JCOMM AD HOC TASK TEAM ON THE MARINE POLLUTION EMERGENCY RESPONSE SUPPORT SYSTEM (MPERSS)

Toulouse, France, 17-18 May 2004

FINAL REPORT

JCOMM Meeting Report No. 29

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

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N O T E

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C O N T E N T S

1. OPENING OF THE SESSION

1.1. Opening

1.1.1 A meeting of the JCOMM ad hoc Task Team on the Marine Pollution Emergency Response Support System (MPERSS) was opened at 0900 hours on Monday 17 May 2004 at the Centre International de Conférence, Météo-France, Toulouse, France, by the chairman of the Team, Mr Pierre Daniel (France). Mr Daniel welcomed participants to the session. He noted that the MPERSS has been operated on a trial basis for the past ten years and stressed that it was important for this meeting to develop specific proposals to a successful transition into an operational phase as far as possible, in line with the commitment made at JCOMM-I.

1.1.2 On behalf of WMO and IOC, the Secretariat representative also welcomed participants to the session. In doing so, she noted that the primary purpose of the workshop was to prepare specific recommendations, including an undated draft system plan, and to prepare specific actions to enhance the implementation of MPERSS worldwide using, as appropriate, information provided during the preceding seminar, Ocean Ops 04, as well as the results of a comprehensive status review to be conducted during this meeting. A list of participants in the workshop is given in Annex I.

1.2 Adoption of the agenda

1.2.1 The meeting adopted its agenda for the session on the basis of the provisional agenda prepared by the Secretariat. The agenda is given in Annex II.

1.3 Working arrangements

1.3.1 The meeting agreed its hours of work and other practical session arrangements. The documentation was introduced by the Secretariat.

2. REPORT OF THE RAPPORTEUR ON MPERSS (CHAIRMAN OF THE AD HOC TASK TEAM)

2.1 The meeting was presented with the report of the Rapporteur on MPERSS, Mr Pierre Daniel. First, Mr Daniel briefly reviewed the past development of MPERSS. The Marine Pollution Emergency Response Support System (MPERSS) had been implemented on a trial basis since January 1994 based on Recommendation 2 of the eleventh session of the WMO Commission for Marine Meteorology (CMM-XI) (Portugal, April 1993). JCOMM-I (Akureyri, June 2001) agreed that MPERSS trials should continue during the coming intersessional period. JCOMM-I also agreed with the substance of the recommendations of the MARPOLSER98 Workshop (Townsville, July 1998). It requested the Services Coordination Group (SCG) to review those recommendations and develop an updated system plan and a plan for their implementation. SCG, at its first session (SCG-I) (Geneva, April 2002), reviewed the recommendations and recognized that discharging all these tasks was not possible for a single Rapporteur and recommended the establishment a small ad hoc Task Team.

Recent Development of MPERSS

2.2 The meeting noted with appreciation the summary results of a questionnaire survey conducted on the status of implementation of MPERSS, prepared by Mr Daniel. The questionnaire survey was conducted just prior to this meeting, in April 2004, as a follow-up to the survey conducted in March 2001. Since the previous survey, important progress in implementation of MPERSS has occurred, in particular in areas V and XV, where MPERSS is now implemented. There are still a few areas were MPERSS is not fully implemented. For areas where MPERSS is

implemented, contacts with supporting services and marine pollution authorities have been strengthened. In most areas, there were trials of MPERSS or incidents where MPERSS applied.

2.3 Some Area Meteorological and Oceanographic Coordinators reported difficulties in the implementation of MPERSS. They can be summarized as follows:

- Ocean circulation models or pollution models not available
- Models not in an operational environment
- Marine meteorologists unfamiliar with pollution modeling requirements
- Size and diversity of MPI area
- Difficulties to bring the right people together and work out solutions
- Lack of people and resources

Ocean Ops 04

2.4 Mr Daniel reported on Ocean Ops 04 - Operational Metocean Products and Services in Support of Maritime Safety and Environmental Management, a scientific workshop focusing on the operational needs of environmental managers (Toulouse, 10-15 May 2004), which took place prior to this meeting. The last two days of the workshop focused on MPERSS. During the workshop a number of presentations related to MPERSS were made. Many issues relevant to MPERSS were raised in these papers, and these are summarised in the session rapporteur reports, which are given in Annex III.

2.5 The meeting noted that the following issues/recommendations were raised at Ocean Ops 04.

- There is an improved understanding and modelling of metocean variables, in particular surface currents
- Search and rescue operations have similar needs as those of MPERSS.
- Strengthened coordination between the providers and users of metocean information and services has been occurring
- The maintenance and enhancement of metocean monitoring systems is important to implement the MPERSS
- It is important to share metocean data in a more effective manner
- Oil spill/drift models need information on the incident source such as physical characteristics and location of the spilt oil. To assist better communications with mariners/ship companies should be established through appropriate international bodies such as the International Maritime Organization (IMO).
- Coordinated systems for emergency response should be established in developing countries. To this end, support by operational services which already have advanced systems would be highly beneficial.
- The Inter-country oil spill modelling system in the Baltic is a good example of regional coordination/cooperation.
- Presently available products from operational oceanography systems are not optimal.
- meteorological services are expected to provide some information specific to marine pollution incidents, such as forecasts related to possible underwater operations.
- Public relations are important.
- Possibility of satellite usage for the MPERSS operation should be further considered.

2.6 The meeting also noted that in the discussion session of Ocean Ops 04 which concluded the symposium, and at which the rapporteur reports were presented, the following broad framework was recommended.

There is a clear need for MPERSS type systems everywhere. Such systems are already in place in a number of areas and operating more or less satisfactorily, sometimes in direct response to MPERSS, sometimes independently. In any case, JCOMM has a major role to play, through MPERSS, in the implementation of marine pollution emergency response systems on a global basis. Specific actions for consideration:

- All MPI areas should consider carefully the various specific recommendations arising from Ocean Ops 04;
- Greater cooperation and coordination is required among MPERSS Area Meteorological and Oceanographic Coordinators (AMOCs), in particular to enhance the development of MPERSS in all areas.

2.7 The meeting noted that these recommendations should be taken into consideration to develop an updated system plan and/or guidelines during this meeting and in the future.

3. REVIEW OF MPERSS IMPLEMENTATION STATUS

3.1 The meeting noted with interest the reports from the MPERSS AMOCs (Argentina, Australia, Chile, France, Japan, Mauritius, New Zealand, Russian Federation, South Africa, the United Kingdom and the United States) on their experiences, progress and success in implementing the system within their respective areas. Those reports (power point presentations given at the meeting and/or written reports), together with the results of the questionnaire survey conducted by Mr Daniel, will be published in electronic form as a JCOMM Technical Report. (**Action:** AMOC representatives provide the Secretariat with their presentations and/or written text, the Secretariat compiles the materials and publishes a JCOMM TR)

3.2 From these reports as well as the verbal information presented by the representatives of the AMOCs, the meeting noted the following specific points:

- The Argentinean government has bought a transport model, but details on its operation have not been decided.

- In Australia, MPERSS has been effectively established, with the full implementation of the Net Water Movement (NWM) system by the Australian Maritime Safety Authority (AMSA). Australia and New Zealand have been in dialogue regarding coordination of MPERSS activities across the MPI X-XIV boundaries in the Tasman Sea. A proposal to assist South Pacific countries based on the Australian marine pollution support system has been developed following the Pacific island workshop (Fiji, September 2002)

- Chile informed that the Chilean Navy was in charge of maritime weather forecast and provides the Chilean Maritime Authority with meteorological information to run an oil drift model.

- France encountered a big pollution incident with the Prestige. Météo-France operates oil spill models. A number of agreements (provision of models, support to national meteorological services in other nations, including African countries, etc.) have been established with other countries.

- Japan has established a domestic framework between the Japan Meteorological Agency (JMA) and the Japan Coast Guard regarding marine pollution emergency. JMA has developed an oil drift model, which uses a hybrid current analysis. Japan also informed that in the Japan sea area, the North-west Pacific Action Plan (NOWPAP) has been established as UNEP's Regional marine pollution coordination scheme.

- Mauritius informed that the national meteorological service is responsible for the provision of meteorological forecast and for the operation of oil spill trajectory models which were obtained through the internet. While meteorological forecasts can be provided satisfactorily, there are a number of problems regarding the oil spill model. Training of interpretation of models is needed. While there are a number of models freely available, it is not clear which model should be used. Information on the activities of other AMOCs should be made available to other AMOCs, especially in developing countries.

- New Zealand reported that the requirements for MetService to respond to a marine pollution incident were written into its " Agreement for Meteorological Service" with the Minister of Transport. The support is limited to provision of meteorological elements.

- Russian Federation reported that although a number of models to be applied for a marine pollution incident had been developed and used in Russia, an appropriate framework/system for their operations had not been developed.

- South African Weather Service provides meteorological information to the Council for Scientific and Industrial Research that runs oil drift models. Since the output of numerical models cannot always be applied directly, intervention by forecasters is important.

- United Kingdom informed that a trial was conducted in 2001. Although the Met Office is ready to run an oil spill model, a private company is at present in charge of the operation of such a model.

- US reported that the NOAA Ocean Prediction Center (OPC) was operational on 24/7. While OPC provides meteorological information, NOAA Hazardous Materials Response Division (HAZMAT) runs active models. These models are freely available.

3.3 The meeting agreed that the core information to be provided by AMOCs was basic meteorological information such as wind, wave and air temperature. The meeting noted that all the represented AMOCs satisfactorily provide marine pollution emergency authorities with basic meteorological forecasts and warnings in the framework of MPERSS. In this regard, the meeting agreed that as far as meteorological components are concerned, MPERSS had already been fully implemented.

3.4 The meeting noted that some national meteorological services had developed and operated oil spill models. Some of the models are freely available, and some are provided under a specific condition.

3.5 Recognizing the importance of current information to run drift models, the meeting noted that the South-East Asian Centre for Atmospheric and Marine Prediction (SEACAMP), an ASEAN project, had established a dedicated web site where much operational oceanographic information in the ASEAN region is available.

3.6 With regard to support to developing countries, the meeting noted that training in the interpretation of models (meteorological models and drift models) would be important for the further implementation of MPERSS worldwide, and that the Capacity Building Jamboree (planned in early 2005) could provide an appropriate opportunity. The meeting requested the Capacity Building Coordination Group (CBCG) to consider this issue in due course. (**Action**: Secretariat to convey this request to CBCG, CBCG consider possible inclusion of the interpretation of models in the issue of the planned Capacity Building Jamboree) The meeting also noted that the JCOMM Technical Report to be published (see para 3.1) could provide some useful information to AMOCs and Supporting Services, especially those in developing countries.

3.7 The meeting noted with regret that the IMO was not represented at this meeting or Ocean Ops 04 because the 78th session of the IMO Maritime Safety Committee (MSC) was taking place in London, 12-20 May. The meeting noted that it is highly desirable that the IMO be represented at future meetings relevant to MPERSS. (**Action**: Secretariat to contact IMO as appropriate)

4. ADVANCEMENT OF IMPLEMENTATION

Updated system plan

4.1 The meeting recalled that a number of recommendations had been raised at MARPOLSER98 and endorsed by JCOMM-I. Based on the current status reported under agenda item 3, and discussions/recommendation raised at Ocean Ops 04, the meeting agreed to develop an updated system plan to be submitted to JCOMM-II for its consideration.

4.2 The meeting noted that it would be premature to designate centres of excellence in meteorological and oceanographic support for pollution emergency response, as support for the Area Meteorological and Oceanographic Coordinators. However, a list of AMOCs which have advanced experience could be compiled.

4.3 With regard to the possible adjustment to the areas of responsibility for MPIs, there would be no need for such adjustment at this stage. The division of the MPI III into III (A) and III (B) should be reflected in an updated system plan. It would be necessary to confirm that Canada has been designated as the AMOC North of 67N in areas IV and XII. (Action: Secretariat to contact Canada)

4.4 The meeting recalled that JCOMM-I agreed that a new MPI sub-area III (c) should be created, comprising the Black Sea. It requested the Secretariat to discuss with Bulgaria the possibility of Bulgaria assuming the responsibility of AMOC for that sub-area. (Action: Secretariat to contact Bulgaria)

4.5 The meeting recalled that the current system plan had been developed before the establishment of JCOMM. Noting that marine pollution emergency response authorities need oceanographic information as well as meteorological information and that some national meteorological services provide operational oceanographic information while some do not, the meeting agreed that the system plan should be applied not only to national meteorological services but also to operational oceanographic services.

4.6 The meeting agreed to replace the current Appendix II with the proposed texts recommended at MARPOLSER98, with some amendments mainly based on discussions at Ocean Ops 04. The meeting agreed that Appendix II should be updated in accordance with technical/scientific development.

4.7 The meeting thoroughly reviewed the current system plan (annex to Recommendation 2 (CMM-XI). The final proposed revised version is in Annex IV. The meeting requested the Secretariat to contact IMO so that appropriate texts in 2.4 and associated appendices could be provided. The meeting requested the chairman of the ad hoc Task Team to submit the revised version to the second session of SCG to be held just after this meeting, for its endorsement. The meeting expected that the revised system plan and other relevant recommendations should be eventually submitted to JCOMM-II for its endorsement. (Action: MPERSS Rapporteur and the Secretariat prepare an appropriate document to JCOMM-II)

Web site

4.8 The meeting agreed that a web site dedicated to MPERSS would be useful. At the same time, considering that metocean information of AMOCs should be provided not to the general public but to marine pollution emergency response authorities, the meeting agreed that it would not be appropriate to include real-time information on incidents on the web site. It also noted that such

an operational service was too difficult to implement by AMOCs at this stage. The meeting thus agreed that the web site should include information such as what is MPERSS, what is available under MPERSS, and contact points in AMOCs. A specific example such as the case with the operations for the incident of the ”Prestige”, would also be useful on the web site. Detailed information regarding each AMOC, such as information to be provided, model description, etc. should be provided on the MPERSS web sites, which should be linked to the web sites of AMOCs.

4.9 The meeting expressed its appreciation to France for its kind offer to develop and host a first version of the site. (**Action**: France to develop a MPERSS web site, each AMOC to establish a link to the MPERSS web site) The meeting noted that the GMDSS web site has its own URL (http://weather.gmdss.org), and agreed that the MPERSS web site should also have its own URL. It requested the Secretariat to obtain an appropriate URL (**Action**: Secretariat to obtain a URL for the MPERSS web site)

5. TECHNICAL GUIDANCE

5.1 The meeting agreed that the MPERSS web site (see para 4.8) would provide useful information, including technical and scientific issues related to the implementation of MPERSS. In this regard, the meeting recognized that it was important that those AMOCs who run models should make model details available on the MPERSS web site.

6. REVIEW OF THE FINAL REPORT AND ACTION ITEMS

6.1 The meeting reviewed, revised and adopted the final report of the session, including action items and recommendations.

7. CLOSURE OF THE SESSION

7.1 The meeting of the JCOMM SCG ad hoc Task Team on MPERSS closed at 1745 on Tuesday, 18 May 2004.

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Annex I

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Annex II

AGENDA

1. OPENING OF THE SESSION

1.1 Opening
1.2 Adoption of the agenda
1.3 Working arrangements

2. REPORT OF THE RAPPORTEUR ON MPERSS (CHAIRMAN OF THE AD HOC TASK TEAM)

3. REVIEW OF MPERSS IMPLEMENTATION STATUS

4. ADVANCEMENT OF IMPLEMENTATION

5. TECHNICAL GUIDANCE

6. REVIEW OF THE FINAL REPORT AND ACTION ITEMS

7. CLOSURE OF THE SESSION

Annex III

REPORTS OF SEMINAR RAPPORTEURS

Session 3 - User requirement (Rapporteur: Peter Dexter)

Three keynote papers were presented to the session relating to user requirements:

(i) Meteorology and maritime safety: A perspective for the future (Eric Berder)

The paper reviewed issues such as the causes and consequences of ship disasters, the requirements for risk reduction, and initial measures which can and are being taken to reduce the risks to shipping from all potential sources of disasters. Specifically, risk reduction to shipping requires good met/ocean forecasts, a good ship, good decisions and good seamanship. *Specifically for JCOMM and metocean service providers, the requirements for reduced risk reduction and enhanced maritime safety included improved predictability of metocean conditions, with longer lead times and better reliability; services targeted to specific ship/voyage requirements; predictions of specific types of abnormal phenomena; and forecasts of surface currents and ship drift, particularly in confined waterways.*

(ii) The importance of metocean data and services to effective maritime emergency response in MPERSS region X (Trevor Gilbert)

After a general review of international shipping and its continuing dependence on metocean information and services, the paper focussed on specific metocean information required to support response operations for oil spills and other major marine pollution emergencies. Such requirements covered most standard metocean variables, but the importance of sea surface current predictions, for both spill response and SAR was stressed. *Specific recommendations for JCOMM included: improved understanding and modelling of metocean variables, in particular surface currents; strengthened coordination between the providers and users of metocean information and services; the maintenance and enhancement of metocean monitoring systems; better data sharing; and the establishment of coordinated systems for emergency response in developing regions.*

(iii) Requirements for integrated management of the oceans (Rick Spinrad)

The paper reviewed issues such as the definition and principles of integrated ocean management, and the goals and objectives of and requirements for such an integrated management approach. In the context of the overall JCOMM objective of enhancing integration in observing systems, data management and product and service provision, specific points for consideration included:

(a) an integrated observing system should encompass the monitoring, communications, data management, modelling and applications; it should also be cost-effective, accessible, timely, have broad applications, and encompass research;
(b) an integrated system required cooperation and collaboration at all levels, including enhanced public-private partnerships;
(c) the system should be efficient in design, conform to international standards, and focus on specific core variables;
(d) the system should also facilitate the transition from research to operations in all components.

Session 16 - Marine Pollution Emergency/Risk and response management (rapporteur: Rod Stainer)

World War II Shipwreck: History, risk assessment, response and weather (R. Monfils)

Pollution from WW 2 shipwrecks may be the largest risk to the marine environment from shipping. There is an advanced database for wrecks in the Pacific, with 3855 identified vessels including more than 300 tankers:

- assessment of likelihood of severe weather events affecting these wrecks is required;
- good metocean data required so that risks on sensitive resources of future spills can be assessed;
- "not if but when"

Coastal, and marine activities, cyclones and risk of oil spills in Madagascar (O.R.J. Ratomahenina)

Large risk of marine pollution in Madagascar due to sewage and chemicals.

Concern in Madagascar of the effects of oil tankers passing through the Mozambique Straits. Tanks and engines are illegally washed. They have grave concerns of a major oil spill and need a marine pollution emergency response support system. They require international support in the event of a major spill.

Madagascar also concerned over impacts of climate change, with likely increases in storm surges, salinity in estuaries and coastal flooding.

Decision making tools, experts, decision maker: what relationship (F. Cabioc'h)

French authorities learned some major lessons from the "Erica". Processes were recommended and put into place. These processes and procedures were tested and found to be mostly successful during the "Prestige" spill.

Session 17- Marine Pollution Emergency/Lessens learned from past emergencies (Rapporteur: Rod Stainer)

Lessons learnt from past emergencies: The challenge of a permanent demand for more, faster, better (T. Girin)

Comparison of "Erica" and "Prestige" events showed the latter to be much more successful, having learned from the previous event. New procedures developed after "Erica" tested in small events.

In the "Prestige" event, there was very close cooperation between France and Spain, with the challenge being to bring the best experts together.

During the "Prestige" event, non real time information was available to the public on the internet. In the future, need to provide easily accessed real time information to all. Very important also to deliver information quickly to decision makers.

Maritime Pollution in Australian waters: The use of remote sensing, computer modelling and chemical fingerprint technologies to identify and processor offenders (T. Gilbert)

Unscrupulous ship operators release more oil into the oceans than through shipping accidents. Major challenge is to identify the culprits. An effective means of doing this is to run a spill model backwards, i.e. reverse modelling. Metocean data is vital to assist with this. Remote sensing is also an effective way of identifying ships, but requires not cloud masking.

Meteorological and oceanograohic information in the case of marine pollution incident (S. Sugimoto)

JMA was requested to develop systems for predicting oil pollution transport following the "Nakhodka" incident in 1997. They subsequently developed a prediction model. In addition to transport prediction, JMA can provide synoptic charts, ocean wave analysis, sea ice charts and SST.

Ice/pollution interactions: detection, modelling, prediction and monitoring (V. Stanovoy)

Ice can be a major transporter of oil pollution in polar regions. Both drifting and melting of ice contribute to the redistribution of the concentration of pollutants. Special attention should be given to the pollution of the ice cover by oil.

Session 18 - Marine Pollution Emergency/Transport modelling (Rapporteur: Phil Parker)

Oil slick drift prediction and operational oceanography systems (P. Daniel)

Improvements to MF MPERSS modelling system: direct use of currents from operational models: Operational models presently don't calculate appropriate currents – need forcing every 6 hrs, diff structure to models to give surf current

-> outcomes v sensitive to current specification: specialized problem for JCOMM
->model plus remotely sensed plus climatology gives improved results

hyper refinement of current
high resolution wind forecasts
hi resolution grid near coast
need current at base of mixed layer?

Operational oil drift forecasting in the Baltic-North Sea area (H. Dahlin)

Inter-country oil spill modeling system in Baltic
Simple GUI, supported by state of art models and infrastructure
Other users out of area welcome to use it, passworded
Human failings e.g. phone lists not up to date etc.
-> integrate systems models know how to give econ of scale and synergy
-> make GUI easy
-> be aware of human errors

Hydodynamic modeling of short, medium and long-term dispersion in macro-tidal seas (P. Bailly-du-Bois)

Wind data/forecasts critical as is access to it
Uncertainty re parameters specific to species
Coupling to real time wind data? Needs strong link and operational to succeed.

Simulating the Prestige oil spill fate with emerging operational global ocean model data (B. Hackett)

FOAM/Mercator can deliver types of data needed (T,S, u, v)
Present available products not optimal
Improved resolution
Data delivery not especially good
Not sufficient real time sat data
Need integrated chain for operational success
Need to be able downscale from global to local scale

Validation essential
Interpolation errors (related to downscaling)
Nesting / improved geolocation bw oil and ocean models
Need to deal with moving source
Need SAR

Crude oils and fuel oils – properties, behaviour and response at sea (Moldestadt)

Oil properties essential for oil fate calculations/weathering
Implication for oil tracking: behaviour of emulsified or solidified oil
Depending on type of emulsion may need differentiated currents at depth for tracking
Knowledge of oil properties and behaviour required for risk analysis, contingency planning, national environmental benefit analysis and response operations.

Overview of oil weathering processes and its implementation within an operational forecasting framework (Comerma)

Oil weathering linked dynamically to modelling incl. met - Wind stress, SST involved, vertical turbulent in ocean mixing layer
Breaking waves affects dispersion of droplets

Accurate currents needed in surf layer
Ocean turbulence for slick fragmentation
Need accurate wind/temps for evaporation/emulsification

Chemical Spill Modeling and Spill Hazard Evaluation of the Most Frequently Spilled Chemicals (N. Whittier)

Using CHEMMAP
Dispersion changes with met conditions e.g.. via evaporation (wind, temps, turbulence, ….)

Two applications of a coastal hydrodynamical model under operational conditions (de Roeck)

mixing, drift, turbulence due waves
residual tidal current
wind effects, density driven currents
*tides, currents, winds, surf heat flux?, temps
range of metocean products needed from –1 to 7 days met, wind stress….sea state, atmospheric pressure, heat fluxes, rainfall….

Physical, Geological and hydrodynamic Factors affecting the transport, dispersion and deposition of pollutants in the Cotonou lagoon (R. Djiman)

Cotonou Lagoon modelling
Tides most important
Winds, thermodynamic structure

Sessions 20 and 21 Marine pollution emergencies / SAR & object drift modelling (Rapporteur: Peter Dexter)

Development of Towing Support Tool (Optimum Towing Support System:OTSS) Towing support tool & object drift at sea (S. Hara)

An optimal towing support system (OTSS) is being developed in Japan. The system involves data input, execution and results/analysis. Input data includes target ship details, towing ship and

towline details, metocean information, drift resistance, etc. There is collaboration in testing the system with the Japan Coast Guard, which still requires evaluation in operational conditions.

An operational search and rescue model for the Norwegian and North Sea (O. Breivik)

Norway has developed and is now using a system for forecasting the drift of objects in the ocean, for use in, inter alia, SAR. The model is forced by an atmospheric model (HIRLAM at 20 km resolution) and an ocean model (POL at 4 km resolution). Drift simulations can be implemented via a web request with a 5 minute response time. In situ exercises have demonstrated the value of the system in reducing the potential search area significantly. Conclusions are that the model is realistic, though more assessment is required, and also more object categories, adapted to European situations. Surface current predictions are also critical. There was also an evident scope to collaborate internationally in Europe and elsewhere.

Capabilities of satellite images and aerial surveillance for oil spill detection; fusion of aircraft and satellite-borne remote sensing to improve the observation of oil spills over European seas (O. Trieschmann)

The EU is implementing a project, Oceanides, to harmonise the reporting of spills, nomenclature, etc.; produce statistics on spills; and undertake a trend analysis. The project involves a mix of aircraft and satellite RS data, which increases the detection rate. Then conclusions of the project to date are that:

(i) Permanent airborne operations, with associated communications, are required;
(ii) The system should be operational and user driven;
(iii) International cooperation is essential.

The progress of the development and application of remote sensors for oil slicks detecting (S. Li)

The Chinese government has recognized the need for a monitoring system for oil pollution, and that international cooperation is required to achieve this. The monitoring system envisaged involves a mix of airborne and satellite remote sensing.

Annex IV

DRAFT REVISED SYSTEM PLAN TO REPLACE ANNEX TO RECOMMENDATION 2 (CMM-XI)

Marine meteorological support for marine pollution emergency response operations on the high seas

1. **PRINCIPLES**

The principles for marine meteorological and oceanographic support for marine pollution emergency response operations are as follows:

Principle 1

For the purpose of the efficient and effective provision of meteorological and oceanographic information for marine pollution emergency response operations on the high seas and in view of the international character of these operations, there is a requirement to provide an internationally coordinated system of meteorological and oceanographic support for such operations. For this purpose the oceans and seas are divided into areas for which National Meteorological and Oceanographic Services ~~assume~~ have accepted responsibility. These areas, termed Marine Pollution Incident (MPI) areas, are the same areas as the METAREAs of the Global Maritime Distress and Safety System (GMDSS) but exclude waters under national jurisdiction.

Principle 2

The areas of responsibility together provide complete coverage of oceans and seas by meteorological and oceanographic information contained in the products prepared and issued by the participating National Meteorological and Oceanographic Services.

Principle 3

The preparation and issue of meteorological and oceanographic information for areas of responsibility is coordinated in accordance with the procedures mentioned in section 2.

Principle 4

The efficiency and effectiveness of the provision of meteorological and oceanographic information in support of marine pollution emergency response operations is monitored by obtaining opinions and reports from the users.

2. **PROCEDURES**

2.1 **Definitions**

2.1.1 An *Area Meteorological and Oceanographic Coordinator (AMOC)* is a ~~National~~ national ~~Meteorological~~ sService which may be

- National Meteorological Service, or
- National Meteorological Service which also operates oceanographic services, or
- National Meteorological Service liaising with Oceanographic Service(s) where these are in operation

which has accepted responsibility for ~~ensuring that~~ coordinating the provision of regional meteorological information and oceanographic information as appropriate, which is issued to support marine pollution emergency response operations in the designated area for which the Service (or Services) has accepted responsibility. The AMOC is also available to provide relevant suppot and advice for waters under national jurisdiction within its area if so requested by the countries concerned. [These ~~National~~ national ~~Meteorological~~ Services may eventually become designated Regional Specialized ~~Meteorological~~ Centres ~~(RSMC)~~ for Marine Pollution Emergency Support.] The support supplied by an AMOC (or a Supporting Service) ~~may~~ shall include ~~some or all of the following~~:

(a) Basic meteorological forecasts and warnings tailored for the area(s) concerned;

The support supplied by an AMOC (or a Supportung Service) ma also include

(b) Basic oceanographic forecasts for the area(s) concerned

(~~b~~c) The observation, analysis and forecasting of the values of specific meteorological and oceano-graphic variables required as input to models describing the movement, dispersion, dissipation and dissolution of marine pollution;

(~~c~~d) In some cases, the operation of these models;

(~~d~~e) In some cases, access to national and international telecommunications facilities;

(~~e~~f) Other operational support.

The issued information may have been prepared solely by the AMOC, or by another Supporting Service(s), or a combination of both, on the basis of an agreement between the Services concerned. The location and contact (telephone, e-mail, telex, telefax, etc.) details of any marine pollution emergency response operations authority (or authorities) responsible within the designated Marine Pollution Incident (MPI) are should be maintained on the MPERSS web site. National information for this site should be maintained by AMOCs or Supporting Services. ~~It is also the responsibility of the AMC to ascertain the location and contact (telex, telefax, etc.) details of any marine pollution emergency response operations authority (or authorities) responsible within the designated Marine Pollution Incident (MPI) area. This information should be made available by the AMC to Supporting Service(s) for the area.~~

2.1.2 A *Supporting Service* is a National Meteorological or Oceanographic Service which has accepted responsibility to provide on request, either directly or to the AMOC, meteorological (basic or enhanced) support for parts of, or an entire, designated MPI area. Depending on the location of the incident, Supporting Services may be requested by the emergency authority to provide the meteorological and/or oceanographic support directly to that authority. In such cases, the AMC should be so advised by the Supporting Service. A Supporting Service should advise the AMOC of the facilities it has available to fulfill its role.

2.2 **Areas of responsibility**

2.2.1 Areas of responsibility (Marine Pollution Incident (MPI) areas) and the responsible Services for AMOCs and Supporting Service(s) shall be as given in Appendix I.

NOTES: (1) The areas of responsibility given in Appendix I are reviewed by ~~the Commission for Marine Meteorology~~JCOMM to ensure complete area coverage and adequacy of services.

(2) An MPI area has, in some cases, been subdivided to meet the requirements of National Meteorological or Oceanographic Services.

(3) The areas of responsibility defined in Appendix I represent a minimum requirement for AMOC and Supporting Services. Both AMOCs and Supporting Services may extend the area of coverage for the issue of meteorological and oceanographic support information beyond these areas of responsibility, if they so wish, to meet national requirements. In this case, the area of coverage should be specified in the text of each communication to the marine pollution emergency response operations authority.

2.2.2 Any amendments to the area of responsibility or proposal for the introduction of a change in participating n~~N~~ational ~~Meteorological~~ Services' responsibilities for an area, shall have the approval of the Executive Council based on a recommendation by ~~the Commission for Marine Meteorology~~JCOMM.

2.2.2.1 Before drawing up any recommendation on the proposed amendment for submission to the Executive Council, ~~the Commission for Marine Meteorology~~JCOMM shall receive the comments of the ~~National~~ national ~~Meteorological~~ Services directly concerned with the proposed amendment as well as the comments of the president(s) of the regional association(s) concerned.

NOTE: All correspondence relating to the areas of responsibility is addressed to the Secretary-General.

2.2.3 Whenever ~~a National Meteorological Service responsible for the issue of meteorological support data to an MPI area~~ an AMOC is no longer able to provide this service~~, the National Meteorological Service~~it should inform the Secretary-General of WMO at least six months in advance of the intended termination date. Whenever a Supporting Service is no longer available to provide this service, it should inform the relevant AMOC at least six months in advance of the intended termination date.

2.3 **Meteorological support to marine pollution emergency response operations on the high seas**

2.3.1 Support to these emergency operations may, as stated in paragraph 2.1.1, include a variety of elements, such as:

(a) Basic meteorological forecasts and warnings tailored for the area(s) concerned. Special attention should be given to the early provision of actual and forecast surface conditions in the area of the pollution incident. This may be the initial requirement following a pollution incident;

(b) Basic oceanographic forecasts for the area(s) concerned. Special attention should be given to the early provision of actual and forecast oceanographic conditions, both surface and subsurface, in and downstream of the area of the pollution incident. this may be the initial requirement following a pollution incident;

(~~b~~c) The observation, analysis and forecasting of the values of specific meteorological and/or oceanographic variables required as input to models describing the movement, dispersion, dissipation and dissolution of marine pollution. AMOC and Supporting Service should, if possible, ascertain from the relevant marine pollution emergency response operations authority the specific meteorological and oceanographic variables required for a particular model, also the location of the model operator and access details. ~~If information regarding specific required variables for a model is not available, general~~ General guidelines for the type of data which will be required are given in Appendix II, if information regarding specific required variables for a model is not available;

(~~c~~d) The operation of the models by the n~~N~~ational Meteor-logical or Oceanographic Service. If an AMOC or Supporting Service has this facility and it can be used in the MPI area, the existence of this facility should be made known to the relevant marine pollution emergency response operations authority at an early stage, and ideally prior to an actual pollution incident in the MPI area. [AMOCs should give consideration to conducting periodic trials of their pollution models and cooperating with the pollution emergency authoritiesn their MPI area to assess the efficiency and effectiveness of the output data from their models.]

(~~d~~e) Access to national and international telecommunications facilities. Effective and efficient communications is an essential element in an emergency situation and AMOCs and Supporting Services must ensure that they have access to reliable communication links between all parties involved in a marine pollution incident within their MPI area.The AMOC should ascertain from the marine pollution emergency response operations authority the method by which the transfer of the required meteorological support shall be effected. This information shall be relayed to the Supporting Service(s) for the MPI area concerned. The use of the ~~International SafetyNET service (of INMARSAT)~~ most appropriate communications methods should be considered ~~if~~to ensure the meteorological an oceanographic support is ~~required at~~delivered to the location of the pollution incident as required, e.g. by the on-scene dispersal craft. Similarly, use of the Global Telecommunication

System (GTS) by a marine pollution emergency response operations authority via a regional telecommunication hub (RTH) of the Global Telecommunication System (GTS) may also be a consideration in cases of a major pollution incident;

(e) *Other operational support. AMOCs shall, at an early stage of a marine pollution incident affecting their area of responsibility, ascertain from the relevant marine pollution emergency response operations authority details of the incident and the nature of the support required. It shall be the responsibility of the AMOC to advise the marine pollution emergency response operations authority of the support facilities which the AMOC and/or the Supporting Service(s) can provide. [This shall be undertaken whether or not a pollution incident occurs in an MPI area, and this information shall be updated to the marine pollution emergency response operations authorities at regular intervals, and immediately should there be a change in the support facilities available from the AMC or Supporting Service. It is the responsibility of the Supporting Service(s) to advise the AMC of any change to its support facilities.] It should be noted that operations at sea in response to marine pollution emergencies are fundamentally dependent on the support of Meteorological and Oceanographic Services. It is thus essential that AMOCs and Supporting Services offer as full a range of operational support as possible and practicable to marine pollution emergency response operations.*

2.3.2 A ~~permanent~~ record of all communications should be maintained, showing the times of origin, transmission and reception of the information provided.

2.4 **IMO regional marine pollution combatting centres. Marine pollution research and monitoring programmes of IOC/UNEP** *<This section will be updated.>*

2.4.1 IMO and UNEP have established regional marine pollution combatting centres in a few locations throughout the world. These centres have been incorporated in the coordinated meteorological support plan in Appendix I. Full details of these centres are given in Appendix III. The majority of these centres are non-operational and have an advisory capacity only. The nature of the centre, whether advisory or operational, is indicated in Appendix III. It should be noted that it is the responsibility of the participating National Meteorological and/or Oceanographic Service(s) to ascertain the location of any marine pollution emergency response operations authority relevant to the MPI area and/or to each marine pollution incident.

2.4.2 The objectives and activities of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea and its role in the case of emergency are given in Appendix IV.

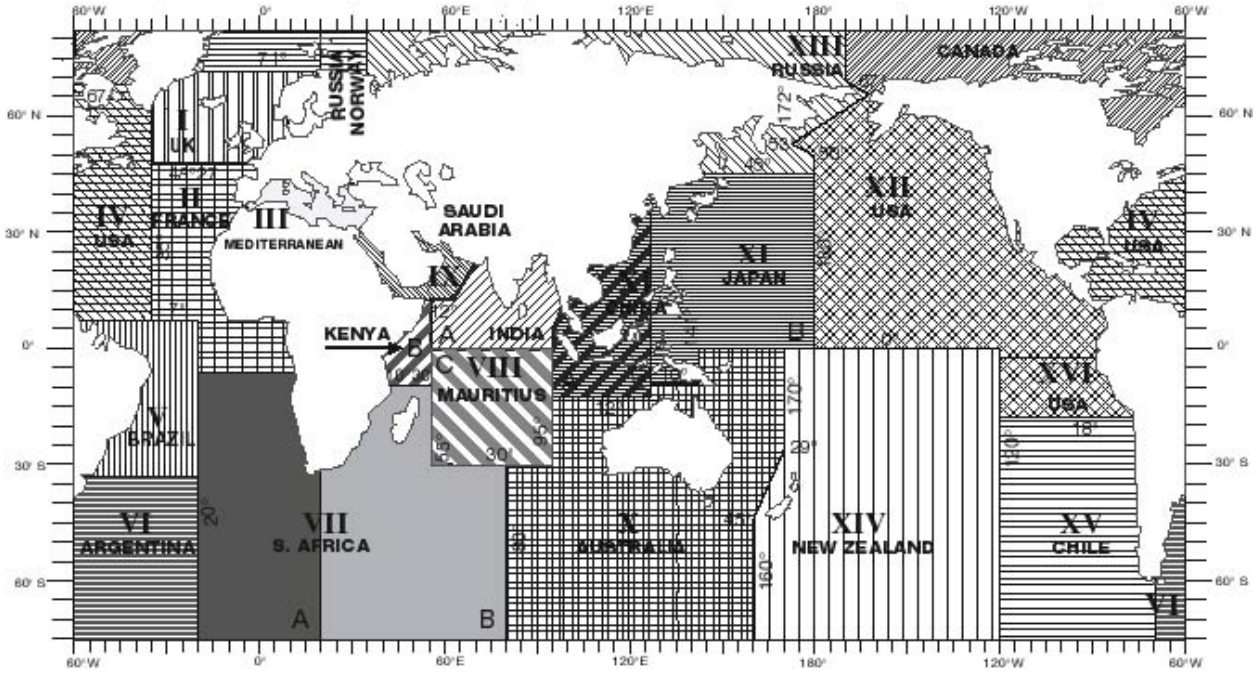
2.4.3 The International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990 (OPRC Convention), in Article 12 — Institutional Arrangements identified the International Maritime Organization Secretariat as having specific responsibilities with regard to the provision of information and technical services under the Convention. Contact information for the IMO Secretariat is also given in Appendix III and information on activities in Appendix V. It is the responsibility of the WMO Secretariat to keep the IMO Secretariat informed of all international dispositions and arrangements made under the WMO meteorological and oceanographic support system. At the same time, AMCs may wish to contact the IMO Secretariat directly to obtain information on specific arrangements which may exist for combatting oil and other pollution incidents in their MPI area(s) of responsibility.

2.4.4 IOC and UNEP co-sponsor the programme on Global Investigation of Pollution in the Marine Environment (GIPME).

Appendix I

~~**AREAS OF RESPONSIBILITY AND NATIONAL METEOROLOGICAL SERVICES DESIGNATED AS AREA METEOROLOGICAL COORDINATORS FOR ISSUING OF METEOROLOGICAL DATA FOR SUPPORT TO MARINE POLLUTION EMERGENCY RESPONSE OPERATIONS**~~

Marine Pollution Incident (MPI) areas showing responsible NMSs



COORDINATED ~~METEOROLOGICAL~~ METOCEAN SUPPORT TO MARINE POLLUTION INCIDENT (MPI) AREA
RECIPIENT OF ~~METEOROLOGICAL~~ METOCEAN DATA

MPI area	***Area meteorological Co-ordinator***	***Supporting Service***	***Remarks***
I	United Kingdom	Norway Iceland Ireland France	Norway responsible for Arctic waters north of 71°N
II	France	Portugal Spain	
III(A)	~~Italy~~France	~~Greece~~ ~~Malta~~ ~~France~~	
III (B)	Greece	Malta France	
IV	USA	Canada	Canada responsible for Arctic waters north of 67°N
V	Brazil		
VI	Argentina		
~~VII(A)~~	~~South Africa~~		~~West of 20°E~~
VII~~(B)~~	South Africa	Réunion	~~East of 20°E~~
VIII(A)	India		Indian Ocean north of the equator, west of 95°E, east of 55°E, excluding Area IX
VIII(B)	Kenya	United Republic of Tanzania	12°N-10°30'S 55°E to East African coast
VIII(C)	Mauritius	Réunion	0° - 30°S 55°E - 95°E
IX	Saudi Arabia	Bahrain	
X	Australia		
XI(A)	China	Hong Kong Malaysia Indonesia Singapore	125°E - Mainland China to west boundary of area IX (95°E) (excluding Philippine waters
XI(B)	Japan	Philippines Indonesia Guam (USA)	
XII & XVI	USA	Canada	Canada responsible for Arctic waters north of 67°N
XIII	Russian Federation		
XIV	New Zealand		
XV	Chile		

Appendix II

METOCEAN INPUT DATA REQUIREMENTS FOR MARINE POLLUTION MONITORING & RESPONSE

~~Two main geographically separate requirements for metocean data:~~

- ~~Coastal region includes continental shelf and Economic Exclusive Zone (EEZ)~~
- ~~Open and high seas.~~

For maritime vessel incidents and pollution events it is important to ensure that actual and forecast (short and medium term) weather and oceanographic information is available for the incident site.

Regional models should be developed or sourced to ensure coverage of the MPERSS area of responsibility.

Main functions and requirements of marine pollution emergency response operation authorities (MPEROAs)

A. Vessel safety and support:

To ensure safety of life and reduce the potential of further pollution, metocean information will be required for:

- crew safety and evacuation
- drifting of the casualty
- salvage considerations
- cargo removal and lightering.

B. Pollution at sea (oil, chemicals and cargo containers)

This can be achieved by spill and drift trajectory modelling using fixed or dynamic metocean models. These trajectory models vary in complexity, cost of development and the geographic area of need eg open sea (primarily influenced by ocean currents and winds) or near shore (influence of tidal conditions and winds). The primary function is to determine:

- movement direction and speed
- spreading of the pollutant.

For most coastal and continental shelf incidents high accuracy digital bathymetric data sets will also be required for most trajectory models as well as the determination of dominant tidal constants for the location.

The ground truthing of spill models are important to ensure the accuracy and performance and assists in the refinement of algorithms. This can be achieved through the deployment of drifter buoys, use of HF ocean surface radar, satellite sensors, etc.

C. Weathering and fate of oil at sea.

The extent of weathering of oil at sea affects the choice of response procedures to be used to combat the spilt oil. To determine "weathering" characteristics of the oil, present models require inputs for:

- sea surface wind speed (present & predicted)
- wave height (present & predicted)
- water temperature & salinity (present & predicted)
- surface current and at depth in the mixed layer (present and predicted)

D. Response Operations of MPEROAs.

MPEROAs will require metocean information to support the planning and carrying out of field operations, these include:

. planning (scenario development)
. operations (at sea/ on shore)
. logistics/equipment (limitations of use under certain sea states)
. recording of response actions and decision support information for cost recovery.

Metocean parameters likely to be required for the individual MPERSS regions ~~may~~ include:

. Sea surface winds - velocity/direction/directional variations/gust factors
. Wave/swell - height/period/direction
. Tidal - height/timing for incident location
. ~~Ocean currents & eddies~~
. ~~Water properties - temperature/salinity~~
air temperature
. Instability and severe weather events - storms, cyclones, wind squalls etc.
visibility
fog
sunshine hours
rain, hail
lightning strikes.

Tidal-height/timing for incident location
Ocean current and eddies
Water properties - temperature/salinity
Ice

~~Other information requirements:~~

~~. visibility~~
~~. fog~~
~~. ice~~
~~. sun up/down~~
~~. air temperature~~
~~. cloud cover~~
~~. rain, hail~~
~~. lightening strikes.~~

Sources of Metocean data:

The collection of metocean data is achieved through many sources and mechanisms including:

. satellite (orbiting/geostationary) ~~eg~~ providing sea surface temperatures, scatterometer winds, sea wave height ~~weather satellites, radar satellites, altimeter~~ etc.
coastal HF radar
. automatic coastal/land stations
. drifting buoys
. moored buoys
Argo floats
. vessel reports/observations and automatic stations
sub surface temperature probes
current profilers
. oil platforms

. aircraft
. weather radar
. weather balloons.

Priorities for metocean collection and modelling

The priorities for metocean data input should initially focus on the high risk areas of coastline, shipping routes, ports, navigation hazards or regions that are known as major problem areas for shipping or oil production/exploration platforms.

Form of Metocean data

The fast communication of metocean data and numerical model outputs is essential for MPEROAs across the MPERSS region. Effective electronic data communications should be established for MPEROAs, also the data must be in a form that meets user requirements in quality, accuracy and presentation needs.

Annex V

LIST OF ACTION ITEMS

para	action	By whom
3.1	provide the Secretariat with their presentations and/or written tex	AMOCs
3.1	compiles the materials provided by AMOCs and publishes a JCOMM TR	AMOCs
3.6	contact CBPA Coordinator about the training of interpretation of models at the planned Capacity Building Jamboree	Secretariat
3.6	Consider possible inclusion of the interpretation of models in the issue of the planned Capacity Building Jamboree	CBCG
3.7	Contact IMO to request their representation at future MPERSS related meetings	Secretariat
4.3	Contact Canada regarding the AMOC North of 67N in areas IV and XII	Secretariat
4.4	Contact Bulgaria regarding a new MPI sub-area III (c)	Secretariat
4.7	Prepare an appropriate document to JCOMM-II	MPERSS Rapporteur, Secretariat
4.9	Develop a MPERSS web site	France
4.9	Establish a link to the MPERSS web site	AMOCs
4.9	obtains a URL for the MPERSS web site	Secretariat

Annex VI

LIST OF ACCRONYMS

AMOC	Area Meteorological and Oceanographic Coordinators
AMSA	Australian Maritime Safety Authority
ASEAN	Association of South-East Asian Nations
CBCG	Capacity Building Coordination Group
CMM	Commission for Marine Meteorology
IMO	International Maritime Organization
HAZMAT	Hazardous Materials Response Division
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JMA	Japan Meteorological Agency
MPERSS	Marine Pollution Emergency Response Support System
MPI	Marine Pollution Incident
MSC	Maritime Safety Committee (of IMO)
NOWPAP	North-west Pacific Action Plan
NWM	Net Water Movement system by the AMSA
OPC	Ocean Prediction Center (of NOAA)
SCG	Services Coordination Group (of JCOMM)
SEACAMP	South-East Asian Centre for Atmospheric and Marine Prediction