

INTERNATIONAL PROGRAMME FOR ANTARCTIC BUOYS

MINUTES OF THE MEETING

1. Opening and Organisation of the Meeting

The first session of the International Programme for Antarctic Buoys (IPAB) was opened at the Scott Polar Research Institute (SPRI), Cambridge, UK, by the Chairman of the Executive Committee, Dr. Christoph Kottmeier, at 9.30 am on Thursday 1 August 1996.

Dr. Peter Wadhams from the SPRI welcomed the attendees and briefly outlined the tradition and aims of the Institute, the museum, and the world-renowned library.

A list of the attendees at the meeting is given in Appendix A. The agenda of the meeting is detailed in Appendix B.

2. Report of the IPAB Co-ordinator

Dr. Ian Allison, Co-ordinator of the IPAB, summarised the activities of the Programme. He outlined the progress of the IPAB and reported on the number of drifters deployed during 1995 and 1996. He identified a considerable increase in Antarctic buoy activities, although most buoys had been operated in the Weddell Sea or off the coast of East Antarctica. In 1995, 24 Antarctic buoys operated and reported via the GTS, with a further 8 buoys providing data to the IPAB data base, but not the GTS. In 1996 to date, there have been 21 buoys south of 55°S reporting via the GTS, and an additional 6 non-GTS drifters. The Co-ordinator identified some issues to be addressed later in the meeting. These included:

- The short life and high failure rate of some drifters deployed in the sea ice zone.
- The tendency for buoys to drift northward out of the area of interest after only a few months.
- The inability to distinguish whether buoys were in ice or water.
- The lack of guidelines on the release of IPAB research data.
- The need for better communication between Participants and the Co-ordinator, particularly regarding forward advice of deployment plans, and on details of buoy characteristics.

Dr. Allison stressed the need for better co-ordination of the disparate programmes within the IPAB and emphasised the lack of data from west Antarctica.

The IPAB data base is maintained at the Antarctic CRC. Since February 1995, data from buoys deployed by Participants have been received monthly from Service Argos and processed and archived at the CRC. A data base of deployment details, and the buoy and sensor characteristics of IPAB platforms has also been compiled. The full report of the Co-ordinator is attached as Appendix C.

3. Reports from Participants

3.1 The Participants at the meeting reported on their programmes of buoy and data collection platform deployments over the first two years of the IPAB. Summaries of the reports given by Participants from Germany, Australia, South Africa, the United Kingdom, Italy, Finland and Brazil are presented in Appendix D1, along with descriptions of their intended future deployments.

3.2 The Russian Federation had deployed no platforms since the launching of the Programme in 1994. Financial constraints made buoy deployments over the next two years unlikely. A report was presented, however, on possible future contributions by Russian Participants to the Programme. This report is also included in Appendix D2.

3.3 Ms. Claire Hanson of the World Data Centre A for Glaciology presented a report outlining the archiving and distribution responsibilities of WDC-A (Appendix D3). Ms. Hanson requested that copies of data reports and research papers arising from individual buoy programmes should be sent to WDC-A for inclusion in the library. It was agreed that WDC-A would assume responsibility for distribution of IPAB data to the worldwide scientific community.

4. Review of Operating Principles of the Programme

The Operating Principles of the IPAB, including the Letter of Intent, the Terms of Reference for the Co-ordinator and the General Principles of Data Archiving were reviewed and partly modified. The updated versions of these documents are presented in Appendices E and G.

5. Status of the Membership Roll

There were thirteen Participants (organisations which have submitted a Letter of Intent [Appendix E, Annex 1]) to the Programme as of 31 July 1996. A further three organisations subscribed to the Programme at, or shortly after the meeting. A full list of Participants is attached as Appendix F. Eleven of them were represented at the meeting.

6. Related Observational Programmes

Under this item on the agenda possible collaboration with and the relationship to other programmes was considered. Mr. Etienne Charpentier, Technical Co-ordinator for the Data Buoy Co-operation Panel (DBCP) summarised the activities and function of the DBCP in relation to the IPAB (Appendix H1). He presented the outline for the proposed DBCP Global Implementation Programme. The meeting agreed to support the proposal in the form that it was presented. It was also agreed that Mr. Piet le Roux would represent the IPAB at the next meeting of the DBCP, scheduled for 22 to 25 October 1996. All attendees were also invited to the Technical Workshop of the DBCP, to be held at Henley-on-Thames, UK, on 21 to 22 October 1996.

Mr. Charpentier requested input from the IPAB on the requirements of the Programme from Service Argos. The meeting agreed on a number of items to be presented by the Co-ordinator of the IPAB to the Technical Co-ordinator of the DBCP by 1 September 1996, for communication to Service Argos. These points were:

- Service Argos should increase the quantity of data, stored for on line access, from the 4 days presently available to 7 or even 14 days.
- Service Argos should utilise CD ROM or DAT tape for the distribution of off line data, instead of the reel to reel tape presently used.
- An FTP site should be established for online access to data for Argos users.

Dr. Victor Savtchenko briefed the meeting on WCRP Antarctic Ice Thickness Project (AnITP) and on WCRP involvement in Antarctic research (Appendix H2), as well as on GCOS and GOOS developments.

It was agreed that the possible relationship of the IPAB with GCOS would need to be considered by the Executive Committee. In the meantime members of the Executive Committee would maintain contact with GCOS developments, principally at a national level, and report back at the next meeting of the IPAB. It was also agreed that a letter would be sent by the IPAB Co-ordinator to Dr. Thomas Spence, Director of the Joint Planning Office of the GCOS programme, informing him that the IPAB was aware of the

requirements of GCOS, and on the possibility of IPAB contributing to some of these requirements.

Ian Allison outlined the proposal for the ASPECT programme (Appendix H3), to be presented to SCAR XXIV for approval. Dr. Allison detailed the intention to link ASPECT with a number of other existing programmes, in particular the IPAB.

7. IPAB Publicity

It was agreed by the meeting that it was necessary to achieve a higher profile for the Programme. Producing a brochure on the Programme was discussed but not adopted. It was agreed that Mr. David Crane would produce a short description of the IPAB and a brief summary of the first meeting for inclusion in a forthcoming edition of the WOCE International newsletter. The document would be submitted following approval by the members of the Executive Committee. A more detailed summary of the proceedings of IPAB-1 would also be prepared by Mr. Crane and presented for publication in the WCRP newsletter.

The possibility of opening a World Wide Web site specific to the Programme was proposed, to improve the information already existing at the DBCP and Antarctic CRC Web sites. It was felt, however, that a better alternative would be to gradually expand the information held at the Antarctic CRC site and to establish a page at the DBCP pointing to this site. The meeting also agreed to the inclusion of IPAB information on a page at the WCRP Web site.

8. Technical Presentations

Technical presentations were given by Mr. David Meldrum and Professor Merritt Stevenson, outlining new developments which could be applicable to the Programme. Summaries of these are presented in Appendix I.

9. Future Activities and Other Business

It was decided that the next meeting of the IPAB should take place in 1998. The Chairman read out a letter from Dr. Roger Colony, describing the intention to hold the 20th anniversary meeting of the IABP in Seattle, US, in August 1998 and suggesting that IPAB-2 could be held there at the same time. It was agreed to leave the exact date and location of IPAB-2 open for the present time but to maintain communication with Dr. Colony over the possibility of arranging a mutually beneficial time and place for both meetings.

Dr. Ian Allison pointed out the benefits of the continuous automatic sea ice drift monitoring offered by the Radarsat GPS system. It was agreed that support could be offered for geophysical data processing systems to allow analysis of this data alongside IPAB drifter data.

Dr. Christoph Kottmeier presented a report entitled Wind and Ice Motion Statistics in the Weddell Sea, produced with contributions from many IPAB participants. It was agreed that Dr. Kottmeier should request WCRP to allow the work to be published as a WCRP White Cover Report. Mr. Jon Shanklin suggested the inclusion of iceberg drifter tracks, readily available on the British Antarctic Survey database, in the report. It was agreed that iceberg tracks should not be included in this report but that they could provide valuable information for future work.

10. Administrative Aspects of the IPAB

In accordance with the management structure outlined in the Operating Principles, the meeting elected the Executive Committee:

Chairman	Dr. Christoph Kottmeier, Germany
Vice-Chairman	Mr. David Crane, United Kingdom
Member	Mr. Piet le Roux, South Africa
Member	Dr. Andrea Pellegrini, Italy

The meeting appointed Dr. Ian Allison, Australia, as Co-ordinator.

Dr. Allison stated that he would be willing to act as Co-ordinator for the next two years, but that other commitments would prevent him continuing after this time. He said that another person from the Antarctic CRC assuming the role was a possibility, but could not be guaranteed. Mr. David Crane proposed Dr. Peter Wadhams, United Kingdom, as a suitable successor to Dr. Allison. Mr. Jon Shanklin suggested that the role could be adopted jointly by the SPRI and the BAS, both in Cambridge, U.K. It was decided to see how the Programme developed over the next year and Dr. Allison suggested that, if necessary, he could then begin a gradual transfer of the Programme co-ordination to Cambridge.

11. Adoption of the Meeting Report

The participants to the meeting reviewed and agreed the draft report.

12. Closure of the Meeting

The Chairman of the meeting stated that the IPAB would become a viable programme with visible progress being made. He stressed that co-operation was essential to counter the technical and logistical problems. Dr. Kottmeier thanked all of the attendees for being present at the meeting and all those who were involved in the organisation. He thanked the Scott Polar Research Institute for supplying the venue.

The First Session of the WCRP International Programme for Antarctic Buoys was closed at 12:50, Saturday, 3 August 1996.

INTERNATIONAL SOUTH ATLANTIC BUOY PROGRAMME

General

The chief objective of the ISABP is to establish and maintain a data network in the Atlantic Ocean between 25° North and 55° South. The aim with this data network is to satisfy the needs of the WWW, GCOS/GOOS, the meterological and the oceanographic community. The bulk of the effort does go into deploying drifting buoys, but effort is also made to establish fixed stations on Islands in the ISABP area of interest.

New logo

A new logo was designed for the ISABP, as the participants thought the previous logo was unsatisfactory.

Fixed stations

No new fixed stations were installed during the past year. The AWS on Southern Thule Island could not be repaired as planned, as bad weather prevented personnel going ashore during the time when the ship was visiting the Island. The station on Bouvet Island was replaced in January this year, after the previous station had provided good data for the previous two year period. In February 1997 a DCP will be installed on Tristan da Cunha Island.

Drifting buoys

In the past year fifty seven buoys were deployed in the ISABP area of interest. There are firm commitments for the deployment of thirty five more drifters before the end of this year. The bulk of these drifters were deployed by dedicated deployment flights and voyages. I would like to give mention to the following deployments:

1. In December 1996, 17 drifters were deployed from the SA Navy Vessel SAS Outeniqua, on a resupply voyage to the Antarctic. These drifters were all SVP-B drifters, and were a mixture of SA Weather Bureau and AOML, Miami, owned drifters.

2. During May 1996, 20 drifters were air deployed west of 40 West, and South of 35 South by the US Navy. Three of these drifters failed upon deployment.

3. Three Barometer drifters were deployed between 8° South and 15° South, 50 nautical miles from the African west coast.

4. A FGGE type WSDdrifter from the UK met office was deployed off Ascension Islands during April this year. Unfortunately the anemometer of this drifter was damaged with deployment, rendering the wind speed sensor unserviceable.

5. Ten drifters were air deployed by the US Navy during July in the Tropical Atlantic, north of the equator. Five all these drifters were WSD FGGE type drifters. This deployment was coordinated by Mike Burdette of the NDBC, and it is the first deployment in this area since the ISABP was formed.

6. Four drifters were deployed by the Argentine Navy Hydrographic office at 44° South, 059° West.

7. Eight drifters will be deployed between 5° and 30° West, South of 35° South in September this year.

Two drifters were deployed from a ship-of-opportunity. Data from all these drifters were disseminated onto the GTS. All drifters were SVP-B drifters, with the exception of the six drifters reporting WSD.

The South Atlantic data situation

For an assessment of the data situation in the ISABP area of interest, the Meteo France Daim charts are extremely helpful. Admittedly these charts evaluate the situation with reference to the WWW requirements, but as virtually only barometer drifters are deployed in the ISABP area, and data from all these drifters are disseminated onto the GTS, it is a reliable benchmark for the ISABP Atlantic ocean. The South Atlantic data situation at the moment is probably better than it has ever been in the history of drifting buoy deployments. The situation, unfortunately, in the mid Atlantic and Tropical Atlantic is not that good. I do, however, envisage many more deployments in this area as soon as the SVP-B WSD drifter becomes available.

Future prospects

Although there were several significant deployments in the ISABP area of interest during the last year, they did not take place in an pre-planned fashion. The coordinator will endeavour to coordinate the different deployments over the next year is a way as to ensure that the different deployments complement each other and provide the optimum drifter spread.

The availability of the SVP-B WSD drifter is keenly awaited by participants, and should encourage deployments in areas that have been up to now neglected.

Plans are underway to place three moored buoys in the South Atlantic Ocean.

Eugene Burger ISABP Programme Coordinator

INTERNATIONAL BUOY PROGRAMME FOR THE INDIAN OCEAN

1. INTRODUCTION

The IBPIO was established during the second of two preparatory meetings held respectively in Goa (February 1996) and La Reunion (September 1996) under the sponsorship of DBCP. The participants of this second meeting adopted the terms of reference and the operating principles drafted during the first meeting, and modelled on the International South Atlantic Buoy Programme (ISABP).

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.

To be consistent with the requirements stated by WWW and GCOS, a network for the basic variables with data points spaced at approximately 500 km should be maintained over the operational area (north of 55°S) - see figure 1. A first programme target will be the maintenance of 100 drifting buoys reporting atmospheric pressure, sea-surface temperature and position, uniformly deployed.

Data acquisition and distribution, quality control and archiving are also detailed in the operating principles. The programme will operate for an initial five-year period with a formal review by the participants after three years, leading to a decision on its continuation.

The programme will be self-sustaining, supported by voluntary contributions from participants in the form of equipment, services (such as communications, deployment, storage, archiving, co-ordination...). As necessary, suitable arrangements can be made for the administration of any voluntary monetary contributions by the participants.

Participants will meet annually to share information on the programme and related matters.

2. FIRST PROGRAMME MEETING

The First Programme Meeting was held in La Reunion immediately after the second preparatory meeting. The following organisations were represented: the Australian Bureau Of Meteorology (ABOM); the Atlantic Oceanographic and Meteorological Laboratories (AOML, USA); Météo-France; the National Institute of Oceanography (NIO, India); Orstom (France); the South African Weather Bureau (SAWB); the DBCP; CLS/Argos and WMO.

The meeting elected a Chairman and a Vice-Chairman for the Programme Committee, appointed a Programme Co-ordinator and agreed on a working programme. A priority task for the Programme Co-ordinator is to canvas for additional participants, especially those organisations in the region that might contribute logistic facilities to the programme.

Following a request of the IBPIO chairman, the DBCP formally recognised the IBPIO as an Action Group of the DBCP, at its twelfth session.

The participation of the relevant agencies should be formalised through letters of intent to the programme chairman before the end of 1996 if possible. The first issue of a quarterly IBPIO Newsletter should be available at the same time.

The Second Programme Meeting will be held in Perth, Australia in July or August 1997.

3. OPERATIONAL PROGRAMME

3.1 Moored buoys

NIO plans to deploy 12 moored data buoys in the seas around India over a period of 3 years (at a rate of 4 buoys per year). Eight of these buoys will be moored in shallow waters, the remaining four in deeper waters (Arabian Sea and Bay of Bengal). All the buoys will measure, at least, atmospheric pressure, air and sea-surface temperatures, wind speed and direction, wave height and period.

3.2 Drifting buoys

By the end of October 1996, about one hundred drifting buoys, owned by 6 agencies, were operating in the Indian Ocean and transmitting their data on the GTS. Only 35% of them was reporting air pressure data in addition to sea-surface temperature but it is expected this percentage will increase in the future. The table here below summarise the present contribution of each agency.

Owner	SST only	Air Pressure	Wind
Atlantic Oceano. and Met. Laboratories	65	18	-
Australian Bureau of Meteorology	-	3	-
Météo-France	-	3	-
National Data Buoy Center (USA)	-	3	-
National Institute of Oceanography	1	5	-
South African Weather Bureau	2	4	-
Total	**68**	**36**	**0**

Table 1. Operating drifting buoys by the end of October 1996

Most of the buoys are provided by AOML. Those which provide only SST measurements are standard SVP drifters. Those which also measure atmospheric pressure are SVP-B drifters. Other agencies also provide such buoys, as well as standard FGGE buoys, although this kind of buoy will probably diminish in numbers. Some Wind-FGGE buoys were already deployed in the Indian Ocean but none are working at present. Figure 2 shows the buoys trajectories for October 1996.

Deployments are generally 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. For each deployment, the assistance of the local meteorological or oceanographic agency is implied for storage management, buoy tests and/or instructions to the crews before departure, even if the buoys are owned by a foreign institution. Other deployment opportunities are expected soon from ships (Indonesia..) and aircraft (US Navy).

Some buoys, owned by SAWB, will migrate from the South Atlantic Ocean, westerly driven to the Indian Ocean. This flux is more or less compensated by the escape of other buoys to the South of Australia.

A total of 80 buoys is expected to be deployed in the Indian Ocean during the period Sept. 1996 - August 1997.

3.3 Data recovery

The data are recovered through the Argos system and sent on the GTS through the processing centers of Toulouse and Landover. The NDBC also relays the data of its own buoys on the GTS.. GTS bulletin headers are as follow:

Center	Hemis.	Normal	Back-up*
Toulouse	North	SSVX05 LFPW	SSVX06 LFPW
	South	SSVX03 LFPW	SSVX10 LFPW
Landover	North	SSVX06 KARS	SSVX05 KARS
	South	SSVX10 KARS	SSVX03 KARS
NDBC	North	SSVX08 KWBC	
	South	SSVX02 KWBC	

(*) Back-up of Landover for Toulouse and vice versa.

In addition to the global coverage provided by the basic system, a Bureau of Meteorology S-band receiving antenna (Local User Terminal (LUT)), located in Perth, allows the data reception for buoys which are in sight of the satellite at the same time they are in sight of the station. This system is one of the components of the Australian Argos Regional Coverage, and data transmission on the GTS commenced in 1996, reducing average delay to less than 30 minutes from satellite pass to GTS for buoys in the Australian region.

The installation of two other LUT's, useful for the IBPIO, is planned next year. A first one will be located in La Reunion and operated by Meteo-France - and Orstom as back-up. The second one will be set up in Cape Town and operated by SAWB.

4. INFORMATION ON THE IBPIO

Besides the quarterly newsletter, IBPIO information is also available on the World Wide Web at *http://www.shom.fr/meteo/ibpio*. The pages, regularly updated, give a description of the programme, its objectives and management, listings of participants and buoys status, monthly buoys trajectories and links to related subjects such as DBCP data quality control information.

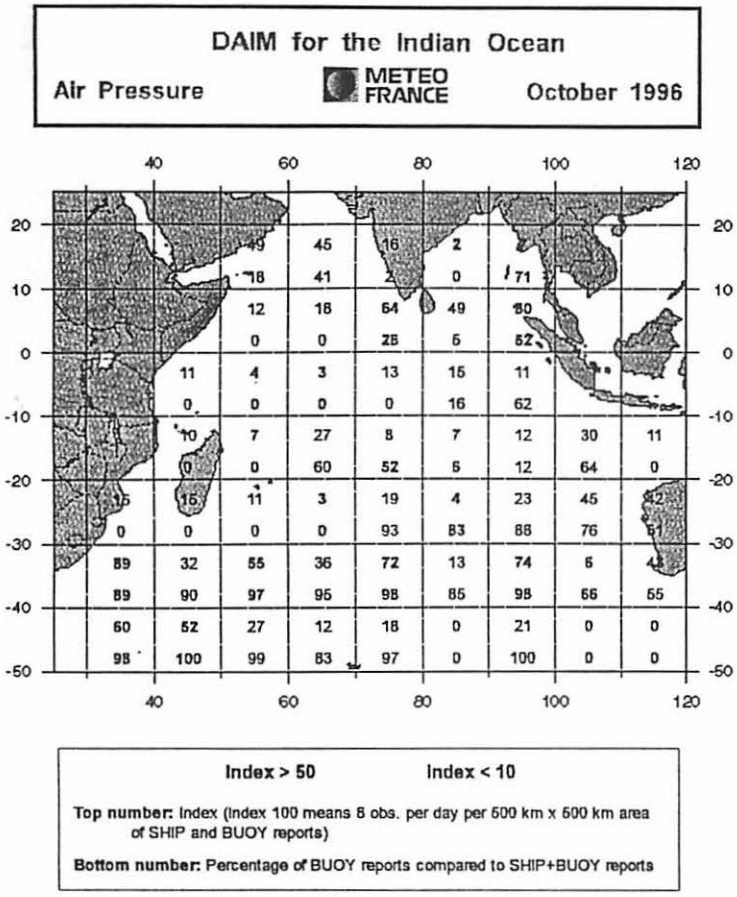


Figure 1. Example of Data Availability Index Map (DAIM)

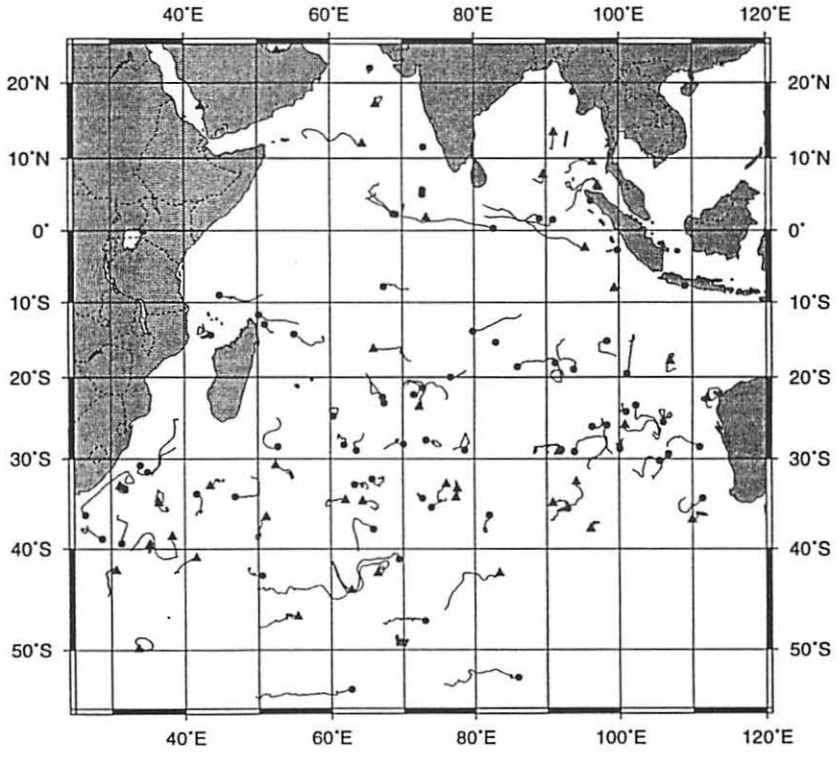


Figure 2. Drifting buoys trajectories in the Indian Ocean (October 1996)
(● SST only - ▲ SST + Air pressure)

ANNEX III

REPORTS FROM THE DATA MANAGEMENT CENTRES

This annex contains the reports by the:

- **R**esponsible **N**ational **O**ceanographic **D**ata **C**entre (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)

- **S**pecialized **O**ceanographic **C**entre (SOC) for drifting buoys of the Integrated Global Ocean Services System (IGOSS) of IOC and WMO, which is implemented by the Sub-division prévision marine (SCEMO/PREVI/MAR) de Météo-France.

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 95 - July 96).

Data Flow

We show in Table 1 various statistics derived for this 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. 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 both numbers, MEDS number of buoys divided by the TC-DBCP number.

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 equal to 1 (position and date/time) 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 2,305,126 with an average of 121,322 per month.

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). Although both curves have a positive upward slope, the gap (1,323 buoys) remains more or less constant between both. On the average, MEDS is receiving data from 35% (see Figure 3) of all the buoys (drifting and fixed platforms). According to the TC DBCP, this percentage is too small by approximately 5%. 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 was suggested in last year's report, more investigations is required to resolve this issue. It may be necessary to perform an exhaustive analysis for one month, meaning define the exact status of every buoy sending data onto the GTS system and compare with the number of messages received from each of these. It will also be worthwhile to define exactly what is meant by "operational" drifting buoys.

Figure 3 provides quantitative ratios that describes the situation with regard to drifting buoys. The first ratio is the number of messages received from drifting buoys as a percentage of the total number of messages received from all buoys (drifting + fixed platforms). This ratio is very high and is on the average 92.6%. This means that drifting buoys still dominate over fixed platforms. The second ratio describes the quality of the messages being sent daily on the GTS. The percentage of good quality messages (position and date/time flags set to 1) is fairly constant (51%) after a sudden decrease in March 1995. The last ratio, being called here the buoy ratio, is the comparison of the number of buoys from which MEDS is receiving data over the the number of physical platforms floating in the oceans. This number was already discussed in the above

paragraph and is on the average around 35%.

Finally, 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 5.5 messages per buoy per day of operation. This number can be compared with the number of satellite passes shown in the following table.

Each transmitter is seen by the satellites six to twenty-eight times a day. The table below shows how many daily passes can be expected at any latitude.

Transmitter latitude	Minimum	Mean	Maximum
0 degrees	6	7	8
15 degrees	8	8	9
30 degrees	8	9	12
45 degrees	10	11	12
55 degrees	16	16	18
65 degrees	21	22	23
75 degrees	28	28	28
90 degrees	28	28	28

Even at low latitudes, the minimum number of messages per buoy per day is greater than 5.5 This could mean two things: first, most of the buoys are being deployed in the tropical latitudes; secondly, a large portion of the buoys do not transmit data on each satellite pass in order to preserve their electrical energy.

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 Figure 5. At the end of December 1995, it contained a total of 9,318,820 messages. More than seventy-five percent (75.51%) of these messages have a quality flag equal to 1 (good quality on position and date/time) and eighty-three percent (83.2%) of these messages are originating from a drifting buoy as opposed to a fix platform. Sub-surface data are available from these buoys since 1987 and the archive now contains a total of 146,692 messages with sub-surface information.

Development

1) Removal of "quasi-duplicates": During the course of last year, it was realized that "quasi-duplicates" were sent by the ARGOS Processing Chain. This problem was mentioned in last year's report but the exact nature and the scope of the problem was unknown at that time.

After further investigation, it was found out that the number of messages received since January 1993 was overestimated. MEDS reprocessed all the data since that date applying a 35-minute filtering window. More than 3 millions messages were re-processed during this particular exercise and 505,103 (13.8%) messages were removed from the archive as being defined as quasi-duplicates. Now, this new procedure technique is applied to the data before the normal processing is completed.

2) ALACE Buoys:

Although ALACE (Autonomous LAgrangian Circulation Explorer) floats have been used extensively in the World Ocean Circulation Experiment, they were designed to acquire velocity data in very remote regions of the world ocean. A recent development is to mount a CTD on the ALACE float creating a profiling Alace float, or P-Alace, or Palace float. The profiling Alace float supplies temperature to 0.006°C and salinity to 0.001ppt precision. Although this is still in the development stage, the Canadian Institute of Ocean Sciences (IOS) on the West Coast has acquired 4 of these so far, 2 for the Labrador Sea and 2 for the NE Pacific. The first deployment in the NE Pacific took place during early September 1995, at station PAPA (50°N, 145°W). The P-Alace does the CTD profile on the up part of its trajectory and transmits the data to a satellite in a highly compressed message. This is then downloaded to the ARGOS land station in Toulouse, France, where the message is automatically converted to an E-mail message and transmitted to IOS via InterNet. The E-mail message is then converted from a hexadecimal coded message to a KKXX message (TESAC) that is transmitted to MEDS, which inserts the message on the GTS for distribution.

Although this device was still experimental, MEDS has inserted 103 TESAC messages from two P-ALace floats since September 1995. Other Principal Investigators have recently expressed their willingness to insert these valuable data sets on the GTS. MEDS has been contacted to carry this additional task. The implications of this new venture are being examined and a decision will be taken soon.

Services

MEDS issues an annual report summarizing the data received and processed during the previous year and showing the locations of the buoys. The 1994 annual report is now being prepared and should be available soon to our clients. Every month, global maps are issued displaying the location of the buoys reporting over the GTS. In addition, MEDS also delivers data for a user specified area, time and range of buoys on various computer media in GF-3 format (such as computer magnetic tape, computer diskette and Exabyte cartrige). Displays of buoy tracks are also available for any ocean area and time frame. The MEDS Monthly DRIBU track chart is also now published on MEDS WWW.

MEDS has completed the development and installation of a computer file providing information about the operators of the buoys as well as the program under which the buoys have been deployed. Other information, such as the program manager or organization and characteristics of the buoys are also kept if this information is made available to MEDS. This data file is updated on a monthly basis with the latest information received from the DBCP Technical Co-ordinator.

MEDS has completed the development of an archiving mechanism for the Drifting Buoys Bulletin Board messages (Owner Buoy QC messages) available each day through InterNet. For a particular buoy or set of buoys, all messages (if any) regarding its operational behaviour and the quality of data are available upon request on paper or on computer diskette.

Table 1: Monthly Statistics on Number of Buoys and Number of Messages received at MEDS from January 94 to July 95 and Comparison with DBCP TC Reported Number

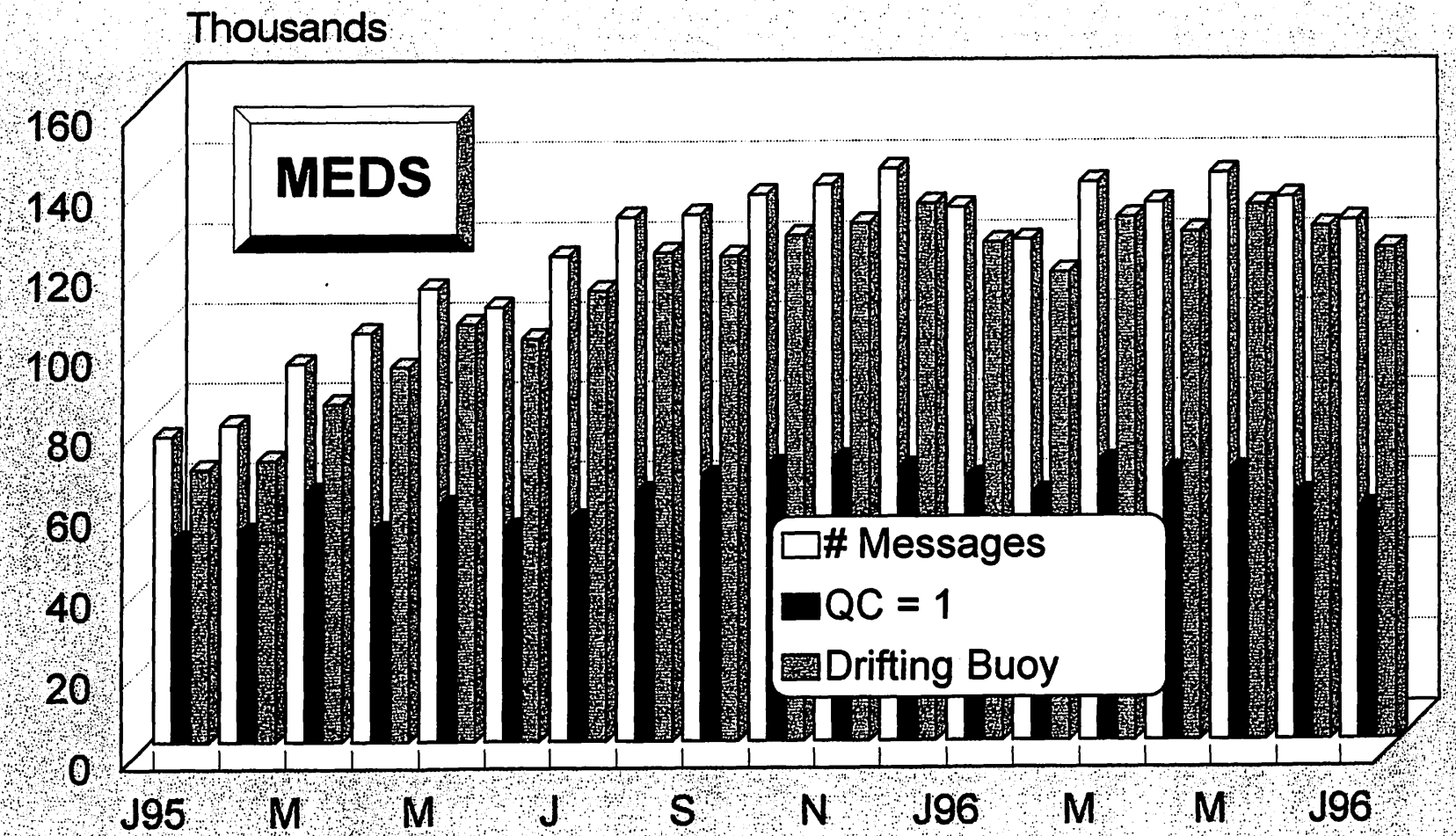
Month/ Year	# of messages received	Ratio in % of messages QC OK	# Buoys MEDS	# of Buoys TC/DBCP	Ratio in %
Jan 95	75,692	65.97	589	1,817	32.42
Feb 95	78,631	66.02	608	1,765	34.45
Mar 95	93,873	65.76	597	1,880	31.76
Apr 95	101,592	51,25	603	1,851	32.58
May 95	112,772	51.89	654	1,911	34.22
Jun 95	108,043	48.83	649	2,044	31.75
Jul 95	120,825	45.43	635	2,119	29.97
Aug 95	130,433	47.22	693	2,139	32.40
Sep 95	131,101	49.97	714	2,068	34.53
Oct 95	136,099	50.08	723	2,119	34.12
Nov 95	138,506	50.41	777	2,051	37.88
Dec 95	142,344	47.40	757	2,058	36.78
Jan 96	132,708	49.06	749	2,064	36.29
Feb 96	124,589	49.03	808	2,100	38.48
Mar 96	138,919	49.57	818	2,158	37.91
Apr 96	133,772	49.54	851	2,151	39.56
May 96	141,016	47.13	835	2,237	37.33
Jun 96	134,968	44.88	881	2,265	38.90
Jul 96	129,243	44.24	861	2,141	40.21

Report prepared by:

Paul-André Bolduc
Marine Environmental Data Service
Ottawa, September 1996.

RNODC for Drifting Buoys

Number of Messages

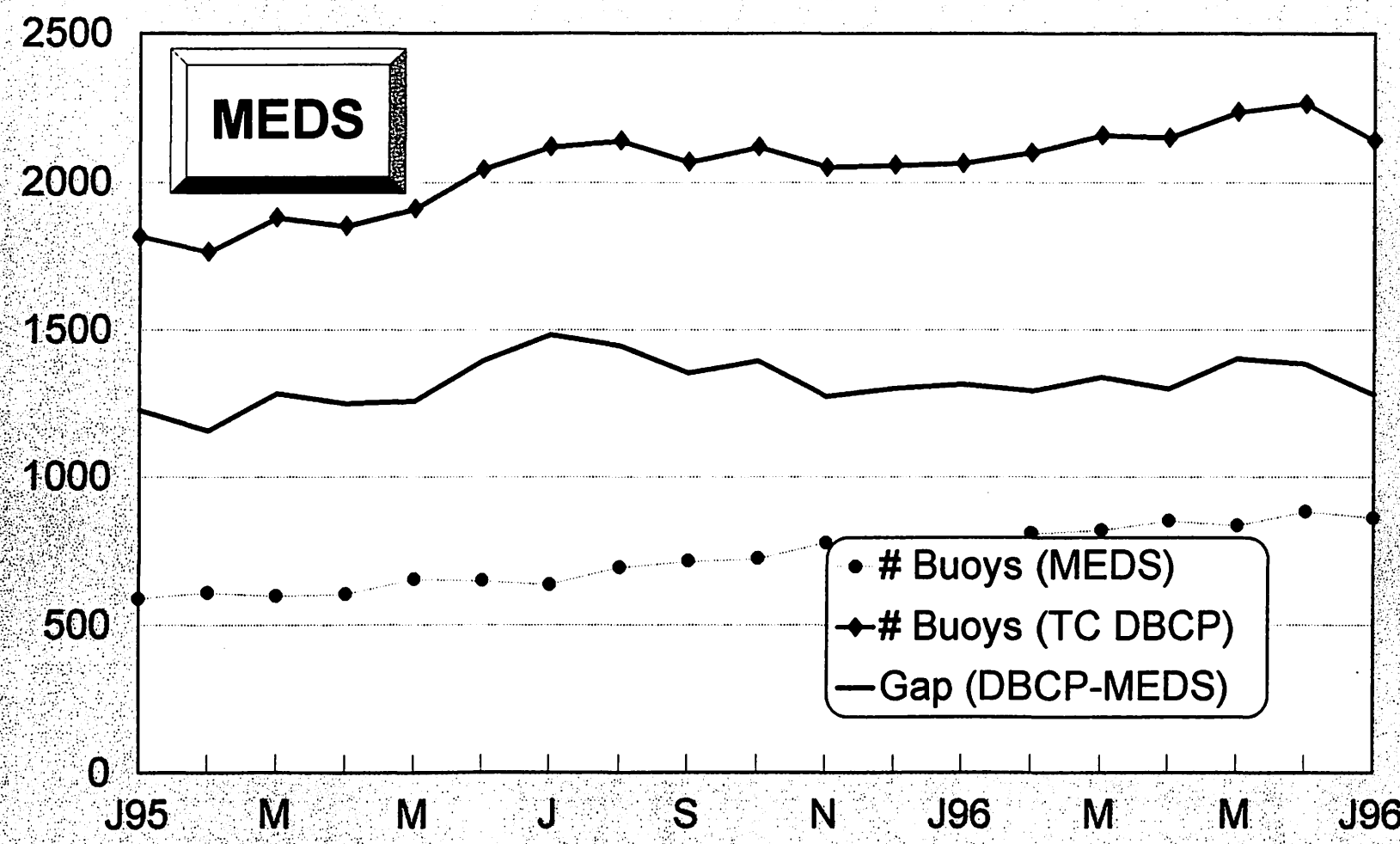


12th DBCP Session, Henley-on-Thames, U.K.

Figure 1

RNODC for Drifting Buoys

Number of Drifting Buoys

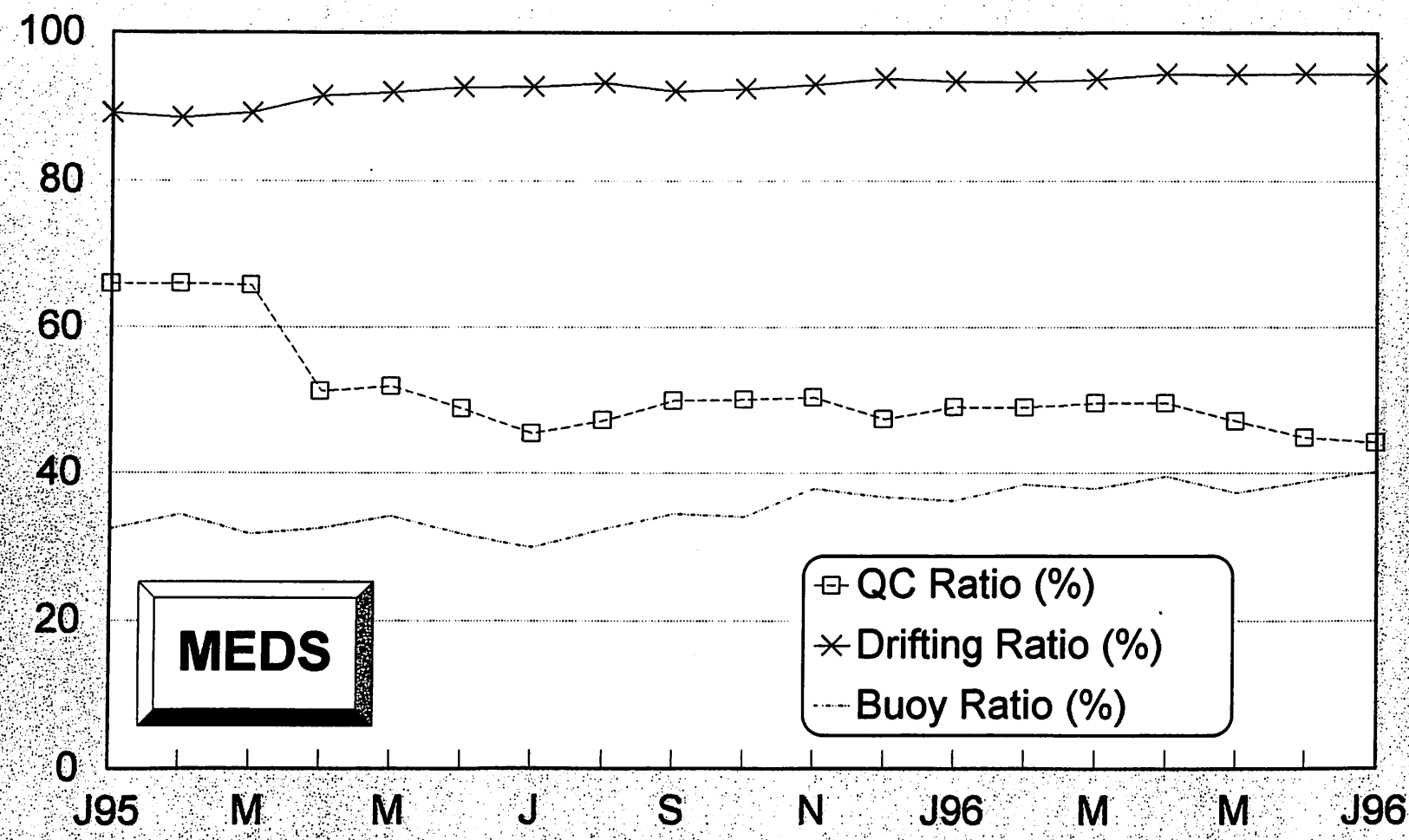


12th DBCP Session, Henley-on-Thames, U.K.

Figure 2

RNODC for Drifting Buoys

QC + Drifting + Buoy Ratios in %

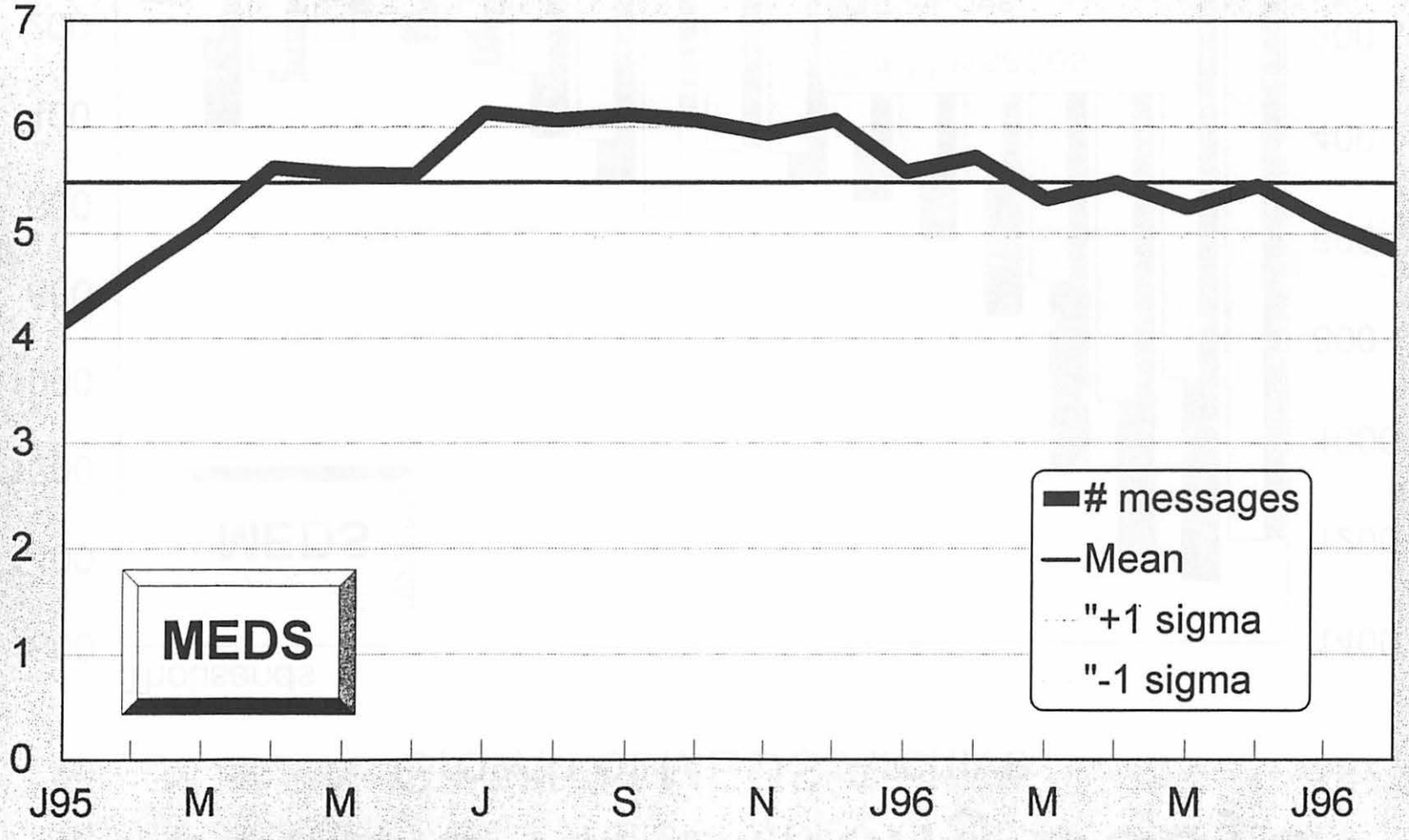


12th DBCP Session, Henley-on-Thames, U.K.

Figure 3

RNODC for Drifting Buoys

Messages / Buoy / Day

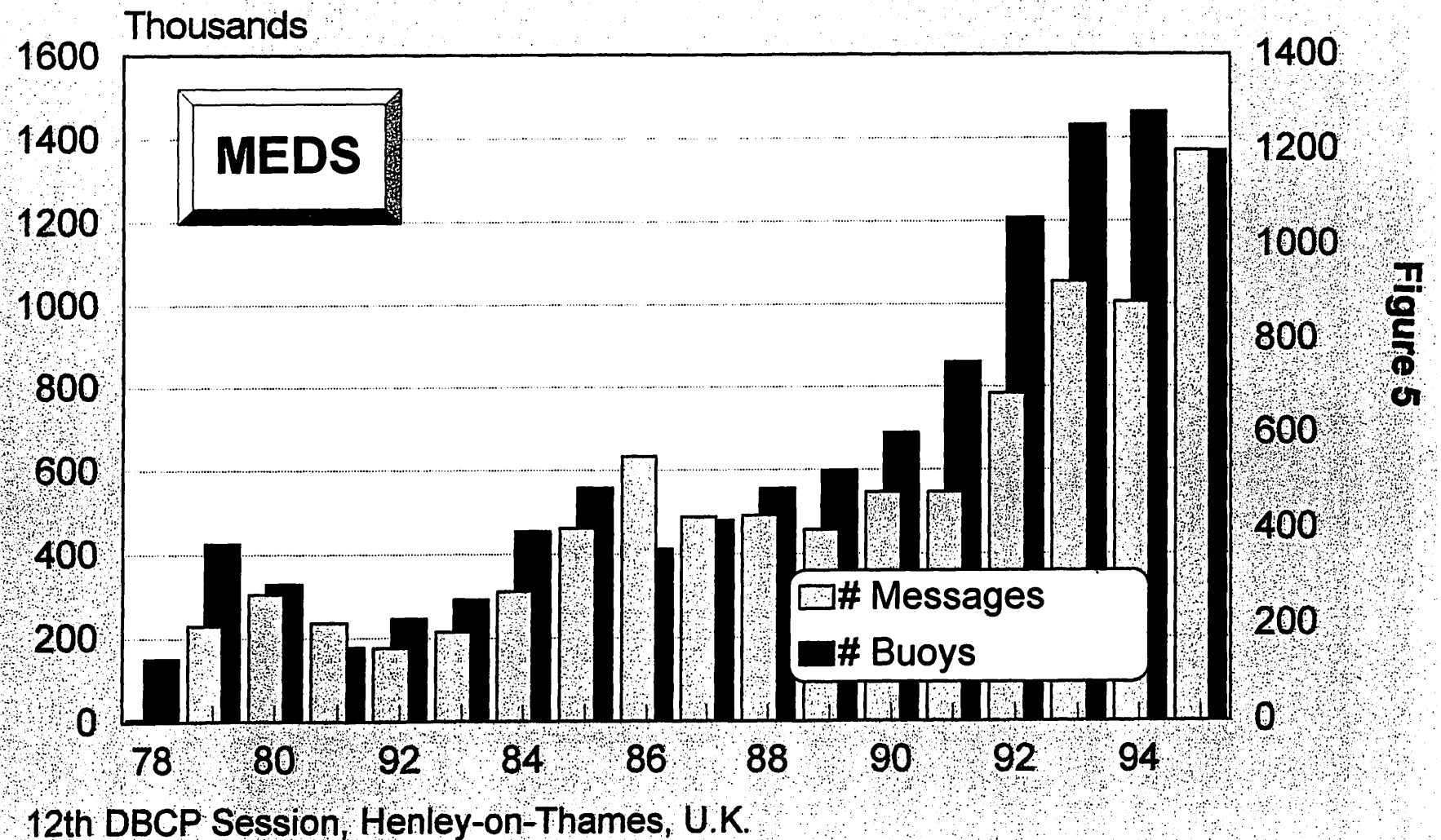


12th DBCP Session, Henley-on-Thames, U.K.

Figure 4

RNODC for Drifting Buoys

Growth of MEDS Archive

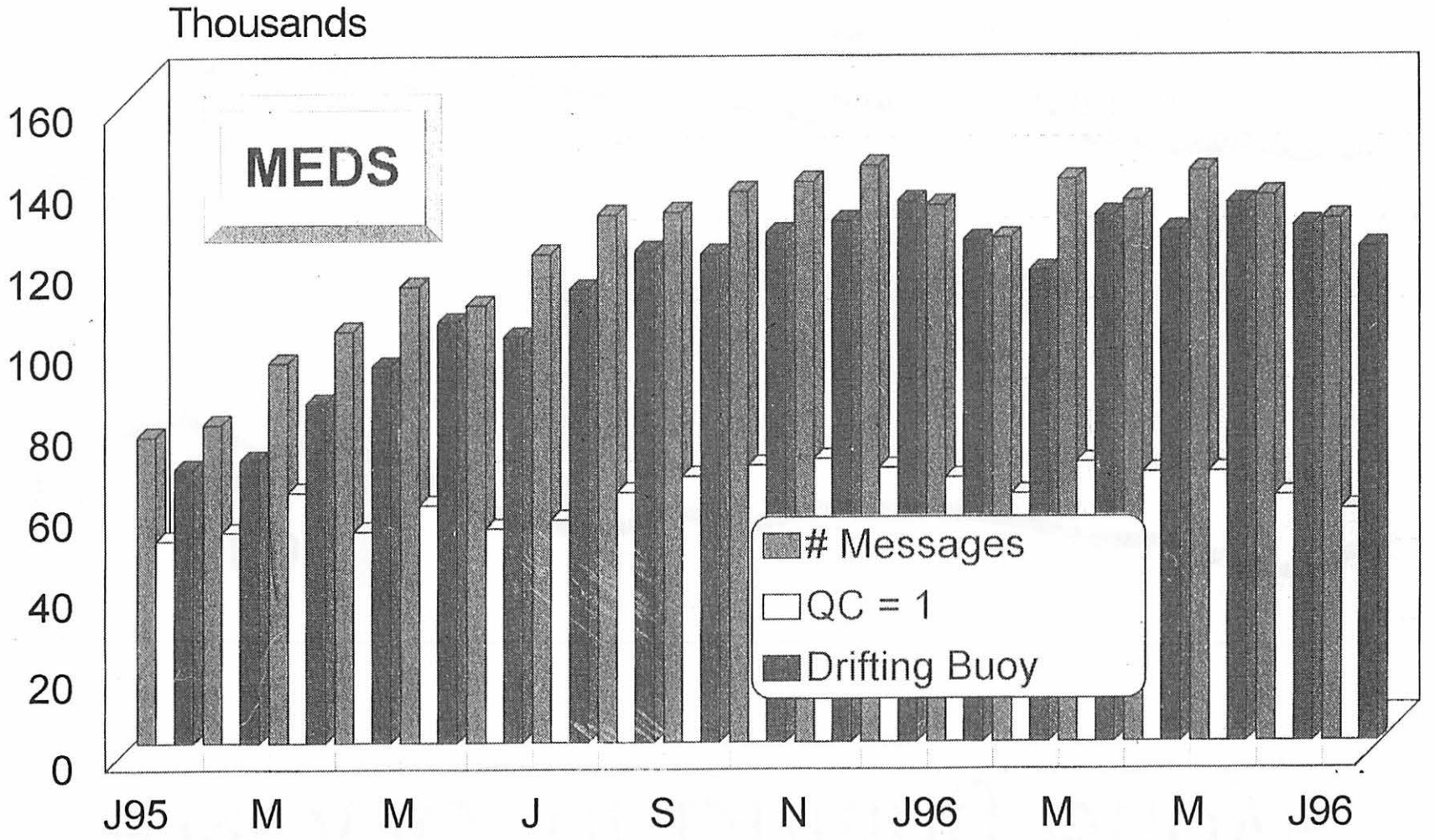


12th DBCP Session, Henley-on-Thames, U.K.

Figure 5

RNODC for Drifting Buoys

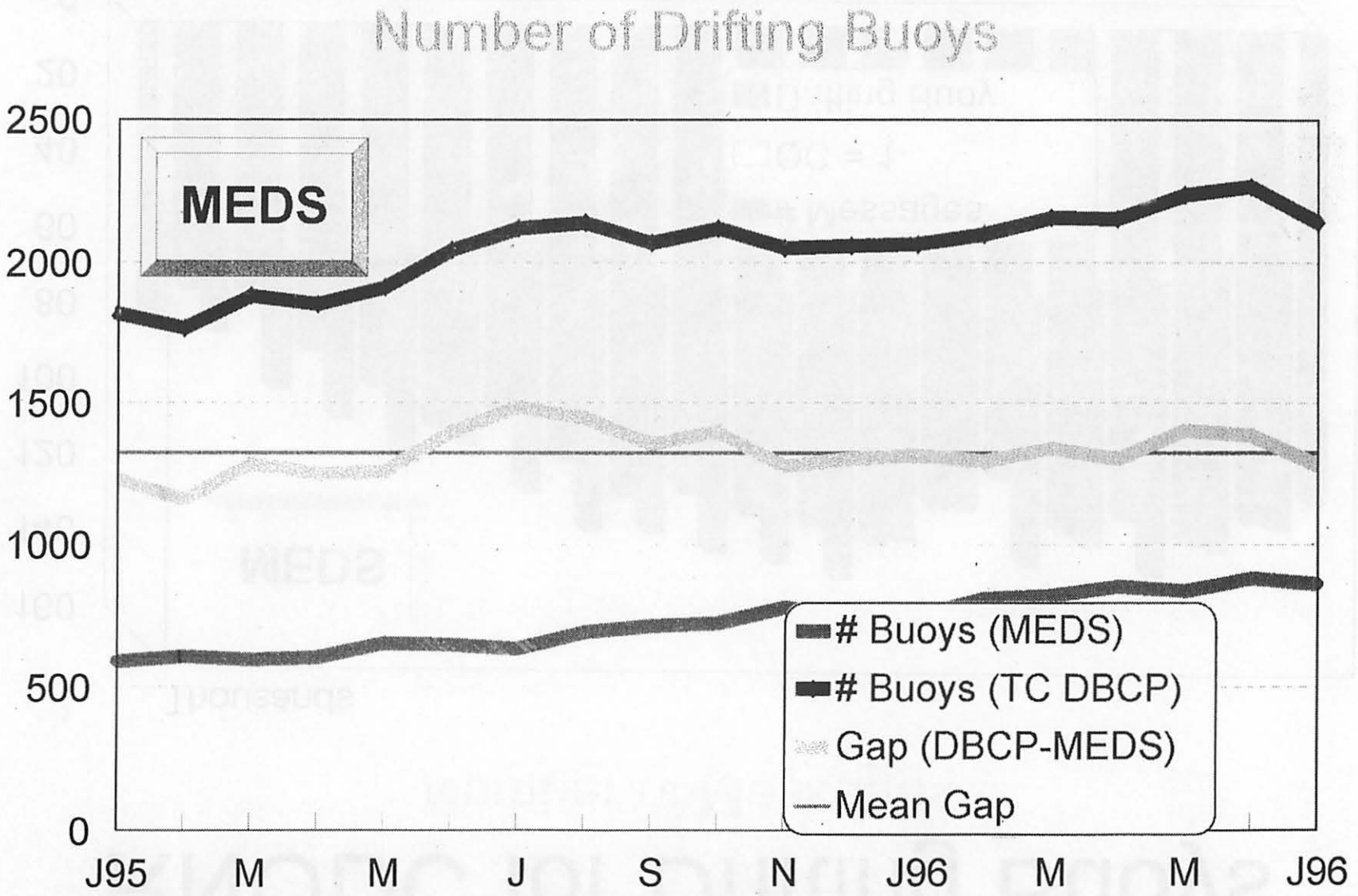
Number of Messages



12th DBCP Session, Henley-on-Thames, U.K.

Figure 1

RNODC for Drifting Buoys

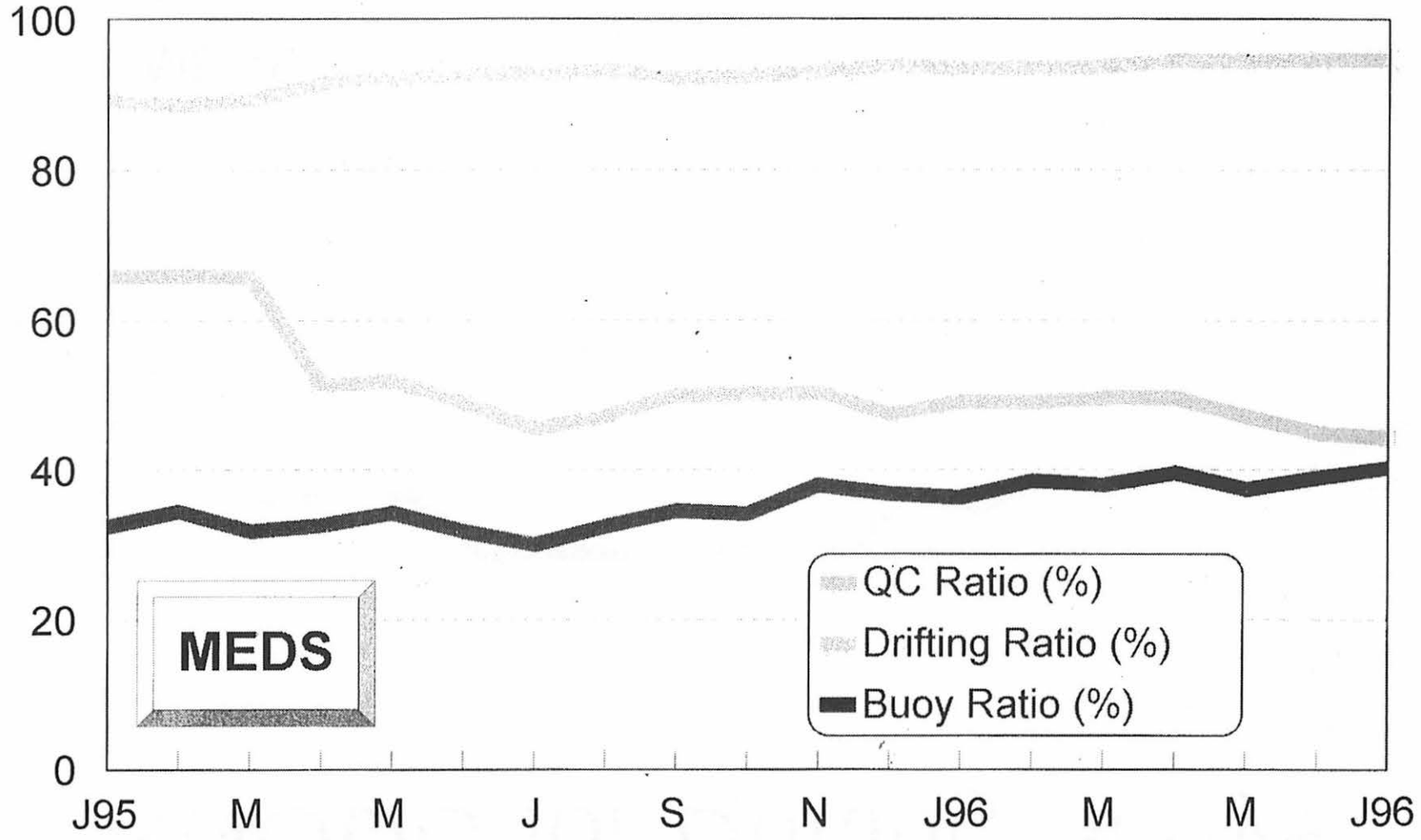


12th DBCP Session, Henley-on-Thames, U.K.

Figure 2

RNODC for Drifting Buoys

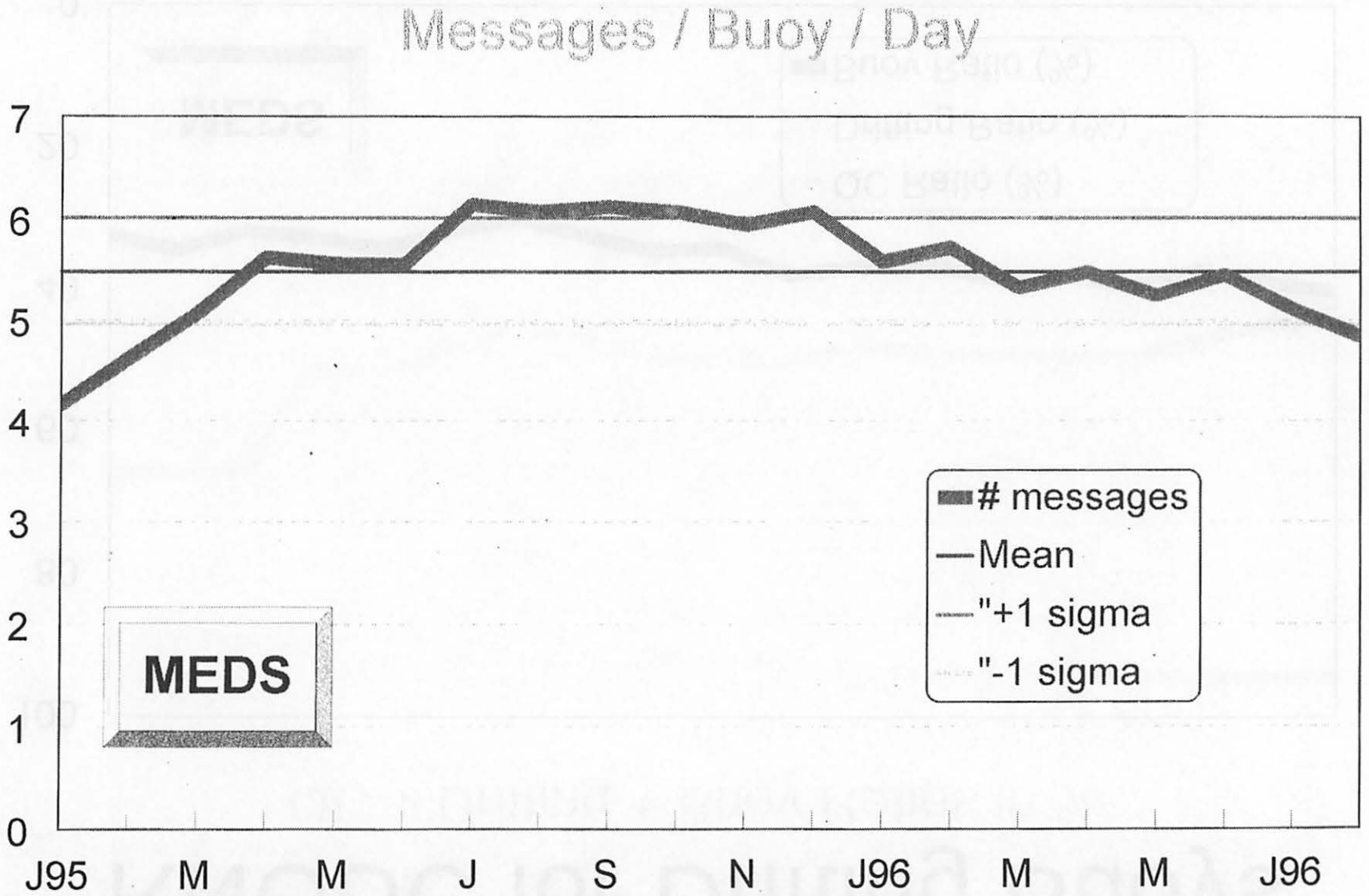
QC + Drifting + Buoy Ratios in %



12th DBCP Session, Henley-on-Thames, U.K.

Figure 3

RNODC for Drifting Buoys

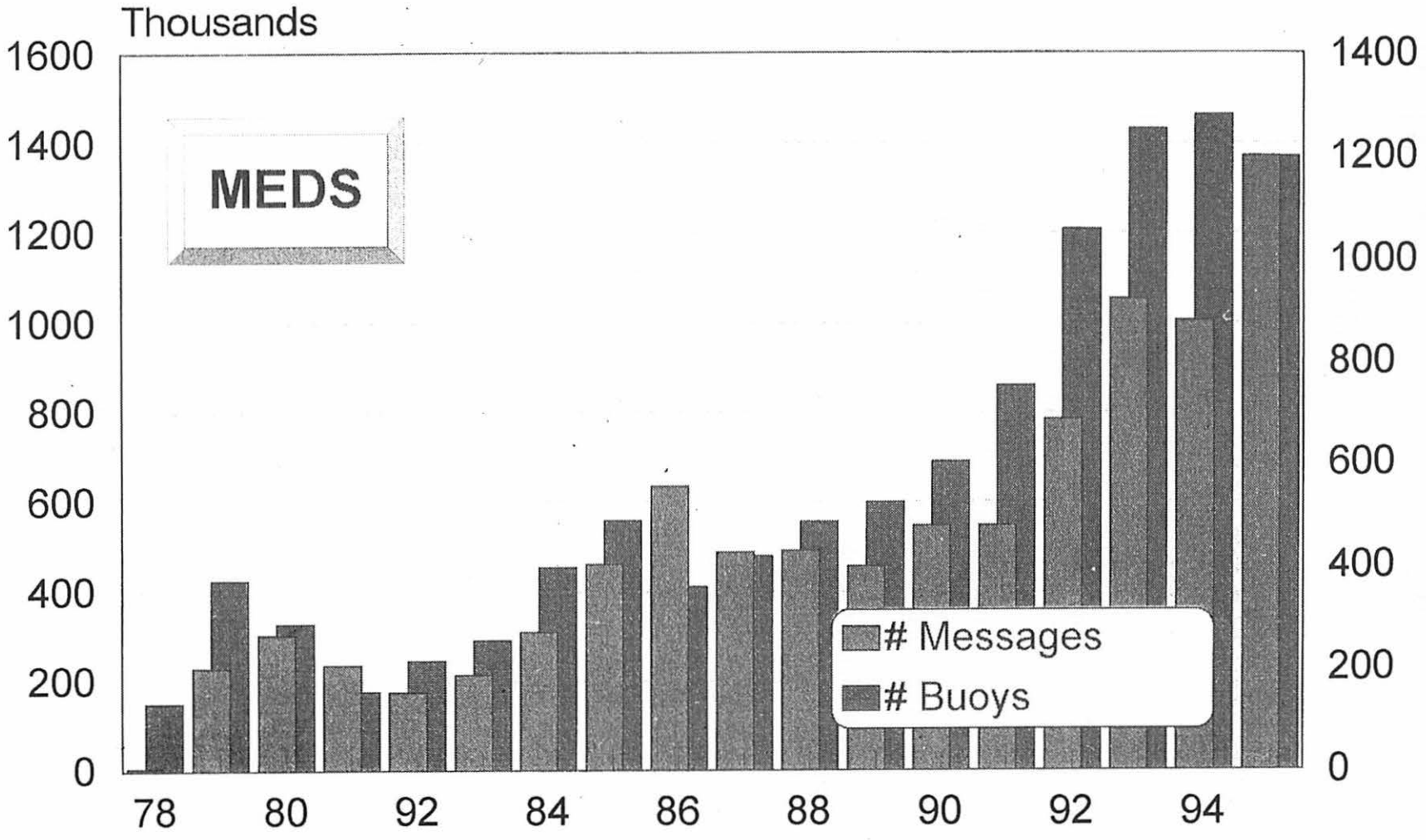


12th DBCP Session, Henley-on-Thames, U.K.

Figure 4

RNODC for Drifting Buoys

Growth of MEDS Archive



12th DBCP Session, Henley-on-Thames, U.K.

Figure 5

SOC for Drifting Buoy Report

1995-1996

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 1995.

Figure 5 shows the time evolution of waveobs reports since the 1st of January 1995.

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 6, 7, 8, 9 show products for June 1996.

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 10, 11, 12, 13 show products for June 1996 .

French SOC Representative

Joël POITEVIN

email : joël.poitevin@meteo.fr

Time evolution of BUOYS reports for wind and pressure

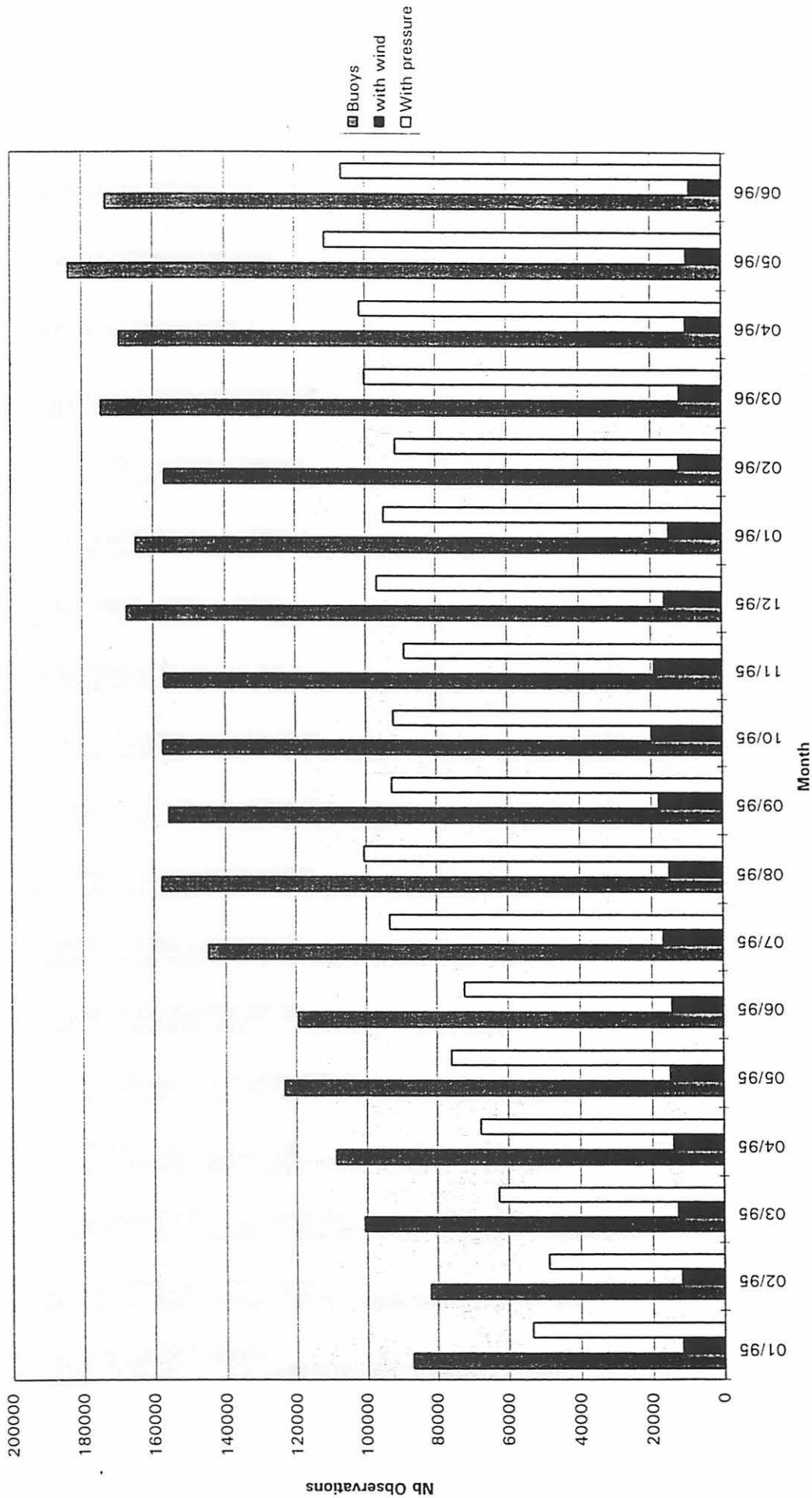


Figure 1

Time evolution of Moored Buoys reports for wind and pressure

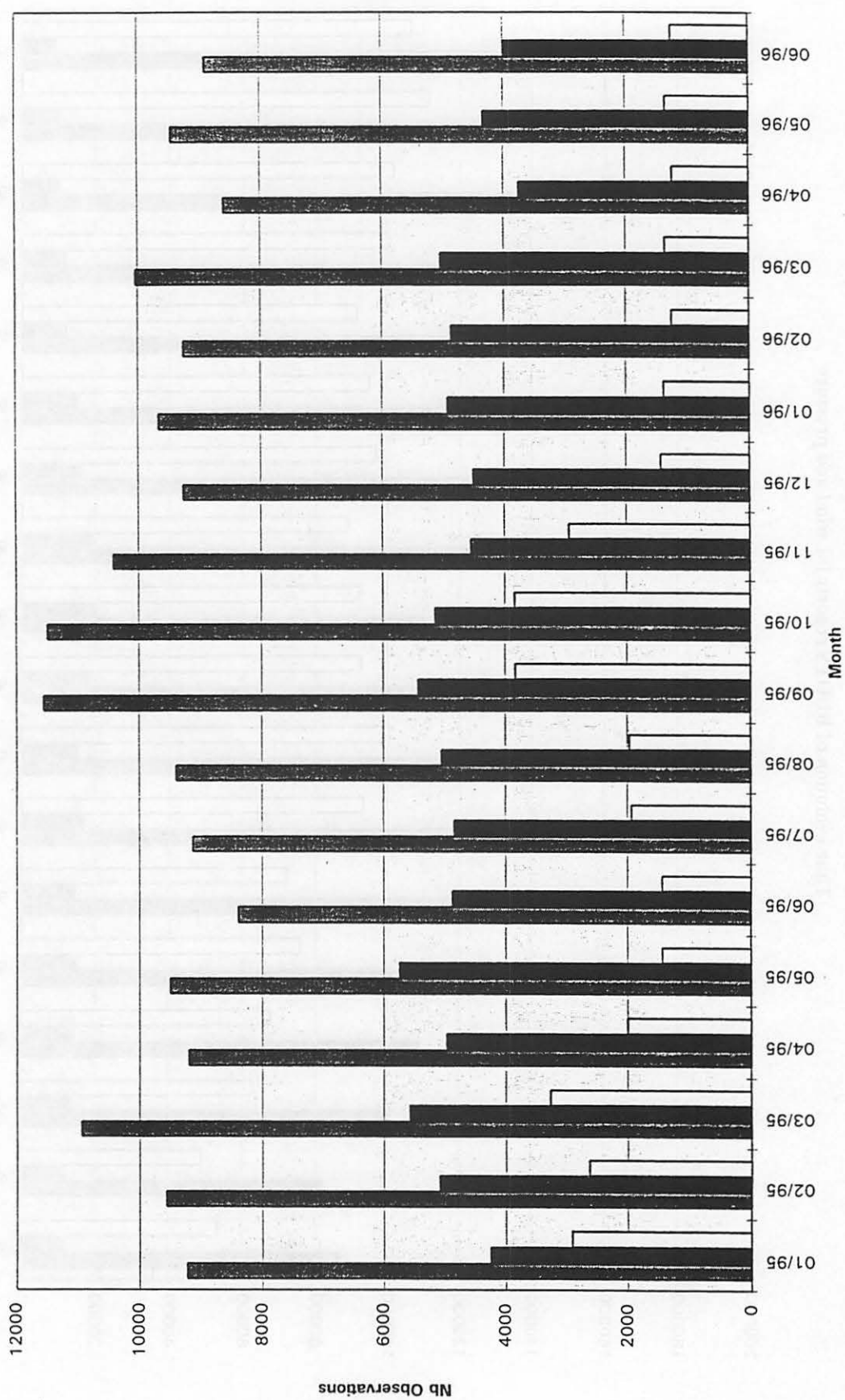


Figure 2

Time evolution of Drifting BUOYS reports for wind and pressure

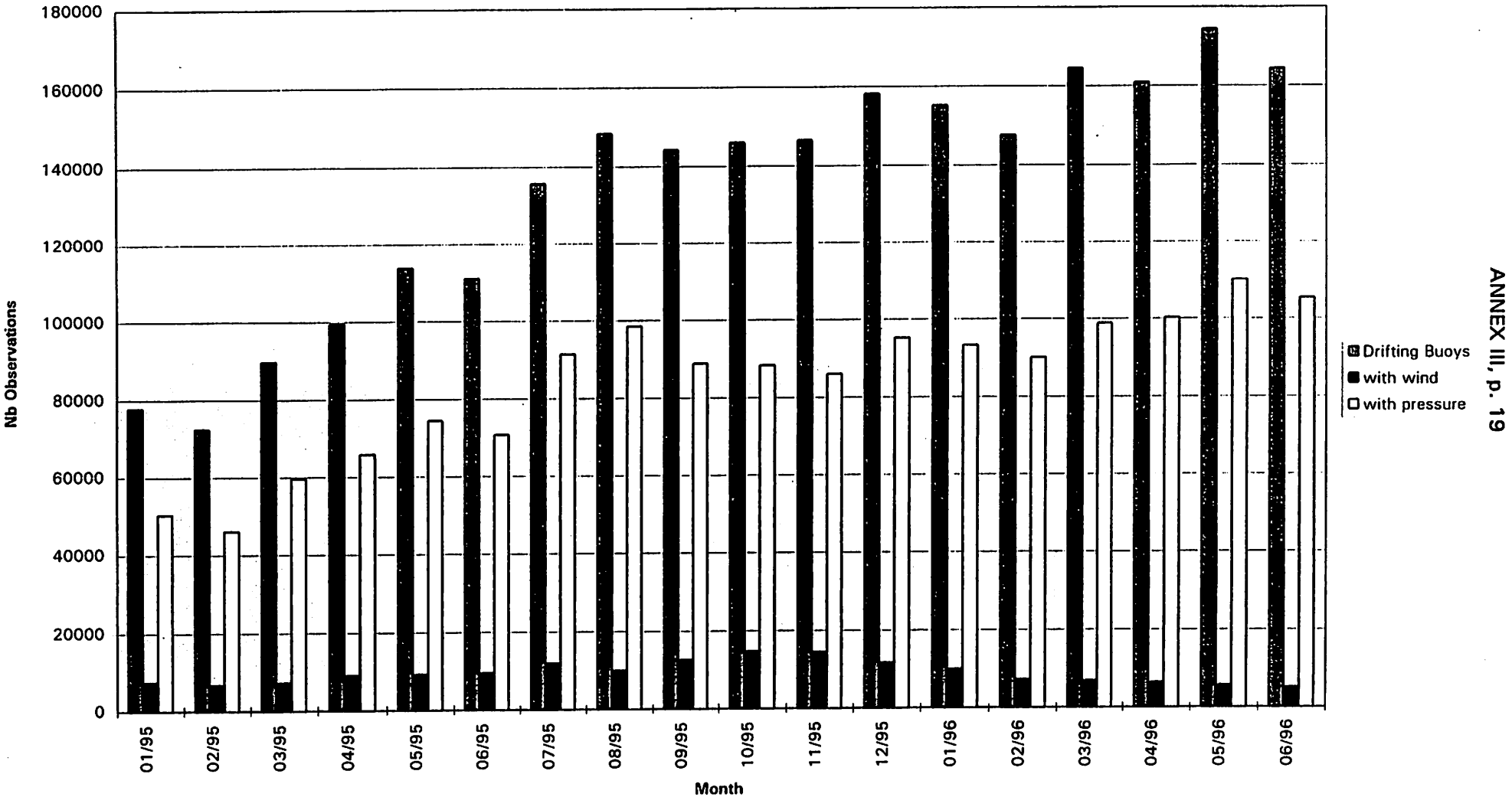


Figure 3

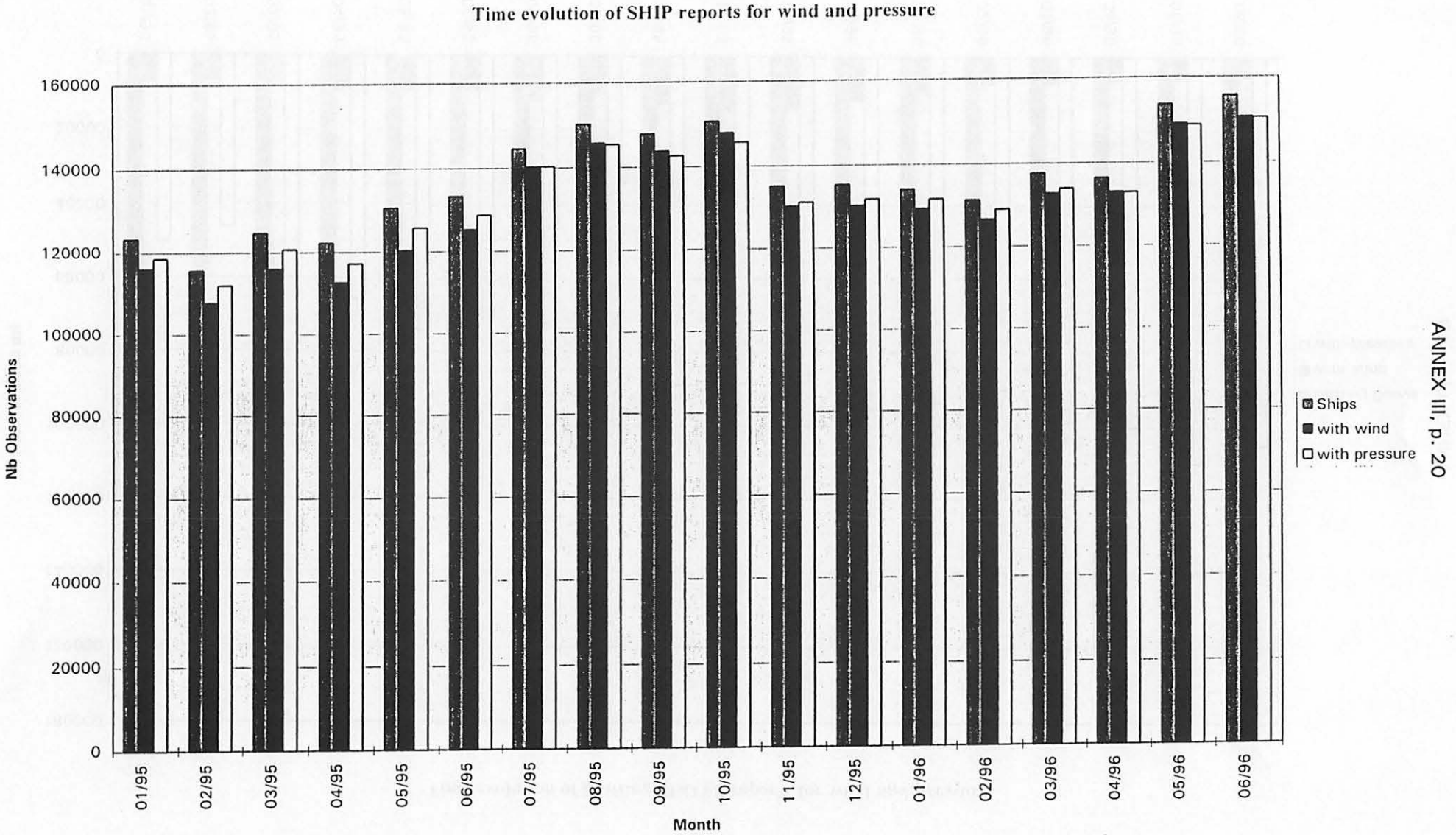

Time evolution of SHIP reports for wind and pressure
Nb Observations
160000
140000
120000
100000
80000
60000
40000
20000
0
01/95
02/95
03/95
04/95
05/95
06/95
07/95
08/95
09/95
10/95
11/95
12/95
01/96
02/96
03/96
04/96
05/96
06/96
Month
Ships
with wind
with pressure

Figure 4

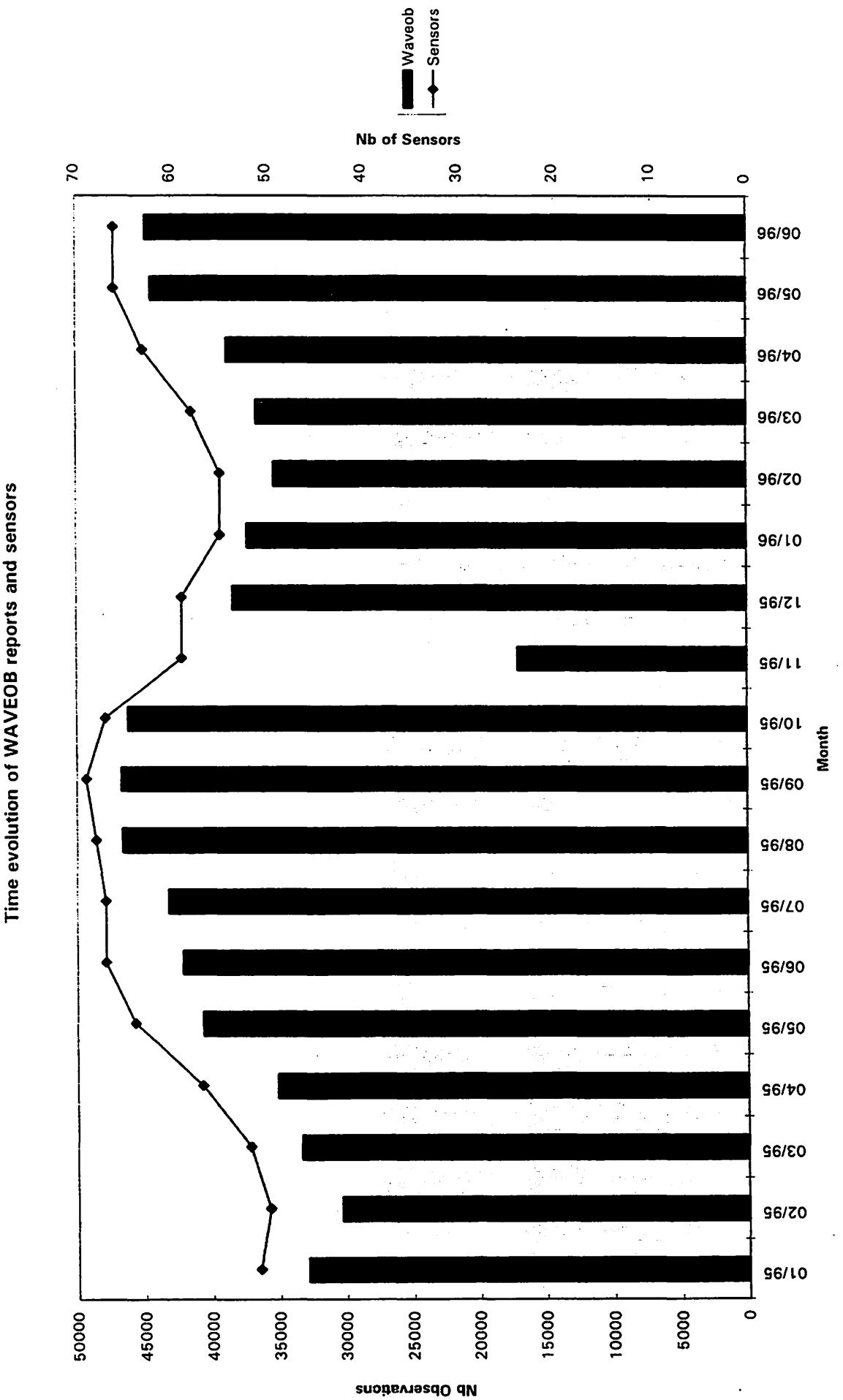

Time evolution of WAVEOB reports and sensors
Waveob
Sensors
Nb of Sensors
Nb Observations
Month
0
10
20
30
40
50
60
70
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
01/95
02/95
03/95
04/95
05/95
06/95
07/95
08/95
09/95
10/95
11/95
12/95
01/96
02/96
03/96
04/96
05/96
06/96

Figure 5

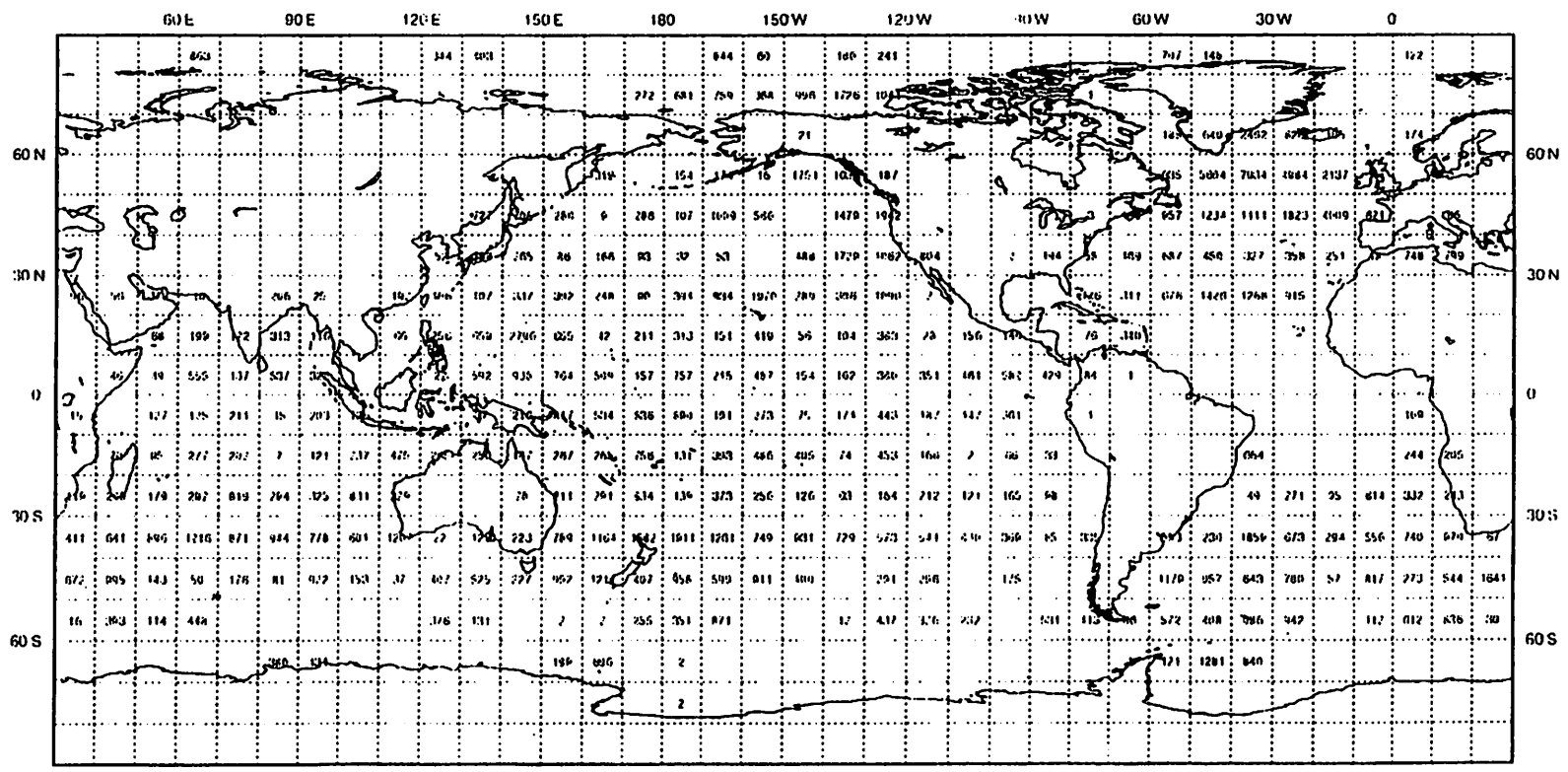
METEO FRANCE

METEO-FRANCE SMISO

Repartition par carre Marsden des observations recues en Juin 1996

Marsden square distribution chart of data received during June 1996

Messages : BUOY **Total : 173264**



MAGICS 4.2 Solaris - smiso - 5 July 1996 07:05:55

Figure 6

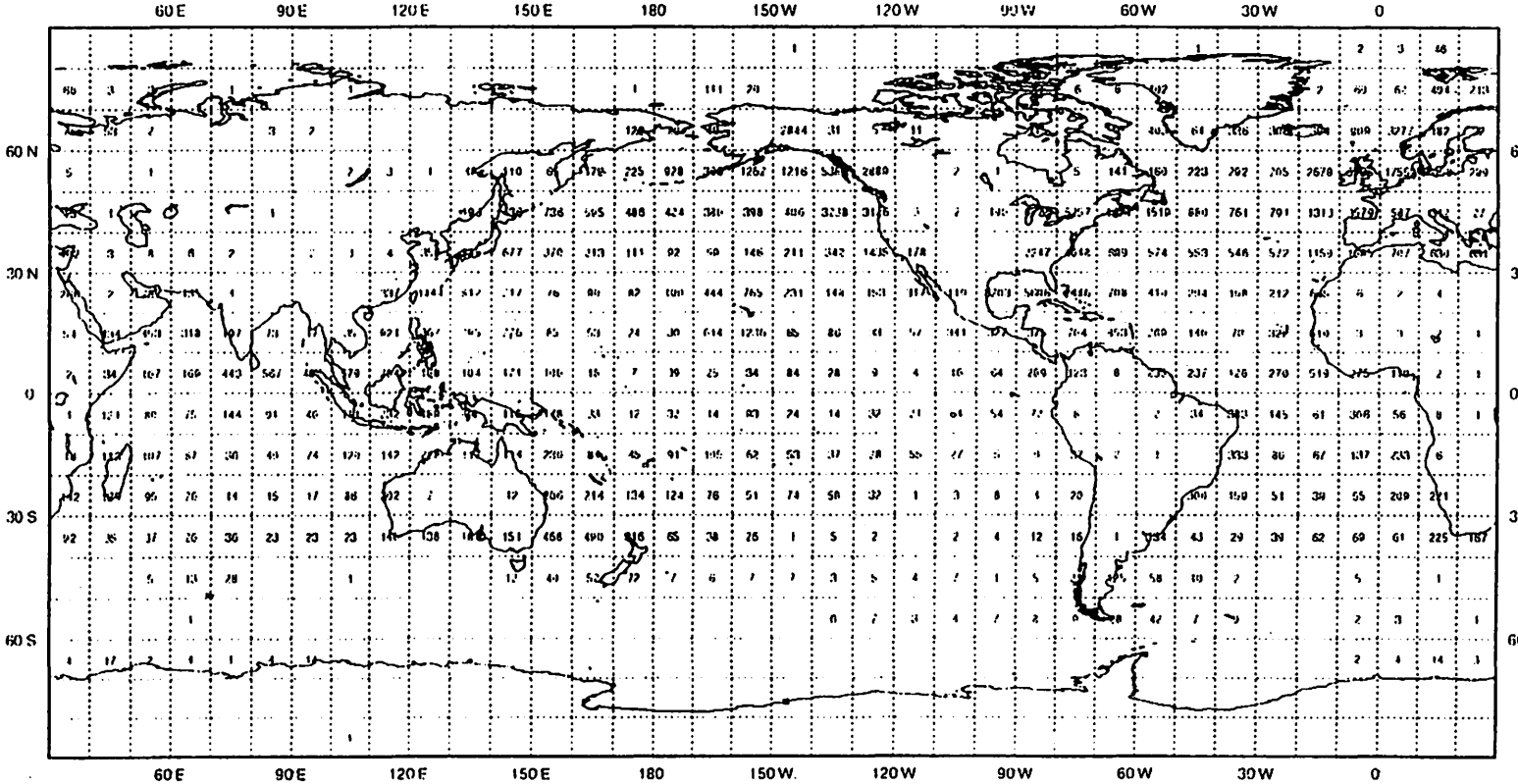
METEO FRANCE

METEO-FRANCE SMISO

Repartition par carre Marsden des observations recues en Juin 1996

Marsden square distribution chart of data received during June 1996

Messages : SHIP **Total : 156720**



MAGICS 4.2 Solaris - smiso - 5 July 1996 07:07:49

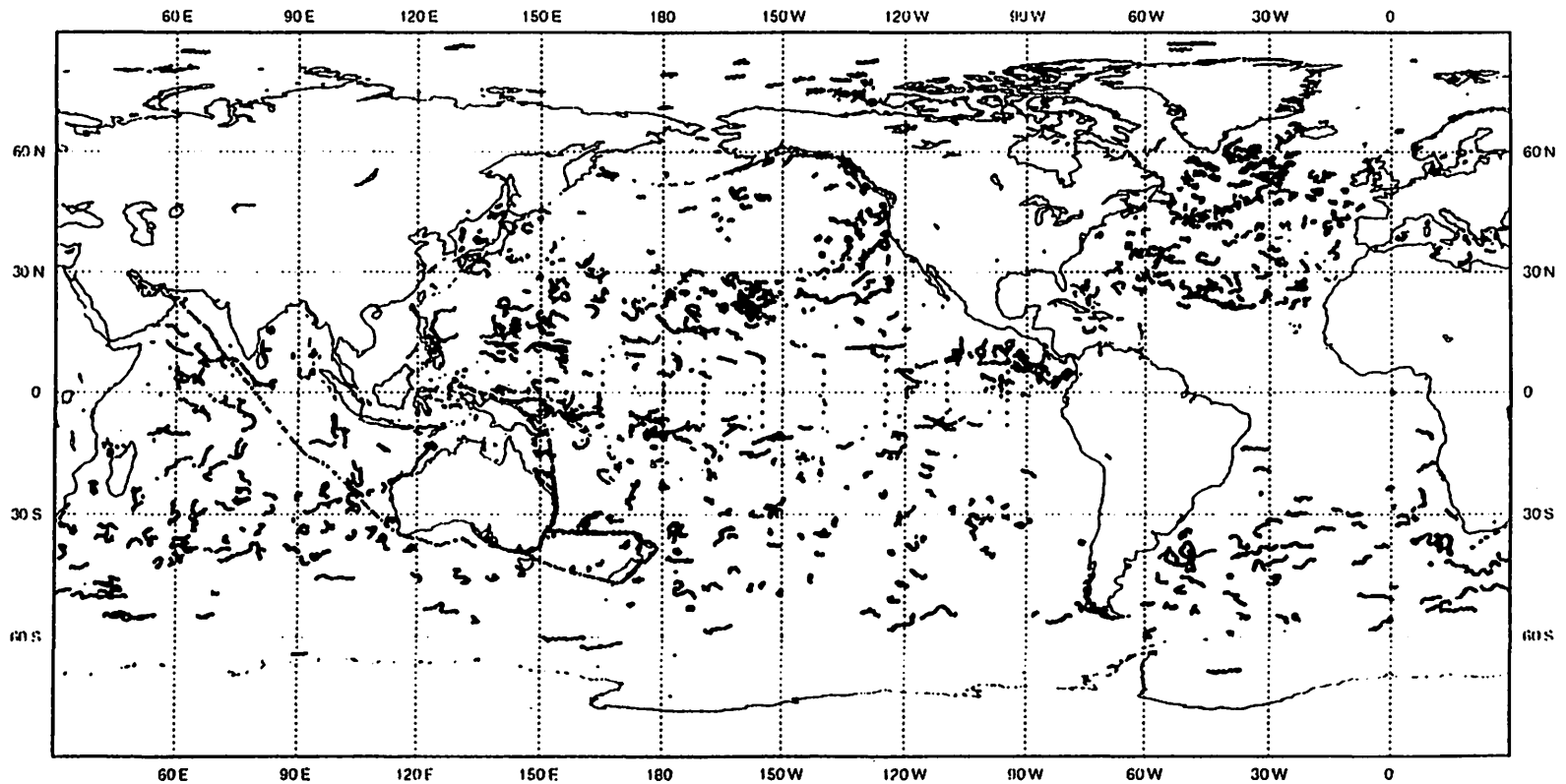
Figure 7

METEO FRANCE

Carte de pointage des observations recues en Juin 1996

Mapping position plot chart of data received during June 1996

Messages : BUOY **Total : 173264**



MAGICS 4.2 Solaris - smiso - 5 July 1996 07:05:02

Figure 8

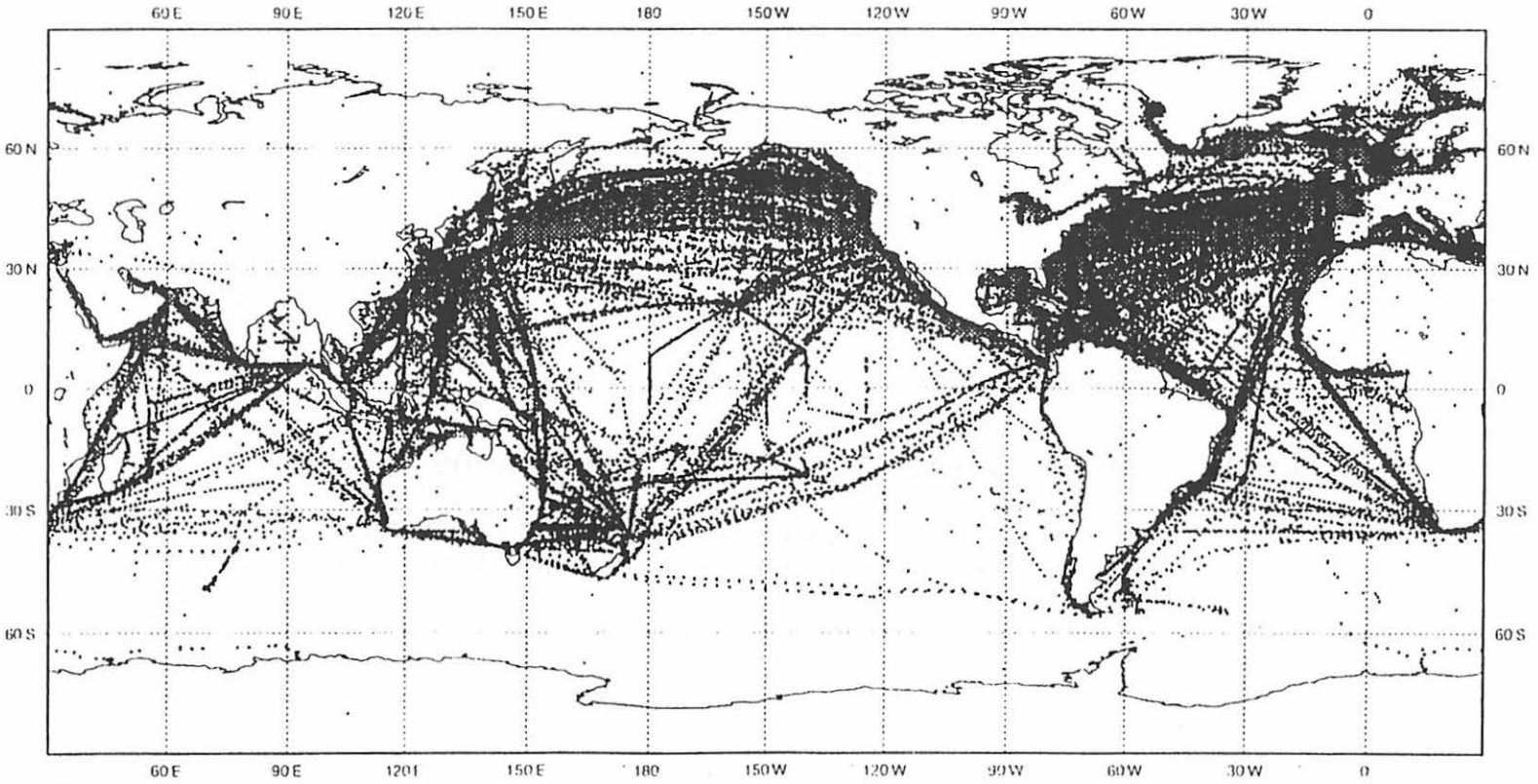
METEO FRANCE

METEO-FRANCE SMISO

Carte de pointage des observations recues en Juin 1996

Mapping position plot chart of data received during June 1996

Messages : SHIP Total : 156720



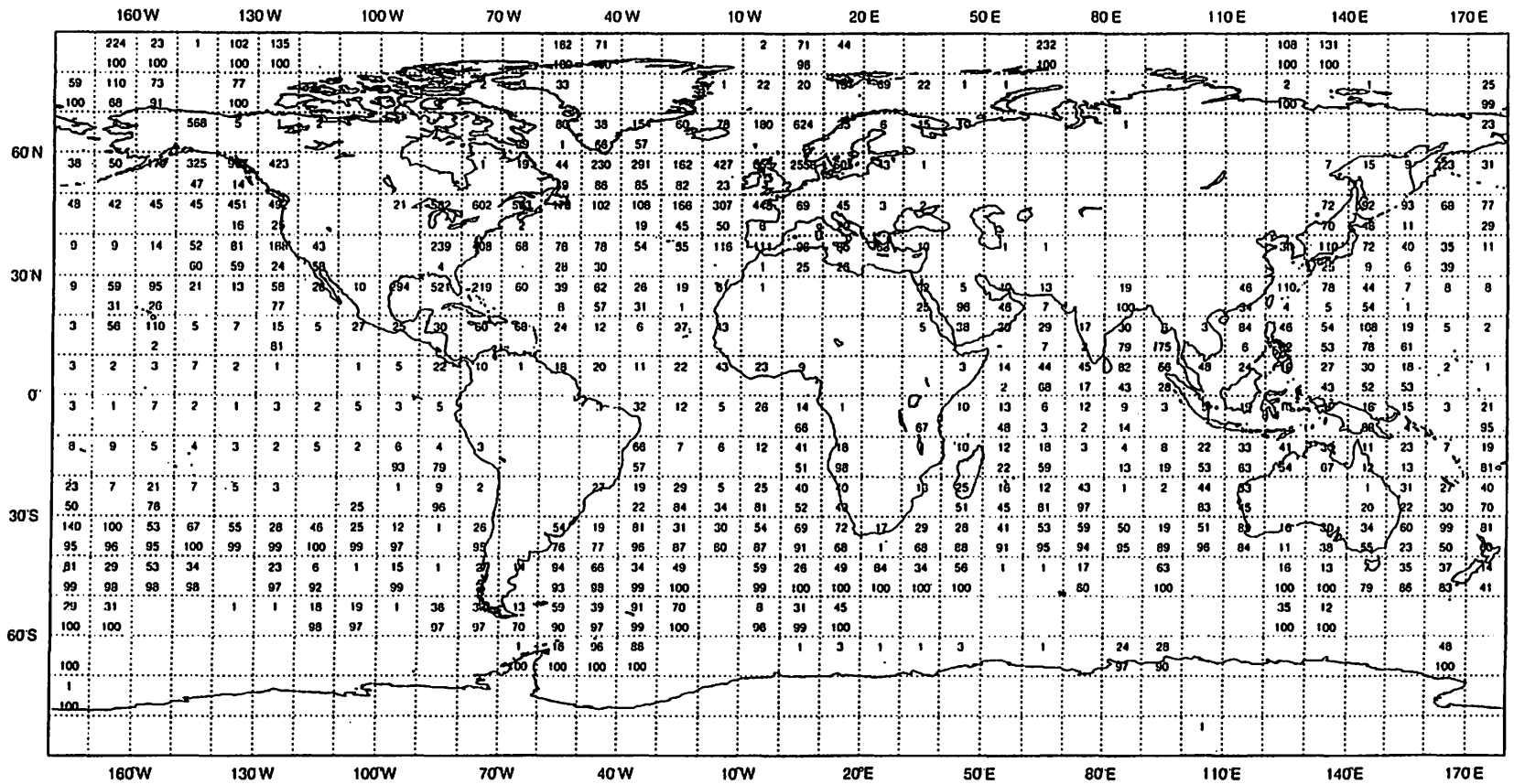
MAGICS 4.2 Solaris - smiso - 5 July 1996 07:06:57

Figure 9

METEO
FRANCE

METEO - FRANCE **PRESSURE** **JUNE 1996**

Marsden square distribution chart of mean monthly data availability index (top) (Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOYS reports) and Percentage of BUOYS reports compared to SHIP+BUOYS reports (bottom)



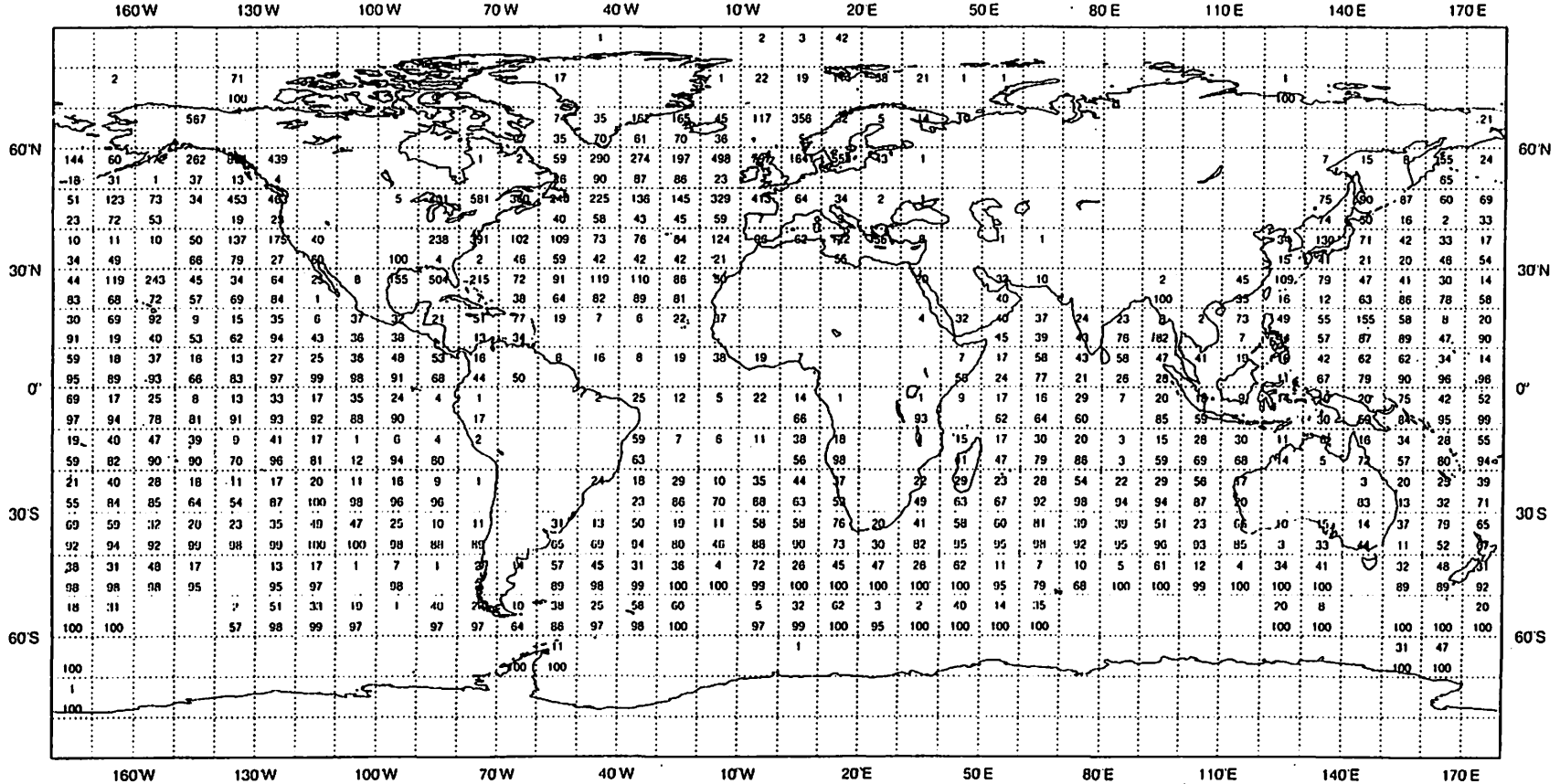
MAGICS 4.2 Solaris - mpma498 - 8 July 1996 09:40:51

Figure 10

METEO FRANCE

METEO-FRANCE **SEA SURFACE TEMPERATURE** **JUNE 1996**

Marsden square distribution chart of mean monthly data availability index (top)
(Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOYS reports)
and
Percentage of BUOYS reports compared to SHIP+BUOYS reports (bottom)



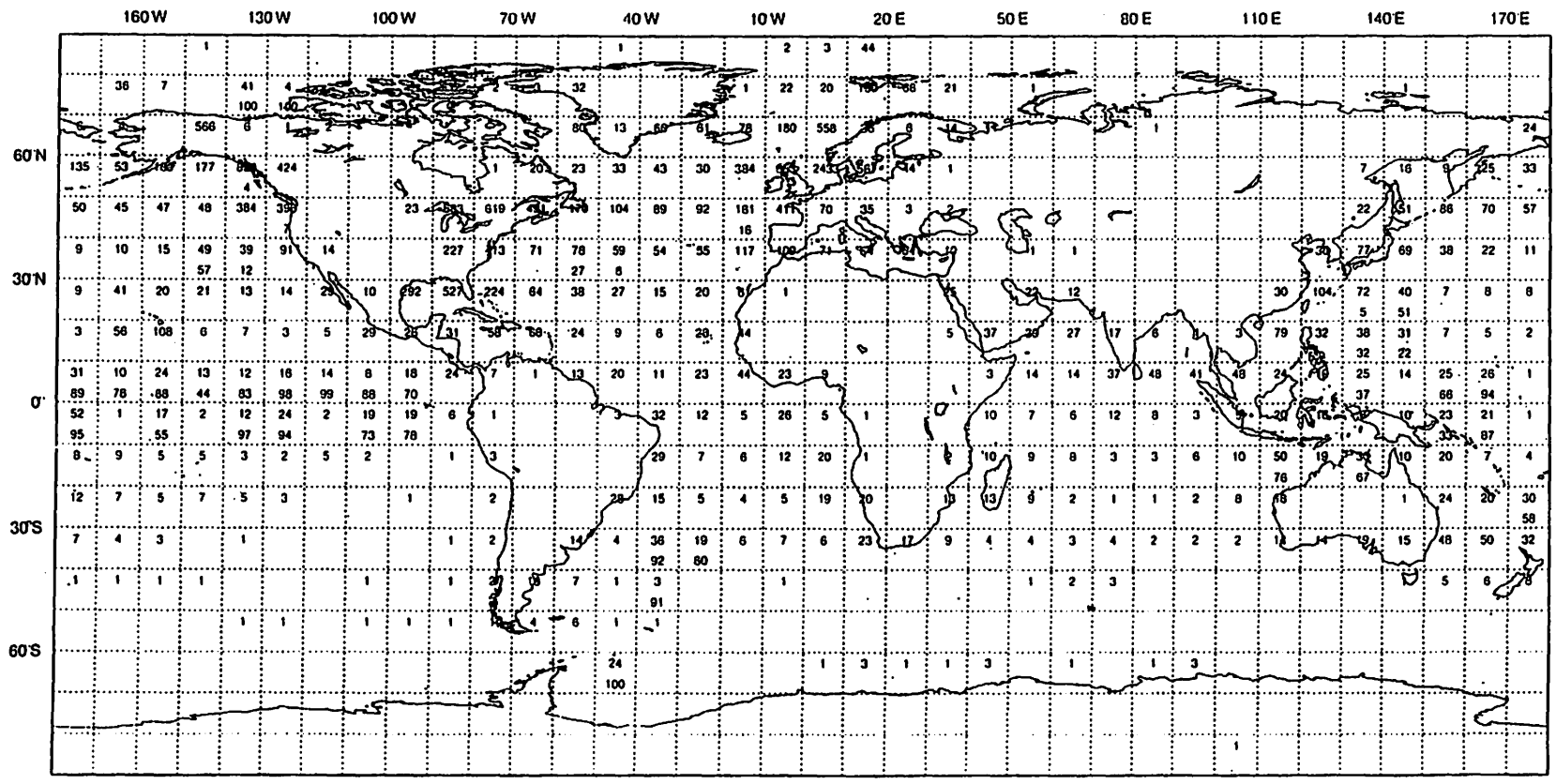
MAGICS 4.2 Solaris - mpma498 - 8 July 1996 09:40:59

Figure 11

METEO FRANCE

METEO - FRANCE **WIND** **JUNE 1996**

Marsden square distribution chart of mean monthly data availability index (top)
(Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOYS reports)
and
Percentage of BUOYS reports compared to SHIP+BUOYS reports (bottom)



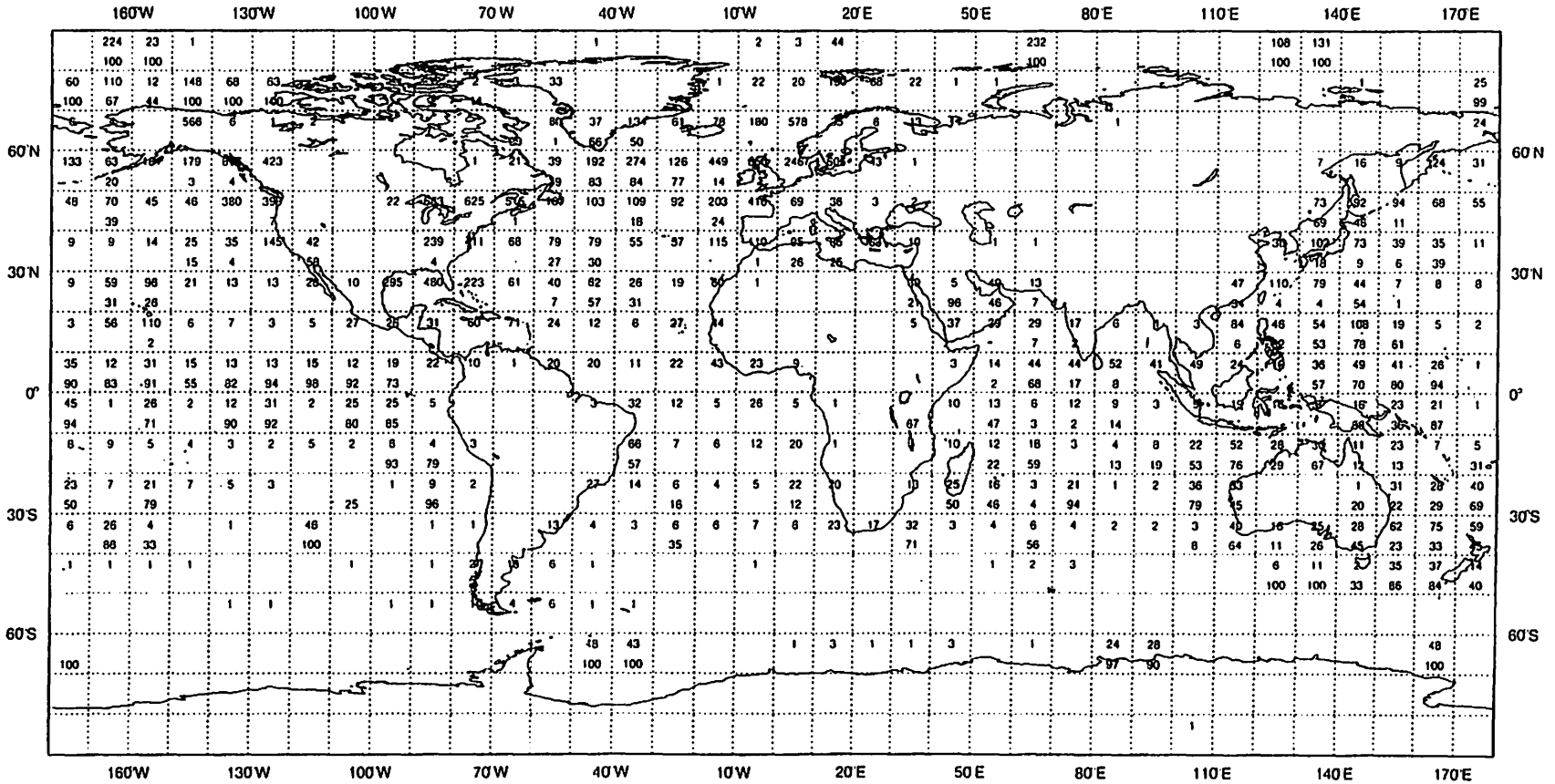
MAGICS 4.2 Solaris - mpma498 - 8 July 1996 09:41:06

Figure 12

METEO FRANCE

METEO - FRANCE **TEMPERATURE** **JUNE 1996**

Marsden square distribution chart of mean monthly data availability index (top)
(Index 100 = 8 obs. per day per 500kM * 500kM area of SHIP and BUOYS reports)
and
Percentage of BUOYS reports compared to SHIP+BUOYS reports (bottom)



MAGICS 4.2 Solaris - mpma498 - 8 July 1996 09:41:13

Figure 13

ANNEX IV

LIST OF ARGOS PROGRAMMES ALLOWING DATA DISTRIBUTION ON THE GTS, JUNE 1996

Program: 29 Experiment: IABP Owner: NPI NORW
ICE DRIFT EXPERIMENT (ICEX)
PGC: Dr. Torgny Vinje
NORWEGIAN POLAR INSTITUTE
Telephone: (+47) 2 12 36 50 Telefax: (+47) 2 12 38 54 Country: NORW
Telemail :

Program: 44 Experiment: Owner: METEO_FRANCE FRAN
SEMAPHORE
PGC: Pierre Blouch
METEO FRANCE
Telephone: (+33) 98 22 44 54 Telefax: (+33) 98 05 04 73 Country: FRAN
Telemail : PIERRE.BLOUCH@METEO.FR

Program: 46 Experiment: Owner: INTL_ICE_PAT USA
USCG DRIFT BUOYS
PGC: Don Murphy
US COAST GUARD, INTERNATIONAL ICE PATROL
Telephone: (203) 441-2631 Telefax: Country: USA
Telemail :

Program: 57 Experiment: Owner: CMD CANA
BEAUFORT SEA MONITORING PROGRAMME
PGC: VANDERKOOY; Nick
CANADIAN MARINE DRILLING
Telephone: (403) 239-1958 /-1913 Telefax: (403) 231 1012 Country: CANA
Telemail :

Program: 76 Experiment: Owner: BIO CANA
ENVIRONMENT MONITORING
PGC: Lawrence
Bedford Institute of Oceanography
Telephone: (902) 426-2431 Telefax: Country: CANA
Telemail : BEDFORD.INST

Program: 85 Experiment: Owner: ABOM AUST
AUSTRALIAN DRIFTING BUOYS
PGC: Graham Jones, Graeme S. Ball
AUSTRALIAN BUREAU OF METEOROLOGY
Telephone: (03) 6620311 Telefax: (+61) 3669 4168 Country: AUST
Telemail : BMRC.AUSTRALIA

Program: 86 Experiment: Owner: ABOM AUST
AUSTRALIAN AUTOMATIC WEATHER STATIONS
PGC: Graham Jones, Graeme S. Ball
AUSTRALIAN BUREAU OF METEOROLOGY
Telephone: (03) 6620311 Telefax: (+61) 3669 4168 Country: AUST
Telemail : BMRC.AUSTRALIA

Program: 88 Experiment: Owner: UN_WISC USA
ANTARCTIC AUTOMATED WEATHER STATIONS
PGC: STEARNS; Prof. Charles R.
UNIVERSITY OF WISCONSIN
Telephone: (608) 262-0780 Telefax: Country: USA
Telemail :

Program: 129 Experiment: WOCE Owner: NOAA/AOML USA
EPOCS
PGC: Dr. Donald Hansen
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY
Telephone: (305) 361-4340 Telefax: (305) 361 4449 Country: USA

Telemail :D.HANSEN, AOML.MIAMI

Program: 133 Experiment: WOCE Owner: CSIRO AUST
AUSTRALIAN CURRENTS
PGC:Pr. George Cresswell
CSIRO
Telephone:(+61)0220 6222,6228 Telefax: Country:AUST
Telemail :G.CRESSWELL

Program: 221 Experiment: WOCE Owner: MSA JAPA
KURUSHIO CURRENT
PGC:Iwao Nogushi (Director of the Ocean Surveys Division, HD)
MARITIME SAFETY AGENCY, Hydrographic Department
Telephone:03-541-3811 X605 Telefax:03 545 2885 Country:JAPA
Telemail :T.MORI

Program: 243 Experiment: SVP Owner: SAWB AFS
SAWBEX
PGC:Piet Le Roux
SOUTH AFRICAN WEATHER BUREAU
Telephone:(+27) 12 290 2998 Telefax:(+27)122902170, 3031 Country:AFS
Telemail :pleroux@cirrus.sawb.gov.za

Program: 271 Experiment: TOGA Owner: IFREMER FRAN
FOCAL DRIFTERS
PGC:Pierre Blouch
METEO FRANCE
Telephone:(+33) 98 22 44 54 Telefax:(+33) 98 05 04 73 Country:FRAN
Telemail :PIERRE.BLOUCH@METEO.FR

Program: 282 Experiment: IABP Owner: US_NAVY USA
AIR SEA
PGC:Deborah Bird
U.S. NAVAL OCEANOGRAPHIC OFFICE
Telephone:(601)688-4242 Telefax: Country:USA
Telemail :NAVO.BUOYS, NAVOCEAN.COM

Program: 314 Experiment: Owner: NMI NORW
SEANOR
PGC:Knut Bjorheim
NORWEGIAN METEOROLOGICAL INSTITUTE
Telephone:(+47) 2 60 50 90 Telefax:(+47) 2 69 25 15 Country:NORW
Telemail :

Program: 323 Experiment: SVP Owner: AES CANA
PAPA
PGC:A. L. Lukawesky
Environment Canada
Telephone:(403) 951 8814 Telefax:(403) 468 79 50 Country:CANA
Telemail :

Program: 336 Experiment: SVP Owner: NIO INDI
COLLECTION OF METOCEAN DATA IN INDIA OCEAN
PGC:GANGADHARA RAO
NATIONAL INSTITUTE OF OCEANOGRAPHY
Telephone:6253 (PANAJI) Telefax:(+91) 832 46 12 Country:INDI
Telemail :

Program: 366 Experiment: Owner: AD-DST AUST
ANTARCTIC SURFACE METEOROLOGICAL PROCESSES
PGC:MORRISSY JOHN
ANTARCTIC DIVISION - DEPARTMENT SCIENCE AND TECHNOLOGY
Telephone:(002)29-0209 Telefax: Country:AUST
Telemail :JOHN_MOR@ANTDIV.GOV.AU

Program: 395 Experiment: TOGA Owner: NOAA/NDBC USA
TROPICAL OCEAN GLOBAL ATMOSPHERE (TOGA EXPERIMENT)

PGC:Mike Burdette
NATIONAL DATA BUOY CENTER
Telephone:(601)688-2422 Telefax:(601) 688 3153 Country:USA
Telemail :NDBC.CENTER

Program: 398 Experiment: TOGA Owner: NOAA/NDBC USA
TROPICAL OCEAN GLOBAL ATMOSPHERE (TOGA EXPERIMENT)
PGC:Mike Burdette
NATIONAL DATA BUOY CENTER
Telephone:(601)688-2422 Telefax:(601) 688 3153 Country:USA
Telemail :NDBC.CENTER

Program: 428 Experiment: Owner: NMI NORW
SOBA NW
PGC:Knut Bjorheim
NORWEGIAN METEOROLOGICAL INSTITUTE
Telephone:(+47) 2 60 50 90 Telefax:(+47) 2 69 25 15 Country:NORW
Telemail :

Program: 435 Experiment: Owner: METEO_FRANCE FRAN
SOBA FRANCE
PGC:Pierre Blouch
METEO FRANCE
Telephone:(+33) 98 22 44 54 Telefax:(+33) 98 05 04 73 Country:FRAN
Telemail :PIERRE.BLOUCH@METEO.FR

Program: 436 Experiment: EGOS Owner: KNMI NL
SOBA NETHERLANDS
PGC:Lars Golmen
CHRISTIAN MICHELSEN RESEARCH
Telephone:(47) 55 57 40 41 Telefax:(+47) 55 57 40 40 Country:NORW
Telemail :

Program: 466 Experiment: WOCE Owner: SACLANT ITAL
EXPARGOS
PGC:STROEBEL FREDERICO
NATO SACLANT ASW RESEARCH CENTER
Telephone:0187-540111 Telefax: Country:ITAL
Telemail :

Program: 470 Experiment: Owner: NOAA/NDBC USA
DRIFTER RAPID RESPONSE
PGC:Larry Clayton
NATIONAL DATA BUOY CENTER
Telephone:(601)688-1818 Telefax: Country:USA
Telemail :

Program: 476 Experiment: Owner: NZMS NZ
NEW ZEALAND DRIFTING BUOYS
PGC:Julie Fletcher
NEW ZEALAND METEOROLOGICAL SERVICE
Telephone:(+64) 4 29 732 37 Telefax:(+64) 4 29 735 68 Country:NZ
Telemail :

Program: 484 Experiment: EGOS Owner: UKMO UK
SOBA U.K.
PGC:Lars Golmen
CHRISTIAN MICHELSEN RESEARCH
Telephone:(47) 55 57 40 41 Telefax:(+47) 55 57 40 40 Country:NORW
Telemail :

Program: 487 Experiment: EGOS Owner: UKMO UK
ODAS 451/452
PGC:Lars Golmen
CHRISTIAN MICHELSEN RESEARCH
Telephone:(47) 55 57 40 41 Telefax:(+47) 55 57 40 40 Country:NORW
Telemail :

Program: 538 Experiment: WOCE Owner: WHOI USA
OCEANO. PRO. YELLOW SEA
PGC:Dr. Richard Limeburner
WOODS HOLE OCEANOGRAPHIC INSTITUTION
Telephone:(617)548-1400 x 2539 Telefax: Country:USA
Telemail :

Program: 539 Experiment: Owner: AD-DST AUST
ANTARCTIC SURFACE METEO PROCESSES
PGC:MORRISSY JOHN
ANTARCTIC DIVISION - DEPARTMENT SCIENCE AND TECHNOLOGY
Telephone:(002)29-0209 Telefax: Country:AUST
Telemail :JOHN_MOR@ANTDIV.GOV.AU

Program: 557 Experiment: IABP Owner: UN_WASH USA
OPERATIONAL ARCTIC BUOY PROGRAM 2
PGC:Roger Colony
UNIVERSITY OF WASHINGTON
Telephone:(206)543-6613 Telefax:(206) 543 6785 Country:USA
Telemail :

Program: 588 Experiment: EGOS Owner: IMO ICEL
ICELAND METEOROLOGICAL BUOYS
PGC:Lars Golmen
CHRISTIAN MICHELSEN RESEARCH
Telephone:(47) 55 57 40 41 Telefax:(+47) 55 57 40 40 Country:NORW
Telemail :

Program: 599 Experiment: Owner: US_NAVY USA
OCEANOGRAPHIC INTERACTION DRIFTER EXPERIMENT
PGC:Deborah Bird
U.S. NAVAL OCEANOGRAPHIC OFFICE
Telephone:(601)688-4242 Telefax: Country:USA
Telemail :NAVO.BUOYS, NAVOCEAN.COM

Program: 600 Experiment: Owner: US_NAVY USA
REMOTE CONTROL WAVE AIR SEA DRIFTER EXP.
PGC:Deborah Bird
U.S. NAVAL OCEANOGRAPHIC OFFICE
Telephone:(601)688-4242 Telefax: Country:USA
Telemail :NAVO.BUOYS, NAVOCEAN.COM

Program: 626 Experiment: Owner: AES CANA
C-NOMAD
PGC:A.L. Lukawesky
Environment Canada
Telephone:403.951.8814 Telefax:403 468 7950 Country:CANA
Telemail :

Program: 627 Experiment: Owner: AES CANA
SEASTAR WEATHER PAK
PGC:A. L. Lukawesky
Environment Canada
Telephone:(403) 951 8814 Telefax:(403) 468 79 50 Country:CANA
Telemail :

Program: 633 Experiment: IABP Owner: AES CANA
ICE FLOE DRIFT
PGC:FALKINGHAM; JOHN
ATMOSPHERIC ENVIRONMENT SERVICE
Telephone:(613)996-1550 (52360 Telefax:(613) 563 84 83 Country:CANA
Telemail :

Program: 655 Experiment: EGOS Owner: CMI NORW
SOBA
PGC:Lars Golmen

CHRISTIAN MICHELSEN RESEARCH
Telephone:(47) 55 57 40 41 Telefax:(+47) 55 57 40 40 Country:NORW
Telemail :

Program: 687 Experiment: TOGA Owner: IFREMER FRAN
XBT. TOGA IFREMER
PGC:VOITURIEZ BRUNO
IFREMER
Telephone:1-47 23 55 28 Telefax: Country:FRAN
Telemail :

Program: 693 Experiment: Owner: AES CANA
ATLANTIC BUOY PROGRAM
PGC:A. L. Lukawesky
Environment Canada
Telephone:403.951.8814 Telefax:(403) 468 7950or7960 Country:CANA
Telemail :

Program: 709 Experiment: Owner: WHOI USA
IMET
PGC:Dr. Robert Weller
WOODS HOLE OCEANOGRAPHIC INSTITUTION
Telephone:(508)548-1400 X2550 Telefax:(508) 457 2181 Country:USA
Telemail :R.PAYNE

Program: 721 Experiment: Owner: US_NAVY USA
ARCTIC/NORTH ATLANTIC DRIFTING DATA BUOY PROGRAM
PGC:Deborah Bird
U.S. NAVAL OCEANOGRAPHIC OFFICE
Telephone:(601)688-4242 Telefax: Country:USA
Telemail :NAVO.BUOYS, NAVOCEAN.COM

Program: 740 Experiment: Owner: TRCF FINL
FINNARP WEATHER PROGRAM
PGC:OLLI-PEKKA
TECHNICAL RESEARCH CENTER OF FINLAND
Telephone:358-0456-5817 Telefax: Country:FINL
Telemail :

Program: 799 Experiment: Owner: ABOM AUST
PAB AUST BUREAU OF METEOROLOGY
PGC:Graham Jones, Graeme S. Ball
AUSTRALIAN BUREAU OF METEOROLOGY
Telephone:(03)6620311 Telefax:(+61) 3669 4168 Country:AUST
Telemail :BMRC.AUSTRALIA

Program: 815 Experiment: Owner: UN_HELSINKI FINL
PROJECT FI-5/89 (FINNARP 89)
PGC:LAUNIAINEN J.
UNIVERSITY OF HELSINKI
Telephone:35801912029 Telefax: Country:FINL
Telemail :

Program: 864 Experiment: Owner: ABOM AUST
CSIRO MERCHANT SHIP XBT PROGRAM
PGC:MEYERS GARY
AUSTRALIAN BUREAU OF METEOROLOGY
Telephone:(002) 206 222 Telefax:(002) 240 530 Country:AUST
Telemail :

Program: 884 Experiment: WESTPAC Owner: NOAA/NDBC USA
WEST-PAC AMOS ARGOS PLATFORM (WAAP)
PGC:Ronald P. Kozak
NOAA/NDBC
Telephone:(601)688-1711 Telefax: Country:USA
Telemail :

Program: 919 Experiment: Owner: AWI GER
SEA ICE PROCESSES IN POLAR REGIONS
PGC:Dr. C. Kottmeier
Alfred Wegener Institute for Polar and Marine Research
Telephone:(+49) 471 483 12 50 Telefax:(+49) 471 483 14 25 Country:GER
Telemail :ckottmei@awi-bremerhaven.de

Program: 1002 Experiment: WOCE Owner: KORDI KOREA
WOCE SVP OF KORDI
PGC:Heung-Jae Lie
KORDI
Telephone:02 863 4110 Telefax:(0345) 82 66 98 Country:KOREA
Telemail :

Program: 1004 Experiment: Owner: SMHI SWED
CURRENT CLIMATOLOGY IN BALTIC SEA
PGC:HAKANSSON B.G.
SMHI
Telephone:46 11 158 000 Telefax:46 11 158 350 Country:SWED
Telemail :

Program: 1053 Experiment: Owner: NIC USA
NATIONAL ICE CENTER
PGC:David Benner
National Ice Center
Telephone:(301) 763-7154 Telefax:(301) 763 4621 Country:USA
Telemail :dbenner@sar_ws.fb4.noaa.gov

Program: 1070 Experiment: Owner: SAIC USA
EDDY CIRCULATION STUDY
PGC:BERGER THOMAS
Science Applications International Corporation
Telephone:919-832-7242 Telefax:919-832-7243 Country:USA
Telemail :

Program: 1104 Experiment: Owner: EVANS-HAMILT USA
LATEX A
PGC:HAMILTON; Robert C.
EVANS-HAMILTON; INC.
Telephone:(713)495-0883 Telefax:(713) 495 61 59 Country:USA
Telemail :R.HAMILTON.EHI (OMNET)

Program: 1109 Experiment: Owner: US_NAVY USA
TOWS PROGRAM - BUOY DEVELOPMENT
PGC:SELSOR; Harry D.
U.S. NAVY
Telephone:(601)688-4760 Telefax:(601) 688 4605 Country:USA
Telemail :

Program: 1155 Experiment: Owner: AD-DST AUST
SEA ICE DYNAMICS
PGC:MORRISSY JOHN
ANTARCTIC DIVISION - DEPARTMENT SCIENCE AND TECHNOLOGY
Telephone:(002)29-0209 Telefax: Country:AUST
Telemail :JOHN_MOR@ANTDIV.GOV.AU

Program: 1191 Experiment: Owner: JMA JAPA
MET/OCEAN RESEARCH
PGC:Hiroshi Eguchi
Japan Meteorological Agency
Telephone:+81-3-3212-8341 Telefax:+81 3 3211 3047 Country:JAPA
Telemail :JMA.OCEAN/Omnet

Program: 1196 Experiment: SVP Owner: WHOI USA
LAGRANGIAN MEASUREMENT OF EDDY CHARACTERISTICS
PGC:Dr. Richard Limeburner
WOODS HOLE OCEANOGRAPHIC INSTITUTION

Telephone:508-548-1400X2539 Telefax:(508) 457 2181 Country:USA
Telemail :

Program: 1246 Experiment: Owner: NDRE SWED
OCEANOGRAPHIC MODELLING OF THE BALTIC SEA
PGC:BERGHULT LENNART
National Defence Research Establishment
Telephone:(19 46) 8 663 15 00 Telefax:(+46) 8 667 24 79 Country:SWED
Telemail :

Program: 1301 Experiment: Owner: UN_TASMANIA AUST
ANTARCTIC WEATHER ANALYSIS AROUND CASEY STATION
PGC:Mr. Bill Budd
Antarctic CRC
Telephone:61 02 207 867 Telefax:61 02 202 973 Country:AUST
Telemail :

Program: 1325 Experiment: SVP Owner: SIO USA
GLOBAL DRIFTER OBSERVATIONS (SSS)
PGC:Mayra Pazos
SCRIPPS INSTITUTION OF OCEANOGRAPHY
Telephone:(619)534-4100 Telefax:(619) 534 79 31 Country:USA
Telemail :P.NIILER

Program: 1326 Experiment: SVP Owner: UN_MIAMI USA
INDIAN OCEAN DRIFTER PROGRAM (SSS)
PGC:OLSON; Dr. Donald B.
UNIVERSITY OF MIAMI
Telephone:(305)361-4074 Telefax: Country:USA
Telemail :

Program: 1346 Experiment: SVP Owner: UN_HAWAII USA
CENTRAL PACIFIC DRIFTER ARRAY
PGC:FLAMENT PIERRE

Telephone:(808) 956-6418/6663 Telefax:(808) 956 92 25 Country:USA
Telemail :

Program: 1348 Experiment: SVP Owner: UN_OREGON USA
SEPARATION OF A CONTROL JET
PGC:BARTH; Jack A. Dr.
University of Oregon
Telephone:(503) 737-1607 Telefax:(503) 737 2064 Country:USA
Telemail :

Program: 1420 Experiment: SVP Owner: WHOI USA
GLOBEC : GEORGES BANK
PGC:Dr. Richard Limeburner
WOODS HOLE OCEANOGRAPHIC INSTITUTION
Telephone:508-548-1400X2539 Telefax:(508) 457 2181 Country:USA
Telemail :

Program: 1425 Experiment: WOCE Owner: SIO USA
WOCE S.V.P.
PGC:Mayra Pazos
SCRIPPS INSTITUTION OF OCEANOGRAPHY
Telephone:(619)534-4100 Telefax:(619) 534 79 31 Country:USA
Telemail :P.NIILER

Program: 1426 Experiment: Owner: NOAA/NDBC USA
WIND SPEED AND DIRECTION EXPERIMENT
PGC:Mike Burdette
NATIONAL DATA BUOY CENTER
Telephone:(601)688-2422 Telefax:(601) 688 3153 Country:USA
Telemail :NDBC.CENTER

Program: 1432 Experiment: Owner: ACER_ENV UK

OMAN OIL MODEL
PGC:OWENS DAN
ACER ENVIRONMENTAL
Telephone:1944 633876511 Telefax:(+44) 63 387 08 99 Country:UK
Telemail :

Program: 1435 Experiment: Owner: METEO_FRANCE FRAN
SOBA FRANCE
PGC:Pierre Blouch
METEO FRANCE
Telephone:(+33) 98 22 44 54 Telefax:(+33) 98 05 04 73 Country:FRAN
Telemail :PIERRE.BLOUCH@METEO.FR

Program: 1447 Experiment: Owner: DML UK
LOIS - SES
PGC:MR DAVID MELDRUM
NATURAL ENVIRONMENT RESEARCH COUNCIL
Telephone:44 16 31 62 244 Telefax:44 16 31 65 518 Country:UK
Telemail :dtm@dml.ac.uk

Program: 1450 Experiment: Owner: METEO_FRANCE FRAN
METEO ANTILLES
PGC:MR CHARLES MANDAR
METEO FRANCE
Telephone:590 82 26 26 Telefax:590 82 14 25 Country:FRAN
Telemail :

Program: 5626 Experiment: Owner: AES CANA
C-NOMAD (MBM)
PGC:A. L. Lukawesky
Environment Canada
Telephone:(403) 951 8814 Telefax:(403) 468 79 50 Country:CANA
Telemail :

Program: 5693 Experiment: Owner: AES CANA
ATLANTIC BUOY PROGRAM - MBM
PGC:A. L. Lukawesky
Environment Canada
Telephone:403.951.8814 Telefax:(403) 468 7950or7960 Country:CANA
Telemail :

Program: 6129 Experiment: SUBDUCTION Owner: NOAA/AOML USA
ATLANTIC SUBDUCTION
PGC:Dr. Donald Hansen
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY
Telephone:(305)361-4340 Telefax:(305) 361 4449 Country:USA
Telemail :D.HANSEN, AOML.MIAMI

Program: 6693 Experiment: Owner: AES CANA
ATLANTIC BUOY PROGRAM
PGC:A. L. Lukawesky
Environment Canada
Telephone:(403) 951 8814 Telefax:(403) 468 79 50 Country:CANA
Telemail :

Program: 7129 Experiment: SVP Owner: NOAA/AOML USA
EXTENSION DU PR 129
PGC:Dr. Donald Hansen
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY
Telephone:(305)361-4340 Telefax:(305) 361 4449 Country:USA
Telemail :D.HANSEN, AOML.MIAMI

Program: 7721 Experiment: Owner: US_NAVY USA

PGC:Deborah Bird .
U.S. NAVAL OCEANOGRAPHIC OFFICE
Telephone:(601)688-4242 Telefax: Country:USA

Telemail :NAVO.BUOYS, NAVOCEAN.COM

Program: 8074 Experiment: Owner: LODYC FRAN
SOUS-PROGRAMME DU 1074
PGC:Gascard
LODYC
Telephone:(1)43362525 3873 Telefax: Country:FRAN
Telemail :J.GASCARD

Program: 8301 Experiment: Owner: UN_TASMANIA AUST
ANTARCTIC CRC DRIFTING BUOYS
PGC:Mr. Bill Budd
Antarctic CRC
Telephone:61 02 207 867 Telefax:61 02 202 973 Country:AUST
Telemail :

Program: 8426 Experiment: SVP Owner: SIO USA
WOCE S.V.P. - NON-SSS FOR P1425
PGC:Mayra Pazos
SCRIPPS INSTITUTION OF OCEANOGRAPHY
Telephone:(619)534-4100 Telefax:(619) 534 79 31 Country:USA
Telemail :P.NIILER

Program: 8721 Experiment: Owner: US_NAVY USA
ARCTIC/NORTH ATLANTIC DRIFTING DATA BUOY PROGRAM
PGC:Deborah Bird
U.S. NAVAL OCEANOGRAPHIC OFFICE
Telephone:(601)688-4242 Telefax: Country:USA
Telemail :NAVO.BUOYS, NAVOCEAN.COM

Program: 9044 Experiment: SVP Owner: METEO_FRANCE FRAN
MARISONDES B
PGC:Pierre Blouch
METEO FRANCE
Telephone:(+33) 98 22 44 54 Telefax:(+33) 98 05 04 73 Country:FRAN
Telemail :PIERRE.BLOUCH@METEO.FR

Program: 9053 Experiment: Owner: NIC USA
JOINT ICE CENTER (SSS)
PGC:David Benner
National Ice Center
Telephone:(301) 763-7154 Telefax:(301) 763 4621 Country:USA
Telemail :dbenner@sar_ws.fb4.noaa.gov

Program: 9085 Experiment: SVP Owner: ABOM AUST
AUSTRALIAN DRIFTING BUOYS
PGC:Graham Jones, Graeme S. Ball
AUSTRALIAN BUREAU OF METEOROLOGY
Telephone:(03)6620311 Telefax:(+61) 3669 4168 Country:AUST
Telemail :BMRC.AUSTRALIA

Program: 9128 Experiment: SVP Owner: NOAA/AOML USA
EPOCS EXPANSION - NON-SSS FOR P9129
PGC:Dr. Donald Hansen
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY
Telephone:(305)361-4340 Telefax:(305) 361 4449 Country:USA
Telemail :D.HANSEN, AOML.MIAMI

Program: 9129 Experiment: WOCE Owner: NOAA/AOML USA
EPOCS - EXPANSION
PGC:Dr. Donald Hansen
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY
Telephone:(305)361-4340 Telefax:(305) 361 4449 Country:USA
Telemail :D.HANSEN, AOML.MIAMI

Program: 9133 Experiment: Owner: CSIRO AUST
OCEAN CURRENT STUDIES AROUND AUSTRALIA (MBM)

PGC:Pr. George Cresswell
CSIRO
Telephone:(+61)0220 6222,6228 Telefax: Country:AUST
Telemail :G.CRESSWELL

Program: 9154 Experiment: Owner: NMI NORW
AURORA
PGC:Knut Bjorheim
NORWEGIAN METEOROLOGICAL INSTITUTE
Telephone:(+47) 2 60 50 90 Telefax:(+47) 2 69 25 15 Country:NORW
Telemail :

Program: 9196 Experiment: SVP Owner: WHOI USA
LAGRANGIAN MEASUREMENT OF EDDY CHARACTERISTICS - SSS
PGC:Dr. Richard Limeburner
WOODS HOLE OCEANOGRAPHIC INSTITUTION
Telephone:508-548-1400X2539 Telefax:(508) 457 2181 Country:USA
Telemail :

Program: 9203 Experiment: SVP Owner: NAVY_SCHOOL USA
EASTERN BOUNDARY CURRENT LANGRANGIAN EDDY STUDY - NON-SSS
PGC:PADUAN; Jeffrey NPGS
PADUAN
Telephone:(408)656-3350 Telefax:(408)656 27 12 Country:USA
Telemail :INTERNET: PADUAN@MAUI.OC.NPS.NAVY.MIL

Program: 9346 Experiment: SVP Owner: UN_HAWAII USA
CENTRAL PACIFIC DRIFTER ARRAY (NON SSS)
PGC:FLAMENT PIERRE

Telephone:(808) 956-6418/6663 Telefax:(808) 956 92 25 Country:USA
Telemail :

Program: 9398 Experiment: Owner: NOAA/NDBC USA
TROPICAL OCEAN GLOBAL ATMOSPHERE II
PGC:Mike Burdette
NATIONAL DATA BUOY CENTER
Telephone:(601)688-2422 Telefax:(601) 688 3153 Country:USA
Telemail :NDBC.CENTER

Program: 9435 Experiment: SVP Owner: METEO_FRANCE FRAN
HANSEN/SOBA
PGC:Pierre Blouch
METEO FRANCE
Telephone:(+33) 98 22 44 54 Telefax:(+33) 98 05 04 73 Country:FRAN
Telemail :PIERRE.BLOUCH@METEO.FR

Program: 9466 Experiment: Owner: SACLANT ITAL
SUB-PROGRAM
PGC:STROEBEL FREDERICO
NATO SACLANT ASW RESEARCH CENTER
Telephone:0187-540111 Telefax: Country:ITAL
Telemail :

Program: 9482 Experiment: Owner: NOAA/PMEL USA
ATLAS BUOYS
PGC:Linda Mangum
Pacific Marine Environmental Laboratory
Telephone:(206) 526 67 40 Telefax:(206) 526 67 44 Country:USA
Telemail :L.MANGUM, S.HAYES, NOAA.PMEL

Program: 9484 Experiment: SVP Owner: UKMO UK
SOBA U.K.
PGC:A.N. Bentley
Meteorological Office
Telephone:344420242 X6219,6078 Telefax:(+44) 344 855897 Country:UK
Telemail :

Program: 9592 Experiment: Owner: UN_HAMBURG GER
WASSERMASSEN IN NORDMEER
PGC:QUADFASEL DETLEF DR
UNIVERSITY OF HAMBURG
Telephone:(040)41232605 Telefax: Country:GER
Telemail :IFM.HAMBURG

Program: 9633 Experiment: Owner: AES CANA
ICE FLOE DRIFT (sub-program)
PGC:FALKINGHAM; JOHN
ATMOSPHERIC ENVIRONMENT SERVICE
Telephone:(613)996-1550 (52360 Telefax:(613) 563 84 83 Country:CANA
Telemail :

Program: 9694 Experiment: Owner: SAIC USA
R. SCALE CURRENT/HYDRO.OBSERV. IN W.WEDDELL SEA
PGC:MUENCH; Robin D.
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Telephone:(206)747-7152 Telefax:(206) 747 9211 Country:USA
Telemail :

Program: 9721 Experiment: Owner: US_NAVY USA
EXTENSION 721 ('ERICA' PROJECT)
PGC:Deborah Bird
U.S. NAVAL OCEANOGRAPHIC OFFICE
Telephone:(601)688-4242 Telefax: Country:USA
Telemail :NAVO.BUOYS, NAVOCEAN.COM

Program: 9919 Experiment: Owner: AWI GER
SEA ICE PROCESS - FIXED STATIONS
PGC:Dr. C. Kottmeier
Alfred Wegener Institute for Polar and Marine Research
Telephone:(+49) 471 483 12 50 Telefax:(+49) 471 483 14 25 Country:GER
Telemail :ckottmei@awi-bremerhaven.de

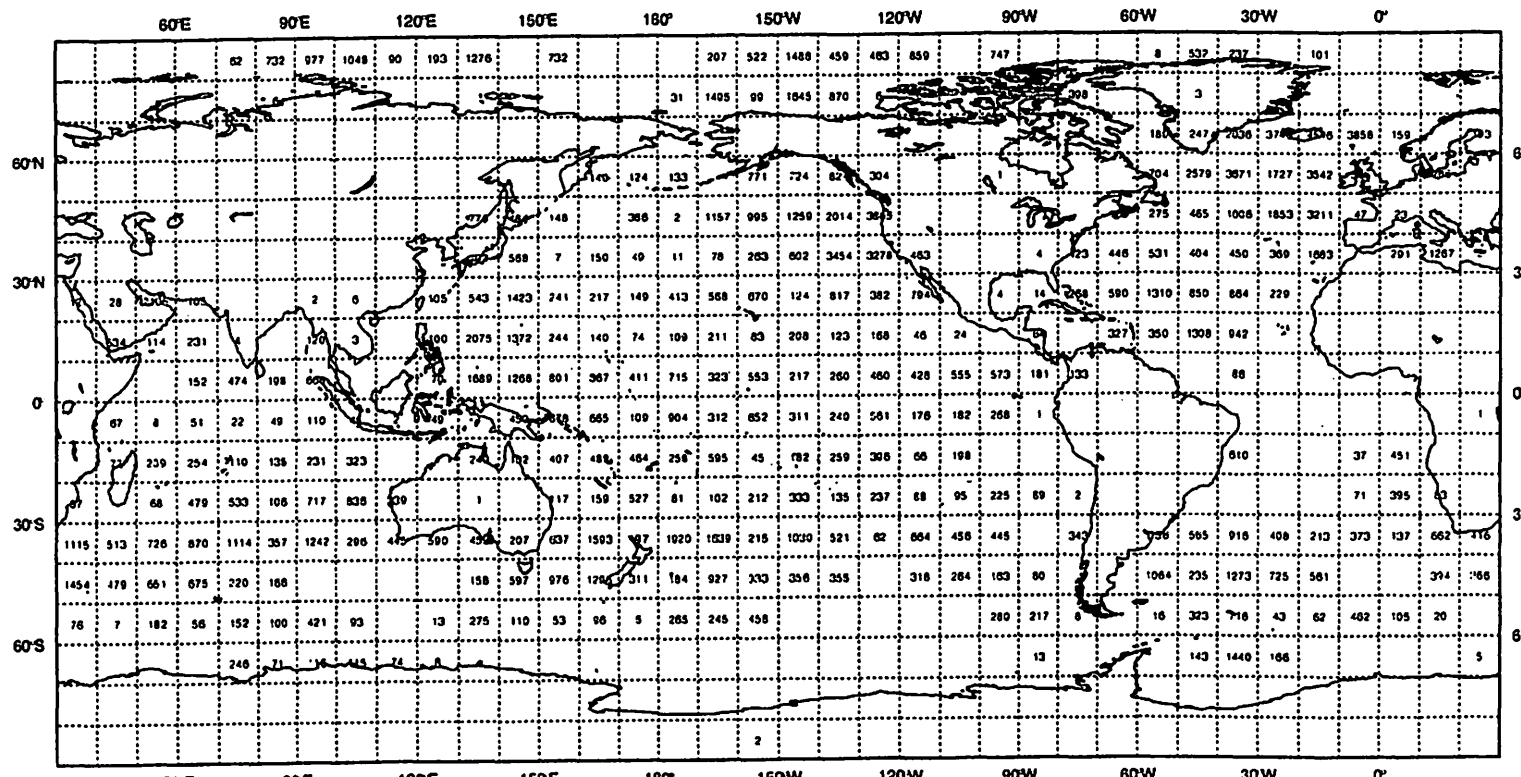
METEO FRANCE

METEO-FRANCE SMISO

Repartition par carre Marsden des observations recues en Octobre 1996

Marsden square distribution chart of data received during October 1996

Messages : BUOY **Total : 174555**



MAGICS 4.2 Solaris - smiso - 7 November 1996 07:45:02

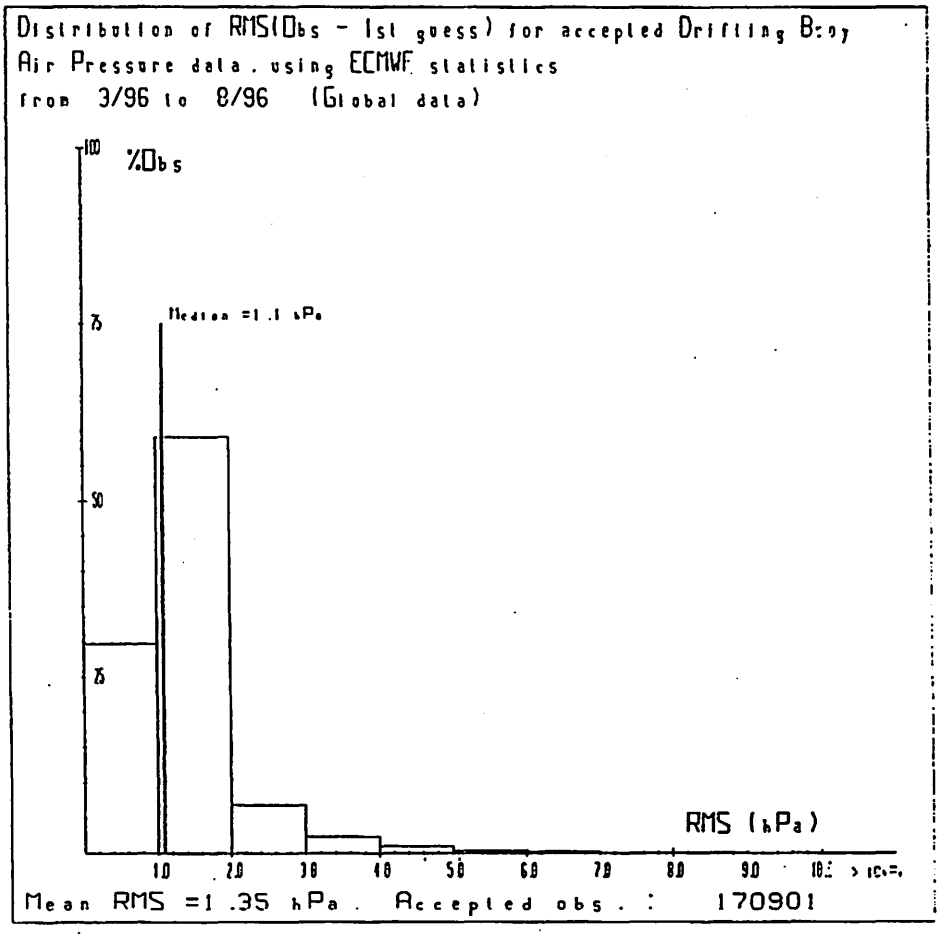
8

ANNEX V

NUMBER OF BUOY REPORTS RECEIVED AT TOULOUSE DURING OCTOBER 1996

ANNEX VI

DISTRIBUTION OF STANDARD DEVIATION (RMS) FOR AIR PRESSURE DATA



ANNEX VII

QUALITY CONTROL GUIDELINES FOR GTS BUOY DATA

These are principles adopted during previous DBCP sessions:

(i) Meteorological Centres are in the best position to undertake data Quality Control (DBCP VI).

(ii) Principal Investigators and Meteorological Centres share the responsibility of data Quality Control (DBCP VI).

(iii) The Technical Co-ordinator is in the best position to act as a focal point between GTS users and Principal Investigators (DBCP V, VI).

(iv) Argos is responsible for assuring that gross errors are automatically eliminated from reports distributed on GTS (DBCP VI).

In order to realise these principles, the following operating procedures or actions are proposed:

1. PGCs

Each Principal Investigator (PI) of an Argos buoy programme reporting data on GTS, designates a person responsible for making changes on PTT or sensor information present in the Argos GTS sub-system. This person is named the Programme GTS Co-ordinator (PGC). The PGC can, of course, be the PI himself but could also be a designated programme Technical Co-ordinator, as is done for the EGOS programme. If such a person does not exist as yet, for a given Argos Programme, the Technical Co-ordinator of the DBCP would contact the Principal Investigator and discuss the issue in order to find one. In a few cases, when a PI allows his platforms being distributed on GTS but does not want to be involved in the process, the Technical Co-ordinator could act as a PGC (i.e. the Technical Co-ordinator of the DBCP can directly ask Argos to make status changes).

2. PMOCs

The DBCP requests one or more Agencies or Institutions to volunteer for acting as Principal Meteorological or Oceanographic Centre responsible for deferred time GTS buoy data Quality Control (PMOC). PMOCs work on an operational basis, for given physical variables, either regionally or globally. The following centres are presently acting as PMOCs:

- The Australian Bureau Of Meteorology (BOM, Melbourne, Australia);
- The Centre de Météorologie Marine (Météo-France, Brest, France);
- Environment Canada (Edmonton) ;
- The European Centre for Medium Range Weather Forecasts (ECMWF, Reading, United Kingdom);
- The Icelandic Meteorological Office (IMO, Reykjavik, Iceland);
- The Japan Meteorological Agency (JMA, Tokyo, Japan);
- The Meteorological Service of New Zealand, Ltd. (NZMS, Wellington ,New Zealand);

- The National Data Buoy Center (NOAA/NDBC, Stennis Space Center, Mississippi, USA);
- The National Center for Environmental Protection (NCEP of NOAA, Camp Spring, Maryland, USA);
- The Pacific Marine Environmental Laboratory (PMEL of NOAA, Seattle, Washington, USA) ;
- The United Kingdom Meteorological Office (UKMO, Bracknell, United Kingdom).
- The South African Weather Bureau (SAWB, Pretoria, South Africa).

National Focal Points for Drifting Buoy Programmes are requested to designate National PMOCs, and possibly to act themselves as PMOCs.

3. INTERNET distribution list (mailing list).

It is proposed that the mechanism for exchanging QC information among the Guidelines Participants shall be an INTERNET distribution list. PMOCs send the proposed messages to a unique INTERNET address which name is BUOY-QC@node_path. "node_path" depends upon who actually operates the distribution list. The full INTERNET address of the Distribution List shall be circulated among the Guidelines participants.

To date the Icelandic Meteorological Office is operating the distribution list server and the Internet address is:

BUOY-QC@VEDUR.IS

The messages are then automatically forwarded to all the individual addresses from a maintained distribution list. Adding, reading, modifying, or deleting a name form the list can be done via INTERNET messages according to an agreed format.

3.1 ECMWF, OPC, METEO FRANCE, and UKMO monitoring statistics are delivered onto the INTERNET Distribution List.

3.2 Any suggestion for modification (i.e. recalibrate or remove sensor from GTS) or any problem noticed (e.g. bad location) on a drifting buoy reporting data on GTS should be placed on the Distribution List. Meteorological Centres are encouraged to make such suggestions.

3.3 Any feed back available on a recalibration actually implemented shall be placed on the distribution list.

4. Operating Procedures for dealing with Potential Problems on GTS (Drifting and Moored Buoy data)

4.1 PMOCs noticing potential problems on GTS can suggest an action via the INTERNET Distribution List. A standardised, telegraphic format is proposed (see Appendix): one message per platform or per sensor, showing the WMO number and the proposed change, directly in the "subject" line, with additional comments appearing in the text itself, using a free format if felt necessary by the PMOC (see example in Appendix).

4.2 PMOCs noticing bad location or bad sensor data episodically appearing on GTS message can copy the message on the INTERNET Distribution List, indicating from which source the message was transmitted. Although it is recommended that LUT operators access to the INTERNET Distribution List as well, if not possible, the Technical Co-ordinator of the DBCP or the responsible PGC or a designated PMOC (see paragraph 4.7.2) would keep them informed by telefax or another mean.

4.3 A 7-day delay is respected by the Technical Co-ordinator of the DBCP before he actually contacts the PGC to propose the change, so that other meteorological centres may also have the opportunity to comment on the suggestion. In that case, the Technical Co-ordinator of the DBCP is given the responsibility to decide which request to consider. Other data users who are on the INTERNET Distribution List are encouraged to check the received messages regularly.

4.4 Then, if the PGC accepts the modification, he requests the adequate Argos Center (i.e. CLS or SAI) to make the change. In order to keep the GTS user community informed, Service Argos announces the change as soon as possible by means of the INTERNET Distribution List (a standardised message is proposed in the Appendix) and also effects the change as prescribed. It is recommended that the PGC also requests appropriate LUTs to implement the same changes.

4.5 If the PGC is not willing to go ahead with a proposed change, the Technical Co-ordinator of the DBCP deposits a standardised message on the INTERNET Distribution List (see Appendix) in order to inform PMOCs.

4.6 Local User Terminals are urged to adopt these Quality Control Operating Guidelines.

4.6.1 It is desirable that LUTs not willing to participate should distribute drifting buoy data on GTS only to local users (i.e. no global GTS distribution).

4.6.2 LUT operators participating and registered on the INTERNET Distribution List are encouraged to inform the participants back by the mean of the Distribution List each time a change is implemented, using the same format as Argos (see paragraph 4.4). If LUTs are not on the Distribution List, they would be encouraged to inform the Technical Co-ordinator of the DBCP of actual changes so that he can forward adequate messages onto the Distribution List.

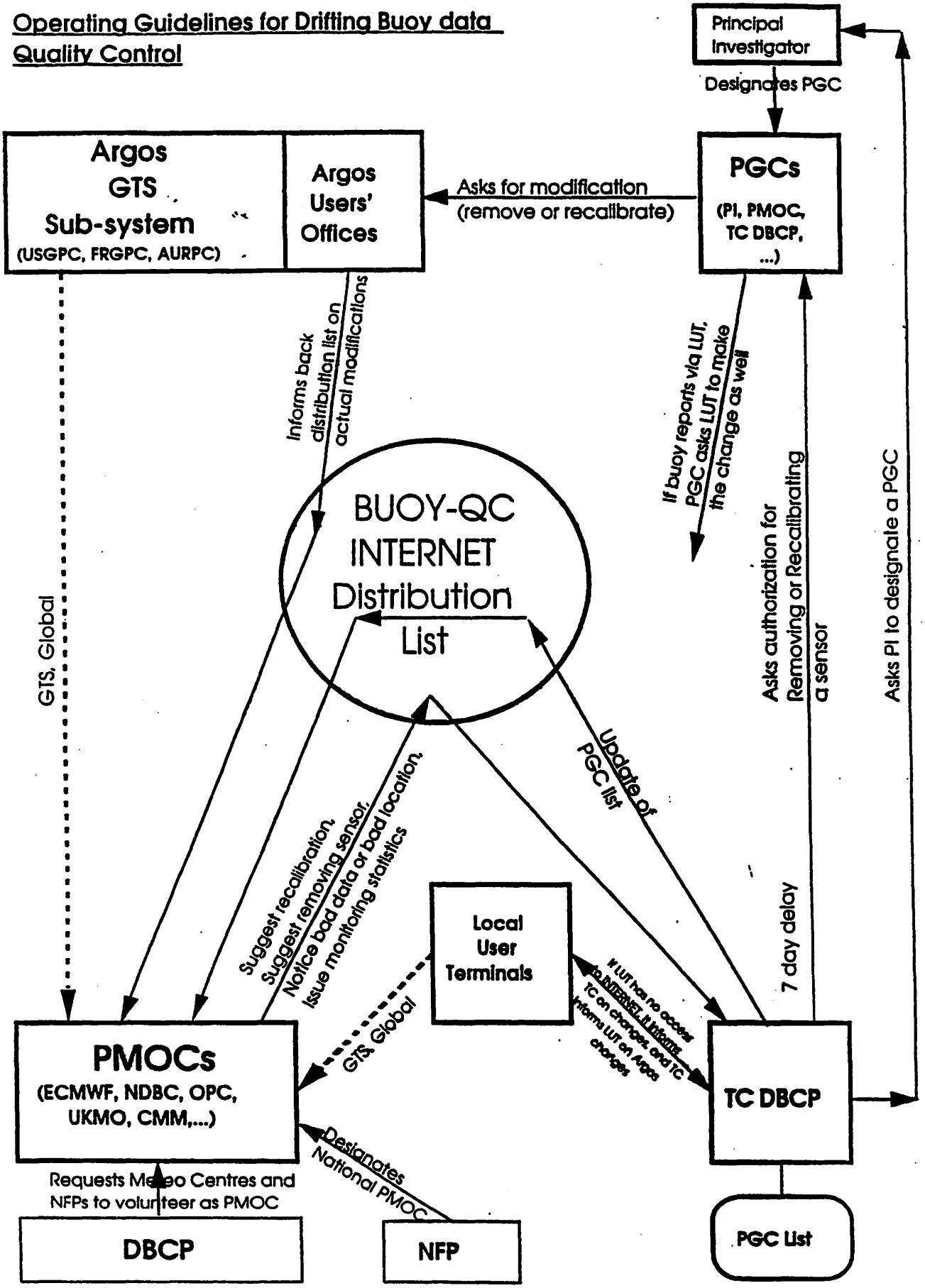
5. List of PGCs

This list is published by the Technical Co-ordinator of the DBCP on a monthly basis. It is forwarded onto the INTERNET Distribution List and sent by regular mail.

6. DBCP, WMO and IOC Secretariats

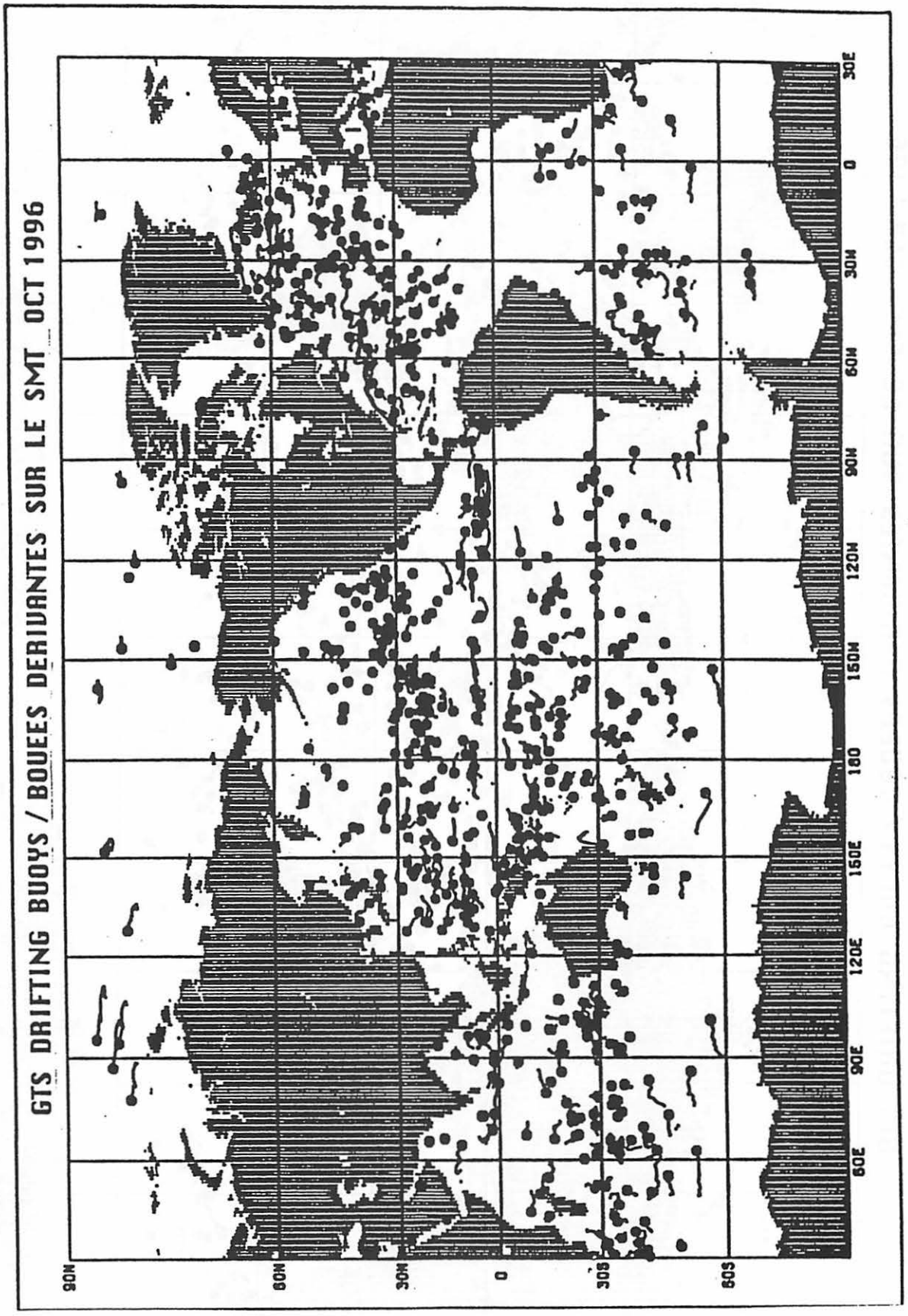
They will promote these Quality Control operating guidelines and encourage participation in this scheme.

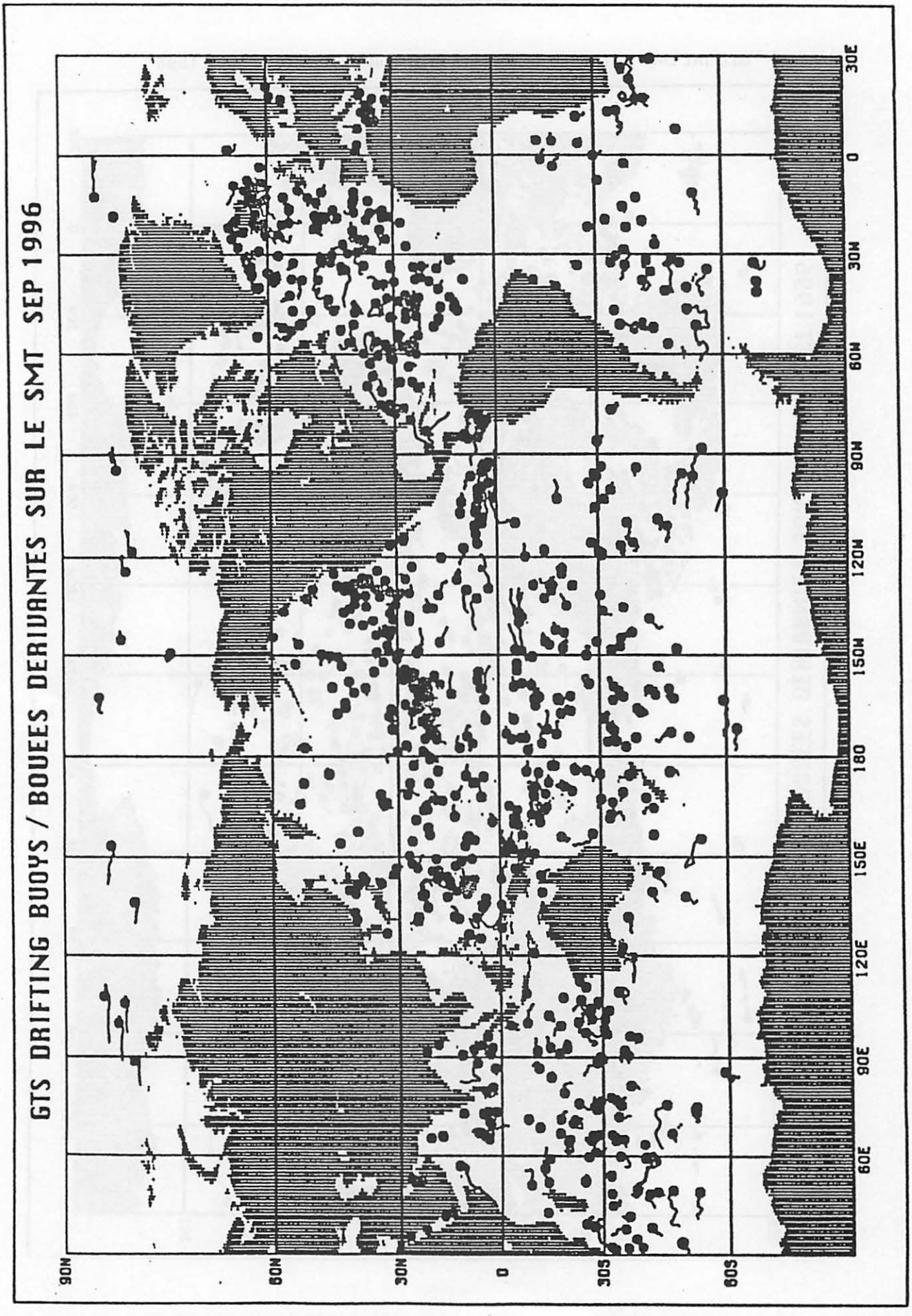
Operating Guidelines for Drifting Buoy data Quality Control

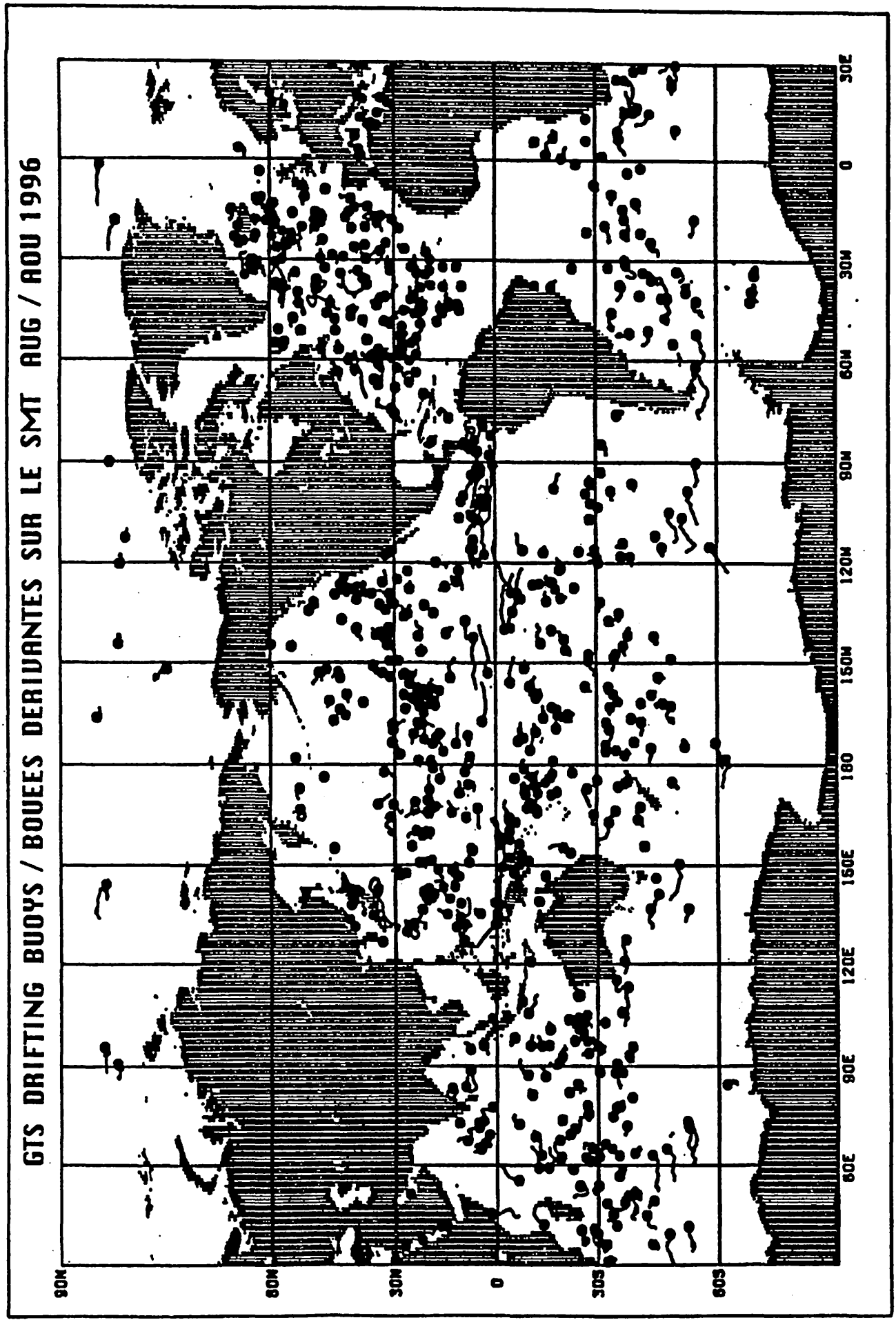


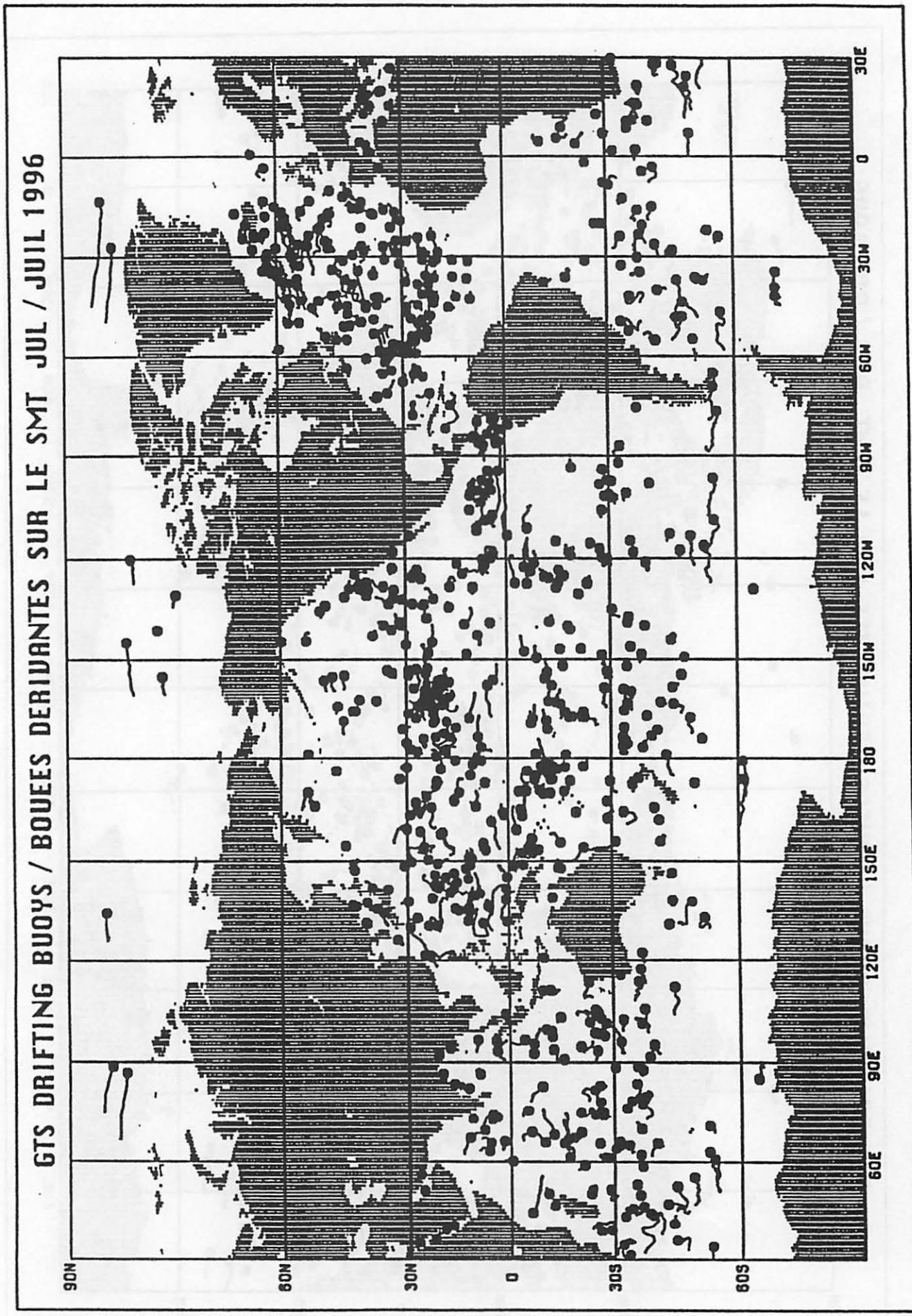
ANNEX VIII

GLOBAL DRIFTING BUOY TRACK CHARTS FOR JULY TO OCTOBER 1996




GTS DRIFTING BUOYS / BOUEES DERIVANTES SUR LE SMT SEP 1996
90N
60N
30N
0
30S
60S
60E
90E
120E
150E
180
150W
120W
90W
60W
30W
0
30E


GTS DRIFTING BUOYS / BOUEES DERIVANTES SUR LE SMT AUG / AOU 1996
90N
60N
30N
0
30S
60S
60E
90E
120E
150E
180
150W
120W
90W
60W
30W
0
30E


GTS DRIFTING BUOYS / BOUEES DERIVANTES SUR LE SMT JUL / JUIL 1996
90N
60N
30N
0
30S
60S
60E
90E
120E
150E
180
150W
120W
90W
60W
30W
0
30E

ANNEX IX

MANUFACTURERS OF SVP BAROMETER DRIFTER

Clearwater Instrumentation
49 Walnut Park, Building No. 2
Wellesley Hills, MA 02181
USA
Tel: (+1) 617 239 3305
Fax: (+1) 617 239 3314
Contact: Gary Williams

Metocean Data systems, Ltd.
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40 Fielding Avenue
Dartmouth, Nova Scotia
CANADA B2W 4A5
Tel: (+1) 902 468 2505
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Metocean Data Systems, Inc.
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Stennis Space Center, Mississippi 39529
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Technocean Associates
4422 SE 9th Av.
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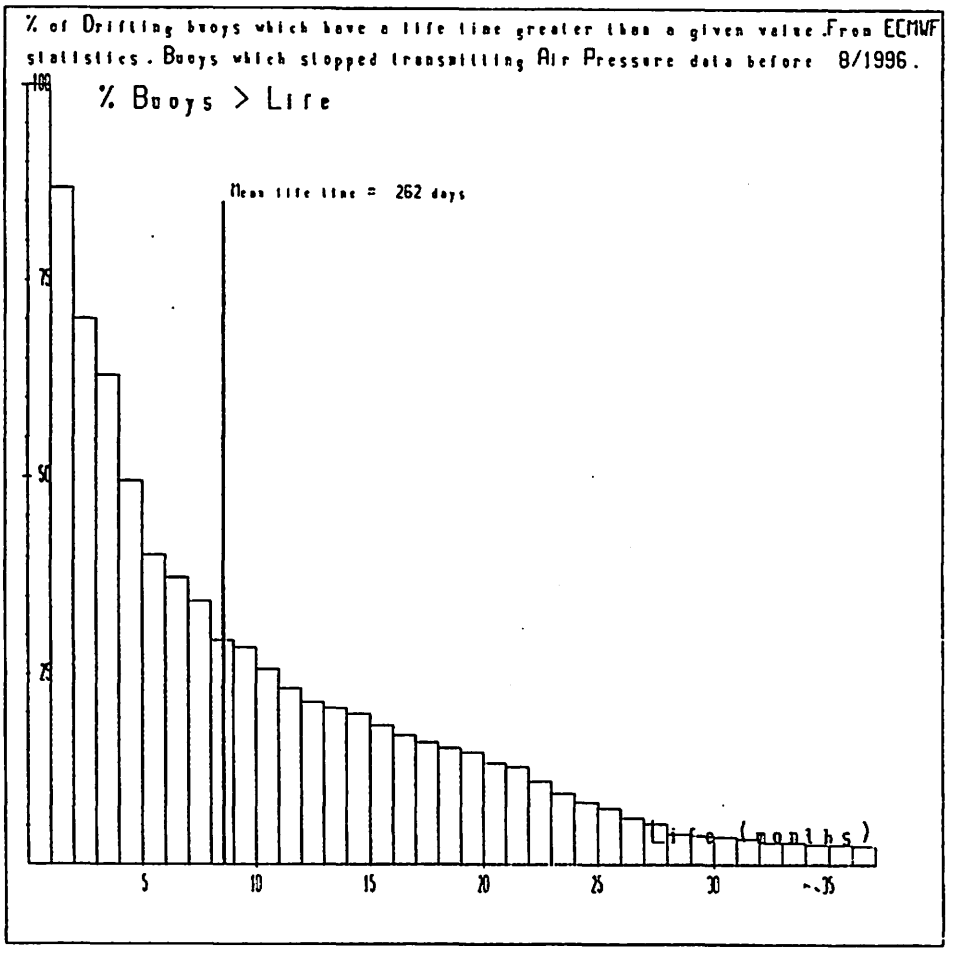
Fax: (+1) 813 574 5613
Contact: Hank White

Turo Technology Pty. Ltd.
P.O. Box 103
Sandy Bay
Tasmania 7006
AUSTRALIA
Tel: (+61) 02 369 511
Fax: (+61) 02 369 506
Contact: Alex Papij

ANNEX X

LIFETIME OF DRIFTING BUOYS



ANNEX XI

U.S. DEPARTMENT OF COMMERCE
NATIONAL CENTERS FOR ENVIRONMENTAL PREDICTION
ENVIRONMENTAL MODELING CENTER

TECHNICAL NOTE

The Effect of Drifting Buoy Data on NCEP Numerical Weather Forecasts

T.-W. Yu

October 1996

OPC Contribution No. 133

1. Introduction

There are generally about 600 to 800 drifting buoy data operationally available for use in analyses during each NCEP global atmospheric data assimilation cycle, depending on the analysis time. Figure 1 shows the distribution of these drifters over the global oceans. One can see that the drifters are about equally distributed over the midlatitude oceans of the Northern and Southern Hemispheres. They represent less than one percentage of the total NCEP global observation data base, which includes conventional surface and upper air observations over land and sea as well as a vast amount of satellite measurements of ocean surface winds, and upper air temperature and humidity data. Table 1 shows typical conventional surface marine observation data counts within + and - 3 hours of an analysis time of the NCEP global data assimilation cycle. Unlike ships and moored buoys which contain sea level pressure, wind, and temperature reports, most of the drifters contain only sea level pressure, with only a very small number (less than 40) of the drifters containing wind vector information.

The effect of the drifting buoy data on the NCEP numerical weather forecasts was investigated by Kistler (1996, personal communication) using the NCEP reanalysis data assimilation system for two months, January and July during the FGGE year, 1979 (see the Appendix for a summary of Kistler's test results). The present study further investigates the effect of drifting buoy data on the NCEP numerical weather forecasts using the most current operational global data assimilation system. Similar to the Kistler's work, a parallel global data assimilation experiment (PRV) was run excluding surface drifting buoy data from the operational NCEP analyses during the global data assimilation cycles for two selected periods, one in the winter month of January 1996, the other in the summer month of July, 1996. The elimination of the drifter data constitutes the sole difference between the PRV parallel run and the operational PRZ run in which the drifter data are used routinely.

The NCEP T62 global data assimilation system, details of which were given in Kanamitsu (1989) and Kanamitsu et al (1992), was used to investigate the impact of the drifting buoy data on

analyses and forecasts. Basically, the assimilation system consists of a forecast model and an analysis scheme. The forecast model is a global spectral forecast model of triangular truncation with 62 waves for the horizontal spectral resolution. In the vertical it has 28 sigma layers. The forecast model includes identical parameterization of such physical processes as convection, precipitation, radiation, and boundary layer physics as those employed in the NCEP operational forecast T126 model. The assimilation experiment is proceeded by a six hour forward integration of the forecast model, starting from the beginning of the data assimilation period, to produce first guess fields of winds (u,v), temperatures (T), and specific humidity (q). The observations within a +/ - 3 hour window are then used to update the first guess fields and complete the analyses.

This process of a six hour model forecast followed by an analysis update is repeated four times a day, once every six hour interval, until the end of the total one month of the assimilation period. For each of the two parallel run experiments, five day forecasts were made at the 0000 UTC cycle of the daily data assimilation, so that there were a total of 31 cases of forecasts. In this study the forecasts valid at 24, 48, 72, 96, and 120 hours of the 31 forecast cases are used for comparison between the two parallel runs. Standard statistics of anomaly correlations and RMS forecast height errors are calculated for each of the two parallel forecasts. In addition, forecast errors of sea level pressures and 10 meter winds with reference to mid-latitude deep ocean buoys and tropical TOGA buoys for the two parallel experiments are compared. These results are discussed in Section 2. A summary concludes this report.

2. Results of the Parallel Experiments

Figure 2 shows the daily anomaly correlations for the 1000 mb height during the month of January 1996 for forecast day 3 (Fig. 2a), and day 5 (Fig. 2b) for the Northern Hemisphere, and day 3 (Fig. 2c), and day 5 (Fig. 2d) for the Southern Hemisphere. At the 1000 mb level, visual comparison of the PRZ (solid curves) anomaly correlations with those of PRV (dashed curves) shows that in general there is very small differences between the forecasts, with the overall forecast being slightly worse for the PRV experiment. However, occasionally there exist significant large differences between the two forecasts. For example during the period of January 13 to 22, 1996, anomaly correlations of the day 3 and day 5 forecasts for the PRV experiment are much worse than those of the PRZ experiment. This suggests that elimination of the drifting buoy data does have a small negative effect on the geopotential height forecasts at 1000 mb level.

The January 1996 monthly mean anomaly correlations for parallel PRV experiment are compared to those of the operational PRZ run, and these statistics are shown in Tables 2a (Northern Hemisphere) and Table 2b (Southern Hemisphere). Similarly, the January 1996 monthly mean statistics of bias and RMS forecast errors for the two parallels experiments are shown in Table 3a (Northern Hemisphere) and Table 3b (Southern Hemisphere). Inspection of the monthly mean anomaly correlations and RMS statistics also suggests that elimination of the drifter data has a small negative impact on the 1000 mb level height forecasts throughout the five day forecast period for the month of January, 1996. This impact is slightly more noticeable over the Southern Hemisphere than over the Northern Hemisphere at the 1000 mb level. At the 500 mb level, the statistics shown in Tables 2 and 3 seem to suggest that elimination of drifter data has a small positive impact on the height forecasts in the Northern Hemisphere. However, it should be emphasized that these differences of anomaly correlations and RMS height forecast errors between the two parallel forecasts are insignificantly small at 500 mb.

The above conclusion is further substantiated by the statistics of mean sea level pressure forecast errors and mean 10 meter wind forecast errors calculated by comparing model forecasts with the mid-latitude buoy observations (See Tables 4a and 4b). These mid-latitude deep ocean buoys are over the Northern Hemisphere with the majority of them located along the east coast and west coast of the United States. All of these buoy winds are adjusted to a height of 10 meters above the ocean surface. One can see from the error statistics shown in Tables 4a and 4b the differences between the two forecasts are very small, suggesting again that elimination of surface drifting buoy data leads to an insignificantly small negative impact on surface level wind and mass fields.

The results for the month of July 1996 are consistent with those of January 1996. Figure 3 shows daily anomaly correlations of the 1000 mb height for day 3 forecasts (Fig. 3a), and day 5 forecasts (Fig. 3b) for the Northern Hemisphere, and day 3 forecasts (Fig. 3c) and day 5 forecasts (Fig.3d) for the Southern Hemisphere for the month of July 1996. Visual inspection of the anomaly correlations between the solid curves (PRZ run) and dashed curves (PRV run) shows again that overall forecasts for the PRV are slightly worse over the Southern Hemisphere 1000 mb level for both day 3 and day 5 forecasts. Over the Northern Hemisphere, anomaly correlations between the two parallel forecasts are not as significantly different. These results are in good agreement with those for the January 1996 parallel experiments.

Results of comparison between the two parallel forecasts by inspecting the mean monthly anomaly correlations (Table 5), mean bias and RMS forecast height errors (Table 6), and mean seal level pressure forecast errors and 10 meter wind forecast errors (see Table 7 with reference to the mid-latitude deep ocean buoys) for the month of July 1996 are in good agreement with those discussed earlier for the month of January 1996, and therefore they will not be elaborated further here. The main conclusion can be drawn from the results shown in Table 5 through Table 7 is that elimination of the drifting buoy data causes a very small negative impact at 1000 mb over the Southern Hemisphere, but with virtually no impact over the Northern Hemisphere.

For the month of July 1996, mean RMS vector wind forecast errors with reference to the TOGA buoys were separately calculated for the Northern and Southern Hemispheres between the two parallel forecast experiments. These TOGA buoys are located between 20 °N and 20 °S latitudes in the tropics. The results are summarized in Table 8a and Table 8b. It clearly shows that elimination of drifting buoys has a negative impact on the Southern Hemisphere; the forecast 10 meter winds have a larger RMS error for the PRV experiment as compared to that of the PRZ experiment (see Table 8b). However, over the Northern Hemisphere, elimination of the drifter data leads to a smaller forecast error of the ocean surface 10 meter winds (see Table 8a).

3. Summary and Conclusions

The original intent of the surface drifter data impact test was to see what effects they might have on the NCEP analyses and forecasts if some percentage of the drifter data were eliminated in the data base. The results presented here, based on two months of data assimilation and forecast experiments, one for the winter month of January 1996 and the other for the summer month of July 1996, show that differences in short range forecasts between the assimilation experiment using all the drifting buoy data and the experiment using no drifting buoy data are not significant at all. Hence, it is clear that using (or excluding) only certain percentage of available drifter data will not have significant impacts on the forecasts in the mean. The results presented here are consistent with the results obtained from assimilation of satellite ocean surface wind data in various operational models. They are also consistent with the results of the drifting buoy tests during the 1979 FGGE period (Kistler, 1996, see Appendix).

Acknowledgments:

The author wishes to express his sincere thanks to D. B. Rao for his reviews of the report, and to M. Iredell for his programming support on the running of the parallel experiments.

REFERENCES

Kistler, R., (1996): Impact test of drifting buoys (personal communication, see Appendix)

Kanamitsu, M., (1989): Description of the NMC global data assimilation and forecast system, Weather and Forecasting, 4, pp 334-342.

Kanamitsu, M., and co-authors (1991): Recent changes implemented into the global forecast system at NMC, Weather and Forecasting, 6 , pp.422-435.

Table 1. Mean data counts available for indicated model run cutoff times after 0000, 0600, 1200 and 1800 UTC as a function of data type for March 1995. Time windows is +/- 3 hours.

	0000 UTC	0600 UTC	1200 UTC	1800 UTC
Marine Ships	678	627	701	656
C-Man Platform	319	322	313	311
Moored Buoys	540	536	535	529
Drifting Buoys	567	658	795	740

Table 2a. Northern Hemisphere monthly mean anomaly Correlations of 1000 mb and 500 mb Height forecasts from 24 to 120 hours for January 1996

Forecast Hours	PRZ (OPNL)		PRV (w/o Drifter Data)	
	1000 mb	500 mb	1000 mb	500 mb
24	.9757	.9894	.9749	.9896
48	.9369	.9628	.9357	.9640
72	.8782	.9159	.8748	.9153
96	.7966	.8447	.7923	.8421
120	.6946	.7582	.6894	.7566

Table 2b. Southern Hemisphere monthly mean anomaly Correlations of 1000 mb and 500 mb Height forecasts from 24 to 120 hours for January 1996

Forecast Hours	PRZ (OPNL)		PRV (w/o Drifter Data)	
	1000 mb	500 mb	1000 mb	500 mb
24	.9379	.9669	.9355	.9678
48	.8706	.9171	.8649	.9158
72	.7868	.8443	.7779	.8396
96	.6889	.7648	.6794	.7585
120	.5848	.6724	.5754	.6613

Table 3a. Northern Hemisphere 1000 mb and 500 mb mean forecast height errors (meters) From 24 to 120 hours for the month of January 1996.

Forecast Hours	PRZ (OPNL)				PRV (w/o Drifter Data)			
	1000 mb		500 mb		1000 mb		500 mb	
	RMS	Bias	RMS	Bias	RMS	Bias	RMS	Bias
24	17.80	0.26	17.72	-0.43	17.96	0.12	17.51	.04
48	28.58	0.77	32.47	1.21	28.68	0.56	32.01	2.03
72	39.08	0.13	47.69	1.80	39.53	-0.12	47.96	2.68
96	49.75	-0.83	63.63	2.08	50.39	-1.22	64.28	2.84
120	60.70	-1.29	78.87	2.58	61.31	-1.92	79.08	2.96

Table 3b. Southern Hemisphere 1000 mb and 500 mb mean forecast height errors (meters) from 24 to 120 hours for the month of January 1996.

Forecast Hours	PRZ (OPNL)				PRV (w/o Drifter Data)			
	1000 mb		500 mb		1000 mb		500 mb	
	RMS	Bias	RMS	Bias	RMS	Bias	RMS	Bias
24	20.42	1.25	22.58	-2.60	20.39	1.43	21.52	-1.76
48	29.61	1.03	35.49	-3.75	29.60	1.54	34.46	-2.24
72	37.82	1.27	47.77	-3.79	38.08	1.73	47.05	-2.31
96	45.76	1.36	58.65	-3.69	46.08	1.95	58.00	-2.19
120	52.64	1.41	68.96	-3.72	52.82	2.06	68.74	-2.22

Table 4a. Mean sea level pressure forecast errors (mb) for the month of January 1996 with reference to Northern Hemisphere mid-latitude deep ocean buoys

Forecast Hours	No. of buoy Observations	PRZ (OPNL)		PRV (w/o Drifter Data)	
		RMS	Bias	RMS	Bias
24	2427	2.51	-0.13	2.50	-0.27
48	2427	3.73	-0.29	3.84	-0.47
72	2280	5.20	-0.11	5.46	-0.09
96	2173	6.67	0.45	6.59	0.36
120	2063	8.19	0.23	7.55	0.26

Table 4b. Mean RMS vector wind errors (m/sec) for the month of January 1996 with reference to Northern Hemisphere mid-latitude deep ocean buoys

Forecast Hours	No. of Buoys	PRZ (OPNL)	PRV (w/o Drifters)
24	2976	5.31	5.20
48	2978	6.31	6.34
72	2958	7.68	7.75
96	2976	8.00	8.12
120	3028	9.55	9.50

Table 5a. Northern Hemisphere monthly mean anomaly Correlations of 1000 mb and 500 mb Height forecasts from 24 to 120 hours for July 1996

Forecast Hours	PRZ (OPNL)		PRV (w/o Drifter Data)	
	1000 mb	500 mb	1000 mb	500 mb
24	.9502	.9757	.9511	.9757
48	.8804	.9334	.8803	.9334
72	.8065	.8685	.8091	.8703
96	.7002	.7772	.7039	.7814
120	.5935	.6585	.5926	.6636

Table 5b. Southern Hemisphere monthly mean anomaly Correlations of 1000 mb and 500 mb Height forecasts from 24 to 120 hours for July 1996

Forecast Hours	PRZ (OPNL)		PRV (w/o Drifter Data)	
	1000 mb	500 mb	1000 mb	500 mb
24	.9684	.9796	.9663	.9783
48	.9226	.9399	.9175	.9373
72	.8558	.8843	.8498	.8797
96	.7789	.8094	.7725	.8052
120	.6797	.7136	.6742	.7089

Table 6a. Northern Hemisphere 1000 mb and 500 mb mean forecast height errors (meters) From 24 to 120 hours for the month of July 1996.

Forecast Hours	PRZ (OPNL)				PRV (w/o Drifter Data)			
	1000 mb		500 mb		1000 mb		500 mb	
	RMS	Bias	RMS	Bias	RMS	Bias	RMS	Bias
24	13.50	0.50	13.56	-1.64	13.38	0.54	13.38	-1.46
48	21.01	-0.44	22.50	-4.05	21.11	-0.13	22.17	-3.60
72	26.95	-0.79	31.55	-6.07	26.79	-0.49	30.89	-5.61
96	33.64	-0.68	40.57	-7.36	33.27	-0.74	39.86	-7.23
120	38.88	-0.80	49.19	-8.47	38.57	-0.93	48.44	-8.35

Table 6b. Southern Hemisphere 1000 mb and 500 mb mean forecast height errors (meters) from 24 to 120 hours for the month of July 1996.

Forecast Hours	PRZ (OPNL)				PRV (w/o Drifter Data)			
	1000 mb		500 mb		1000 mb		500 mb	
	RMS	Bias	RMS	Bias	RMS	Bias	RMS	Bias
24	22.78	1.24	25.66	-0.84	23.34	1.23	25.87	-1.30
48	35.66	2.57	43.28	1.16	36.35	2.36	43.19	0.30
72	47.51	2.73	59.17	2.28	48.05	2.85	59.06	1.48
96	58.71	1.62	75.44	2.30	58.87	2.37	74.86	1.80
120	70.14	1.18	92.23	2.84	70.08	2.17	91.11	2.44

Table 7a. Mean sea level pressure forecast errors (mb) for the month of July 1996 with reference to Northern Hemisphere mid-latitude ocean buoys

Forecast Hours	No. of buoy Observations	PRZ (OPNL)		PRV (w/o Drifter Data)	
		RMS	Bias	RMS	Bias
24	3637	1.64	0.27	1.60	0.26
48	3623	2.29	0.38	2.26	0.33
72	3630	2.88	0.27	2.80	0.15
96	3631	3.37	0.09	3.31	0.04
120	3632	3.93	-0.36	3.91	-0.30

Table 7b. Mean RMS vector wind errors (m/sec) for the month of July 1996 with reference to Northern Hemisphere mid-latitude deep ocean buoys

Forecast Hours	No. of Buoys	PRZ (OPNL)	PRV (w/o Drifters)
24	3637	3.71	3.71
48	3623	4.39	4.33
72	3630	4.82	4.76
96	3631	5.23	5.13
120	3632	5.66	5.61

Table 8a. Mean RMS vector wind errors (m/sec) for the month of July 1996 with reference to Northern Hemisphere TOGA buoys

Forecast Hours	No. of Buoys	PRZ (OPNL)	PRV (w/o Drifters)
24	485	3.60	3.57
48	485	3.68	3.64
72	485	3.88	3.84
96	488	4.10	4.03
120	493	4.24	4.21

Table 8b. Mean RMS vector wind errors (m/sec) for the month of July 1996 with reference to Southern Hemisphere TOGA buoys

Forecast Hours	No. of Buoys	PRZ (OPNL)	PRV (w/o Drifters)
24	453	2.97	3.01
48	436	3.27	3.28
72	449	3.32	3.44
96	447	3.31	3.37
120	449	3.50	3.56

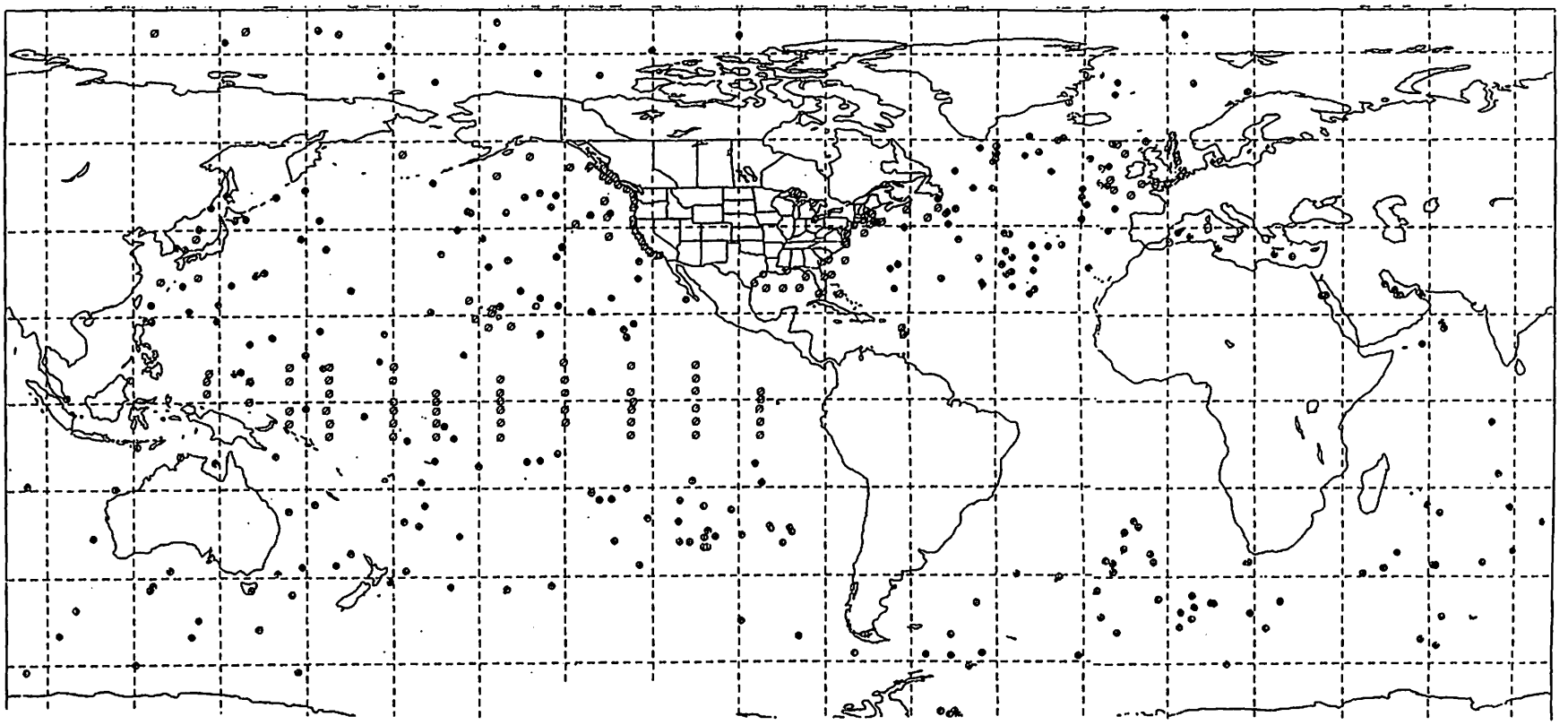


Figure 1. Typical distribution of surface buoy observations. The circles with slash indicate locations of moored buoys, and the circles with plus indicate the locations of drifting buoys.

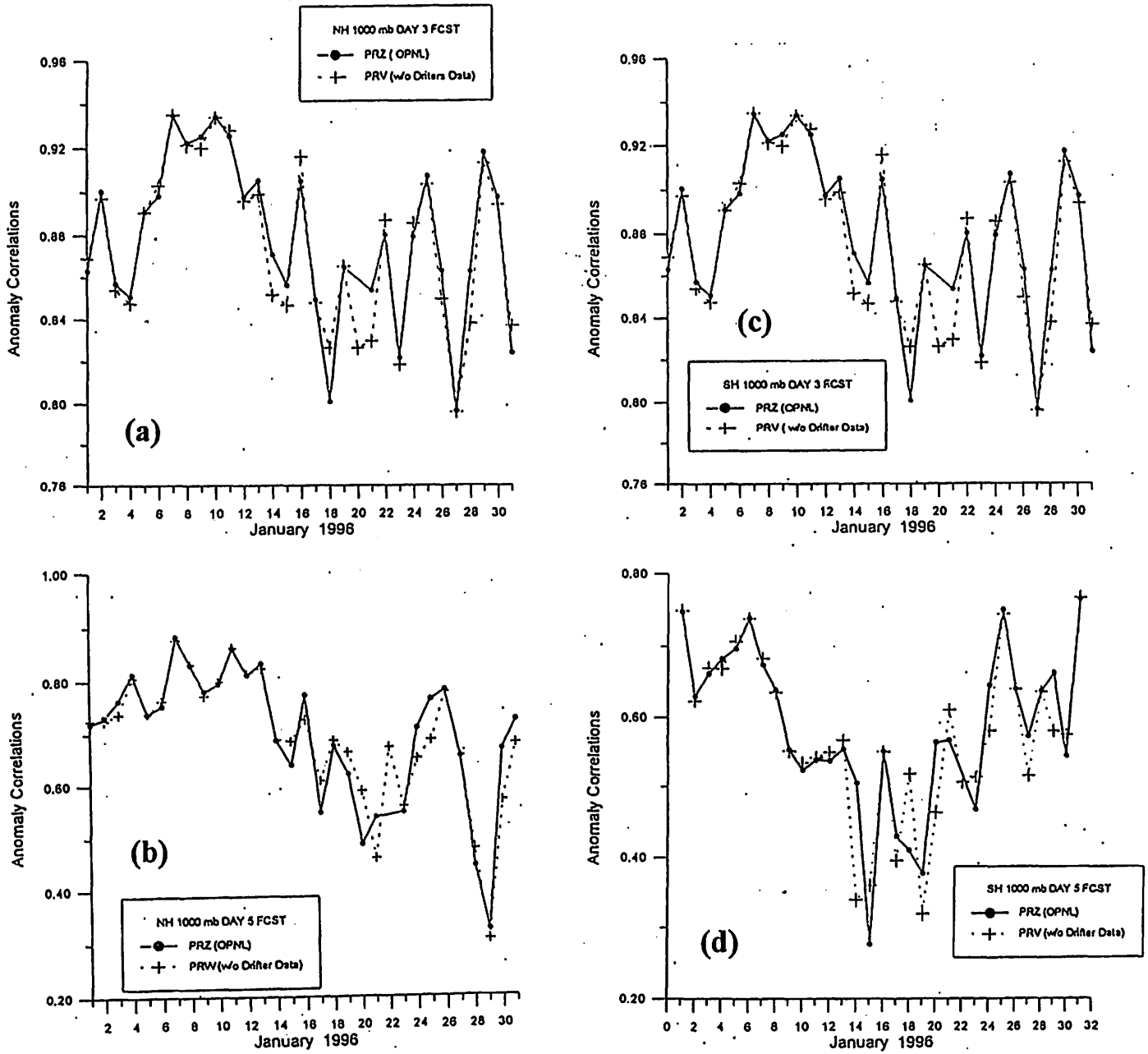


Figure 2. 1000 mb Height Anomaly Correlations for January 1996.

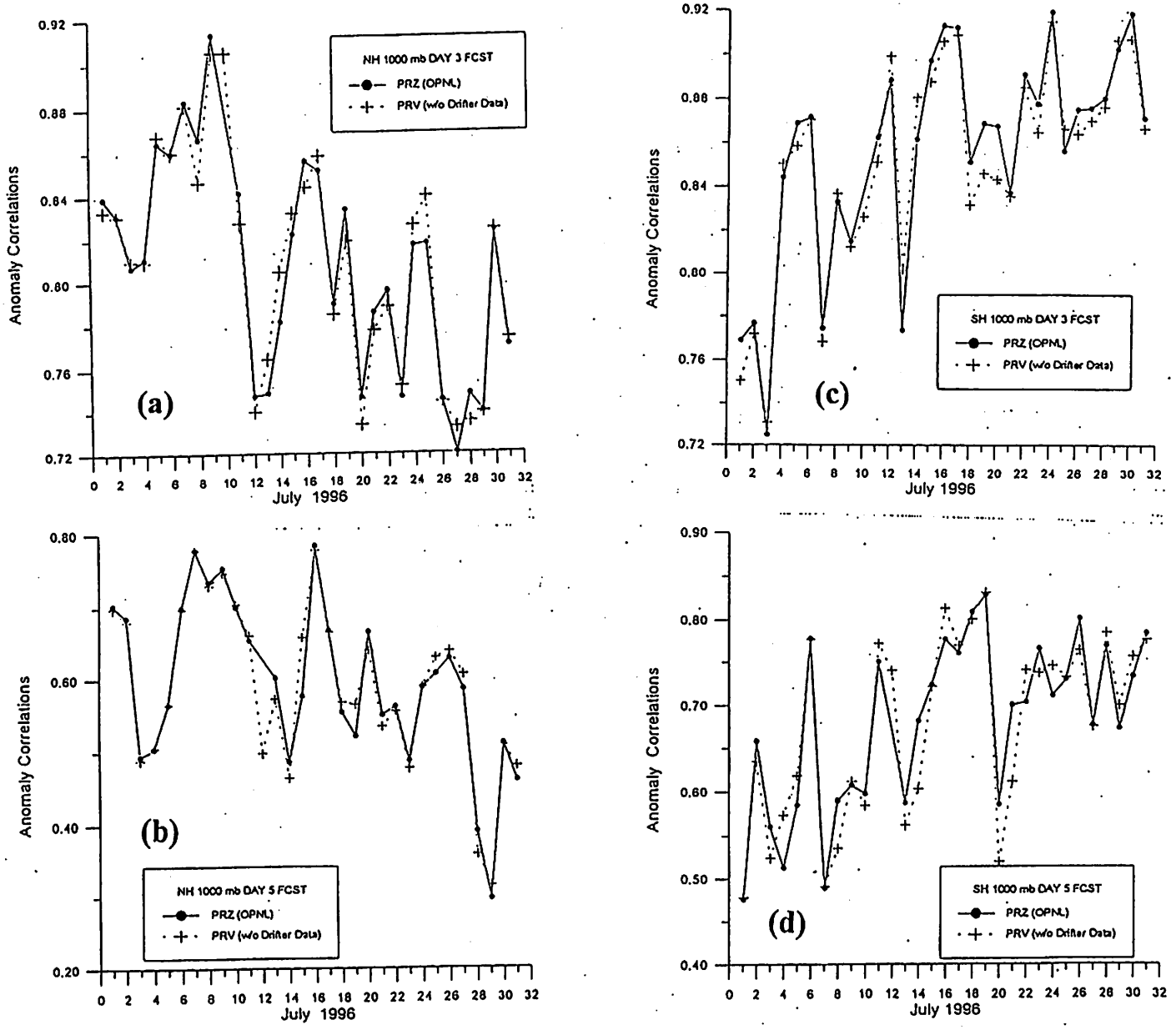


Figure 3. 1000 mb Height Anomaly Correlations for July 1996.

APPENDIX

Impact Test of Drifting Buoys

The Reanlysis data assimilation system was used to test the impact of drifiting buoys (DRIBU's) for two months, January (7901) and July (7907) during the FGGE year, 1979. The control was the official run of the Reanalysis. The impact test run, No-DRIBU, was identical except that DRIBU's were excluded.

As is done for operational implimentations, the impact was measured by comparing the relative skill of global predictions. Anomaly correlation(AC) and root-mean-square error(RMS) of predicted geoptential height fields and the verifying analyses of each respective assimlation system were compiled for both hemispheres (N-Hem,S-Hem) at 1000 mb and 500 mb, every 24 hours through 5 days (024 048 072 096 120) for daily predictions originating at 0000 GMT.

Results

Tables 1 and 2 compare the 7901 RMS and AC, respectively, while Tables 3 and 4 are the 7907 respective tables.

The results for Jan 1979 (7901) show little differentiation. Most of the AC scores table 3 are identical. The RMS scores in Table 1 displays mixed results The N-Hem scores are a virtual tie. The S-Hem scores reverse sense: postive impact at 500mb and negative at 1000mb.

The Jul 1979 RMS scores in Table 2 are mixed across the hemispheres. Both levels of N-Hem scores display a slight postive impact. The S-Hem 1000mb scores are more decidely negative at all time, but the 500mb scores reverse from postive to negative in time.

The N-Hem Jul 79 AC scores in table 4 are a tie. Both levels of S-Hem scores indicate negative impact at 24 hours that diminishes in time, reversing to postive impact at 1000mb, and a tie at 072 at 500 mb.

Discussion

One of the original rationales for the deployment of DRIBU's was to act as a "reference" level for the satellite satellite temperature soundings. This mind set of " reference level" arose from the historical use of two dimensional grid point analysis techniques operating on mandatory pressure levels as the basis of objective analyses used for NWP. Having the withdrawal of a source of data produce mixed-to-little impact indicates that the data are basically redundant. This is partically true in a 3D-VAR analysis such as the SSI, where all the data are considered at the same time, and the necessity of a "reference level" is obviated.

Table 1. Jan 79 RMS comparison

7901:N-Hem:1000:024: RMS avg	No-DRIBU	18.61	Control	18.64
7901:N-Hem:1000:048: RMS avg	No-DRIBU	29.83	Control	30.00
7901:N-Hem:1000:072: RMS avg	No-DRIBU	40.20	Control	40.41
7901:N-Hem:1000:096: RMS avg	No-DRIBU	52.16	Control	52.36
7901:N-Hem:1000:120: RMS avg	No-DRIBU	64.02	Control	63.99
7901:N-Hem:500:024: RMS avg	No-DRIBU	18.96	Control	19.08
7901:N-Hem:500:048: RMS avg	No-DRIBU	32.73	Control	32.81
7901:N-Hem:500:072: RMS avg	No-DRIBU	47.53	Control	47.58
7901:N-Hem:500:096: RMS avg	No-DRIBU	64.90	Control	64.81
7901:N-Hem:500:120: RMS avg	No-DRIBU	80.84	Control	80.64
7901:S-Hem:1000:024: RMS avg	No-DRIBU	22.52	Control	22.76
7901:S-Hem:1000:048: RMS avg	No-DRIBU	32.95	Control	33.82
7901:S-Hem:1000:072: RMS avg	No-DRIBU	42.18	Control	43.13
7901:S-Hem:1000:096: RMS avg	No-DRIBU	48.81	Control	50.10
7901:S-Hem:1000:120: RMS avg	No-DRIBU	54.94	Control	56.15
7901:S-Hem:500:024: RMS avg	No-DRIBU	26.16	Control	25.68
7901:S-Hem:500:048: RMS avg	No-DRIBU	40.71	Control	40.11
7901:S-Hem:500:072: RMS avg	No-DRIBU	54.05	Control	52.77
7901:S-Hem:500:096: RMS avg	No-DRIBU	64.72	Control	63.55
7901:S-Hem:500:120: RMS avg	No-DRIBU	74.46	Control	73.20

Table 2. Jul 79 RMS comparison

7907:N-Hem:1000:024: RMS avg	No-DRIBU	14.64	Control	13.52
7907:N-Hem:1000:048: RMS avg	No-DRIBU	22.16	Control	21.55
7907:N-Hem:1000:072: RMS avg	No-DRIBU	29.18	Control	28.86
7907:N-Hem:1000:096: RMS avg	No-DRIBU	35.02	Control	34.89
7907:N-Hem:1000:120: RMS avg	No-DRIBU	40.53	Control	40.54
7907:N-Hem:500:024: RMS avg	No-DRIBU	16.34	Control	14.69
7907:N-Hem:500:048: RMS avg	No-DRIBU	25.82	Control	24.46
7907:N-Hem:500:072: RMS avg	No-DRIBU	34.99	Control	34.10
7907:N-Hem:500:096: RMS avg	No-DRIBU	43.79	Control	43.54
7907:N-Hem:500:120: RMS avg	No-DRIBU	51.48	Control	51.80
7907:S-Hem:1000:024: RMS avg	No-DRIBU	28.23	Control	29.53
7907:S-Hem:1000:048: RMS avg	No-DRIBU	42.93	Control	47.62
7907:S-Hem:1000:072: RMS avg	No-DRIBU	58.05	Control	64.27
7907:S-Hem:1000:096: RMS avg	No-DRIBU	71.60	Control	76.54
7907:S-Hem:1000:120: RMS avg	No-DRIBU	81.78	Control	86.30
7907:S-Hem:500:024: RMS avg	No-DRIBU	32.73	Control	29.27
7907:S-Hem:500:048: RMS avg	No-DRIBU	52.36	Control	52.02
7907:S-Hem:500:072: RMS avg	No-DRIBU	71.74	Control	74.43
7907:S-Hem:500:096: RMS avg	No-DRIBU	89.51	Control	91.93
7907:S-Hem:500:120: RMS avg	No-DRIBU	104.13	Control	106.32

Table 3. Jan 79 AC comparison

7901:N-Hem:1000:024: AC avg	No-DRIBU	0.98	Control	0.98
7901:N-Hem:1000:048: AC avg	No-DRIBU	0.94	Control	0.94
7901:N-Hem:1000:072: AC avg	No-DRIBU	0.89	Control	0.89
7901:N-Hem:1000:096: AC avg	No-DRIBU	0.81	Control	0.81
7901:N-Hem:1000:120: AC avg	No-DRIBU	0.72	Control	0.72
7901:N-Hem:500:024: AC avg	No-DRIBU	0.99	Control	0.99
7901:N-Hem:500:048: AC avg	No-DRIBU	0.97	Control	0.97
7901:N-Hem:500:072: AC avg	No-DRIBU	0.93	Control	0.92
7901:N-Hem:500:096: AC avg	No-DRIBU	0.86	Control	0.86
7901:N-Hem:500:120: AC avg	No-DRIBU	0.78	Control	0.78

7901:S-Hem:1000:024:	AC	avg	No-DRIBU	0.90	Control	0.91
7901:S-Hem:1000:048:	AC	avg	No-DRIBU	0.79	Control	0.79
7901:S-Hem:1000:072:	AC	avg	No-DRIBU	0.65	Control	0.66
7901:S-Hem:1000:096:	AC	avg	No-DRIBU	0.55	Control	0.54
7901:S-Hem:1000:120:	AC	avg	No-DRIBU	0.43	Control	0.43
7901:S-Hem:500:024:	AC	avg	No-DRIBU	0.94	Control	0.95
7901:S-Hem:500:048:	AC	avg	No-DRIBU	0.86	Control	0.87
7901:S-Hem:500:072:	AC	avg	No-DRIBU	0.75	Control	0.76
7901:S-Hem:500:096:	AC	avg	No-DRIBU	0.63	Control	0.65
7901:S-Hem:500:120:	AC	avg	No-DRIBU	0.51	Control	0.52

Table 4. Jul 79 AC comparison

7907:N-Hem:1000:024:	AC	avg	No-DRIBU	0.92	Control	0.95
7907:N-Hem:1000:048:	AC	avg	No-DRIBU	0.85	Control	0.87
7907:N-Hem:1000:072:	AC	avg	No-DRIBU	0.76	Control	0.77
7907:N-Hem:1000:096:	AC	avg	No-DRIBU	0.64	Control	0.66
7907:N-Hem:1000:120:	AC	avg	No-DRIBU	0.51	Control	0.52
7907:N-Hem:500:024:	AC	avg	No-DRIBU	0.95	Control	0.98
7907:N-Hem:500:048:	AC	avg	No-DRIBU	0.90	Control	0.93
7907:N-Hem:500:072:	AC	avg	No-DRIBU	0.83	Control	0.85
7907:N-Hem:500:096:	AC	avg	No-DRIBU	0.73	Control	0.74
7907:N-Hem:500:120:	AC	avg	No-DRIBU	0.61	Control	0.61
7907:S-Hem:1000:024:	AC	avg	No-DRIBU	0.91	Control	0.93
7907:S-Hem:1000:048:	AC	avg	No-DRIBU	0.84	Control	0.83
7907:S-Hem:1000:072:	AC	avg	No-DRIBU	0.73	Control	0.70
7907:S-Hem:1000:096:	AC	avg	No-DRIBU	0.60	Control	0.58
7907:S-Hem:1000:120:	AC	avg	No-DRIBU	0.50	Control	0.48
7907:S-Hem:500:024:	AC	avg	No-DRIBU	0.92	Control	0.96
7907:S-Hem:500:048:	AC	avg	No-DRIBU	0.83	Control	0.86
7907:S-Hem:500:072:	AC	avg	No-DRIBU	0.71	Control	0.72
7907:S-Hem:500:096:	AC	avg	No-DRIBU	0.58	Control	0.58
7907:S-Hem:500:120:	AC	avg	No-DRIBU	0.46	Control	0.46

Bob Kistler

ANNEX XII

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ANNEX XIII

FINANCIAL STATEMENTS PROVIDED BY WMO AND IOC

Interim Account as at 31 August 1996

	US$	US$
Balance from 1995		21'349
Contributions Paid for Current Biennium		133'918
Total Funds Available		155'267
Obligations Incurred		
Technical Co-ordinator	120'936	
Experts	4'774	
Chairman's travel	5'352	
Reports	1'217	
Administration direct	0	
		132'280
Balance of Fund		US $ 22'987
Represented by.		
Cash at Bank		22'987
Unliquidated obligations		(1)
		US $ 22'987

Contributions	Received 1996
Australia	12'500
Canada	15'000
France	15'000
Greece	2'200
Iceland	1'500
Ireland	1'568
Netherlands	1'575
New Zealand	
Norway	1'575
South Africa	
UK	15'000
USA	68'000
TOTAL	133'918

(1) Commitments totalling approximately $3,200 for publication of Technical Documents Nos. 6 and 7 are yet to be included in the account.

Financial Statement by IOC for the year 1 June 1995 to 31 May 1996
(all amounts in US $ unless otherwise specified)

BALANCE (from previous year)			**$ 18 554**
FUNDS TRANSFERRED FROM WMO (relevant to the period)			
90 000	(04.05.95)		
15 000	(09.08.95)		**$ 105 000**
FF 79 000	(21.12.95)		**FF 79 000**
	TOTAL RECEIPTS		**$ 123 554** **FF 79 000**
EXPENDITURES			
Technical Co-ordinator's employment:			
	- Salary:	69 600	
	- Allowances:	14 517	
	- Relocation (yearly provision)	3 400	**$ 87 517**
Technical Co-ordinator's missions:			
	- Bergen (7-8 June 1995):	1 793	
	- Kiel (27-28 June 1995):	1 917	
	- Cambridge (21-22 September 1995):	1 462	
	- Pretoria (16-26 October 1995):	3 317	
	- Copenhagen (15-17 January 1996):	1 335	
	- New Orleans/Washington (19-26 January 1996):	2 786	
	- Goa (10-16 February 1996):	2 359	
	- Geneva (1-3 May 1996):	1 307	
	- Bonas (14-17 May 1996):	490	**$ 16 766**
Contract with CLS/Service Argos:			**FF 79 000**
	TOTAL EXPENDITURES		**$ 104 283** **FF 79 000**
BALANCE (at 1 June 1996)			**$ 19 271**

TECHNICAL DOCUMENTS ISSUED WITHIN THE DATA BUOY CO-OPERATION PANEL SERIES

No.	Title	Year of issue
1	Annual report for 1994	1995
2	Reference Guide to the GTS Sub-system of the Argos Processing System	1995
3	Guide to Data Collection and Location Services using Service Argos	1995
4	WOCE Surface Velocity Programme Barometer Drifter Construction Manual	1995
5	Surface Velocity Programme (SVP) - DBCP/SIO Workshop on SVP barometer drifter evaluation	1996
6	Annual report of the DBCP for 1995	1996
7	Developments in buoy technology and enabling methods - Technical presentations made at the eleventh session of the DBCP	1996
8	Guide to moored buoys and other ocean data acquisition systems	1997
9	Annual report for 1996	1997

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