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VOSP-V
MONITORING AND DATA MANAGEMENT

Review of the MCSS

(Submitted by Mr Scott Woodruff and Dr Elizabeth C. Kent)

Summary and purpose of document

This document provides a general review of the current status and future plans, emerging from the Data Management Program Area (DMPA) and its Expert Team on Marine Climatology (ETMC), for the Marine Climatological Summaries Scheme (MCSS). These plans initially include a new cross-cutting Task Team on Delayed-Mode Voluntary Observing Ship Data (TT-DMVOS).

ACTION PROPOSED

The VOS Panel is invited to:

(a) Consider the general status and future plans outlined for the MCSS;
(b) Define its working relationships with the new TT-DMVOS, whose membership is planned to include selected members of the ETMC and SOT;
(c) Take into account the establishment of the TT-DMVOS when discussing relevant agenda items, including its proposed reporting mechanisms and project plan;
(d) Consider and comment on the discussion regarding the role of the delayed-mode in providing climate-quality data from the Voluntary Observing Ships as presented in Appendix B.

Appendices: A. TT-DMVOS: Additional Background, Terms of Reference, and Proposed Membership
B. Discussion: Climate quality data from the VOS - role of the delayed mode
C. MCSS Summaries (MCS): Additional Background and Example (Air Temperature, January 1991-2000)

DISCUSSION

The Marine Climatological Summaries Scheme (MCSS), which was defined in the 1960s and has represented the core of the work of the Expert Team on Marine Climatology (ETMC) to date, ties together two important functions:

(a.) Delayed-mode (DM) Voluntary Observing Ship (VOS) data management; and
(b.) The production of the MCSS (tabular/graphical) Summaries (MCS).

Due partly to the longevity of the overall Scheme, the two separate functions possess a variety of strengths. On the other hand, as the JCOMM seeks to define a new, overall data management strategy, plus the establishment of new linkages with other WMO Commissions, including for Climatology (CCl) and Basic Systems (CBS), a review and restructuring of the MCSS is needed.

As an initial step, the Data Management Coordination Group (DMCG) (JCOMM 2007) is establishing a self-funded, cross cutting Task Team on DMVOS, which is proposed to include members from both the ETMC and SOT. As the ETMC falls both within the Data Management Program Area (DMPA) and the SOT within the Observations Program Area (OPA), the TT-DMVOS will also interconnect said program areas. See *Appendix A* for additional background on TT-DMVOS.

The TT-DMVOS will need to consider the relationship between data available in real-time and that available in delayed-mode. Therefore, would be an ideal time for the consideration of the user requirements for both data streams and some of the wider issues surrounding the provision of data for both operational and climate applications. *Appendix B* discusses some of these relevant issues, and the SOT is invited to provide its perspective on the ideas presented.

An important parallel task, which should be initiated during the Second Session of the ETMC (Geneva, Switzerland, from 26 to 27 March 2007), will be to establish a new direction for the secondary MCSS function — the tabular/graphical MCS. A JCOMM questionnaire issued in 2005 provided information regarding the potential customer base and purposes of the MCS products. However, these justifications need to be more broadly agreed upon, to the extent that the MCS products will be managed and officially sanctioned by the ETMC, as opposed to produced and offered nationally. The JCOMM (2005) also recommended that the ETMC explore how oceanographic and ice climatologies could be coordinated with the marine meteorological data, so that the results could be viewed as an integrated product.

In response, the new task interconnections also need to be established between the DMPA/ETMC and the JCOMM Services Program Area (SPA), including its Expert Teams for Wind Waves and Storm Surges (ETWS) and Sea Ice (ETSI); and, as appropriate, to other commissions and organizations including the CCl and the joint CCl-CLIVAR-JCOMM Expert Team on Climate Change Detection and Indices (ET-CCDI). One suggested approach, along the lines similar to that of the TT-DMVOS, might be to establish a parallel self-funded, cross-cutting Task Team on Marine and Oceanographic Climatological Summaries (TT-MOCS). See *Appendix C* for additional background regarding the MCS, including a product example.

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APPENDIX A

TT-DMVOS: ADDITIONAL BACKGROUND, TERMS OF REFERENCE, AND PROPOSED MEMBERSHIP

At its Second Session, the Data Management Coordination Group (JCOMM 2007) agreed that maintaining the Delayed-Mode VOS Data flow utilizing the International Maritime Meteorological Tape (IMMT) format was important, but also that the management of the MCSS, including the two separate functions of VOS data handling and MCSS Summaries (see Appendix B), needed to be modernized.

As an initial step, it recommended the establishment of a new self-funded Task Team on Delayed-Mode Voluntary Observing Ship data (TT-DMVOS), to focus exclusively on the first function. The Team would be tasked, amongst other things, to manage the Global Collecting Centres (GCCs), establish requirements for the IMMT format and the Minimum Quality Control Standards (MQCS), reconcile the IMMT and the International Maritime Meteorological Archive (IMMA) formats, revise relevant WMO technical publications as needed, and establish a website to share relevant information.

The entire set of International Comprehensive Ocean-Atmosphere Data Set (ICOADS; Worley, et al., 2005) observational data (presently covering the periods of 1784 to 2005) is already made freely available to the international climate research community in the IMMA format. This is a highly flexible ASCII format, suitable for storage of historical or contemporary marine meteorological data from ships, buoys, and other Ocean Data Acquisition Systems (ODAS). Some near-surface oceanographic profile temperatures have also been blended into ICOADS from the Levitus World Ocean Database (WOD). The IMMA format has not yet been thoroughly reviewed within the ETMC, which should be a useful step prior to proposed JCOMM publication, or potentially, formal adoption as an international format standard.

The WMO Publication No. 47, *Ship Platform and Instrumental Metadata for 1973-2005*, have been blended into the ICOADS using the IMMA format, with the extensive cooperation of Dr E. Kent and colleagues. The WMO–No. 47 metadata back to 1955 (Kent, et al., 2007), which were recently imaged and digitized by NOAA's Climate Database Modernization Program (CDMP), will likely be blended, as proves feasible, into ICOADS in the future.

Another logical extension of this important work would be the assembly and blending into the ICOADS of ODAS platform and instrumental metadata, both operationally and historically. Unfortunately, the ODAS metadata are currently largely fragmented and possibly unavailable for some historical platforms, with a unified JCOMM repository only recently under development by China.

The Minimum Quality Control Standards (MQCS) defined under the MCSS provide a well-tested basis for members to QC their VOS data. However, not all members have been able to take advantage of this approach, due to resource constraints and other factors, such as pre-existing national QC procedures. Possible areas for the MQCS augmentation could include the following items: (a.) Expansion, where possible nationally or internationally, to include the integration and archival (e.g., in the IMMA format) of QC feedback flags supplied by operational weather models and Global Atmospheric and other Reanalyses (e.g., Compo et al., 2006), and (b.) The Convergence of MQCS with QC procedures used for non-VOS marine data and in the oceanographic community.

As an initial step, the DMCG-II (JCOMM 2007) requested completion around mid-2007 of a document bringing together, in general terms, information regarding the QC procedures of the VOS, Global Surface Underway Data (GOSUD), and the Shipboard Automated Meteorological and Oceanographic System (SAMOS) Initiative.

Terms of Reference of the JCOMM DMPA Task Team on Delayed-Mode Voluntary Observing Ship

Data (TT-DMVOS)

Background: The Marine Climatological Summaries Scheme (MCSS), established in 1963 (Resolution 35, Cg-IV), has as its primary objective the international exchange, quality control and archival of delayed-mode marine climatological data, in support of global climate studies and the provision of a range of marine climatological services. Eight countries (Germany, Hong Kong, China, India, Japan, Netherlands, Russian Federation; United Kingdom and USA) were designated as Responsible Members (RMs) to gather and process the data, including also data from other Contributing Members (CMs) worldwide, and to regularly publish Marine Climatological Summaries (MCS) for representative areas, in chart and/or tabular forms. Two Global Data Collecting Centres (GCCs) were established in 1993 in Germany and the United Kingdom to facilitate and enhance the flow and quality control of the data. Eventually, all data are to be archived in the appropriate World Data Centres, such as the NOAA National Climatic Data Center (NCDC).

Scope: In practice, the delayed-mode marine climatological data, handled under the MCSS, and published in the MCS, have generally been limited to Voluntary Observing Ship (VOS) data (i.e., excluding buoy or other non-ship data), in accordance with the original intent of the MCSS. The Task Team will focus primarily on modernizing the management and quality control of the delayed-mode VOS data, while at the same time exploring possible connections with the management of real-time VOS and other ship-based data (e.g., Shipboard Automated Meteorological and Oceanographic System (SAMOS) and GOSUD). So as to develop a clearer separation between data processing, and the preparation of climatological summaries, the Team's scope will be limited to data management. Because the RMs and the GCCs have primary involvement in the data processing, they will be invited to contribute to the work. The review and modernization of the MCS is clearly also an important task, which will be considered separately by the ETMC, and to which the RMs will also be invited to contribute. In addition, as part of the collective modernization of the data management and the MCS, it is anticipated, in due course, that the "MCSS" terminology will be replaced by a new and more up-to-date terminology reflecting a separation between the two functions.

The self-funded Task Team will primarily work via email and shall:

(i.) Examine current delayed-mode VOS data management practices, including those of the GCCs, and streamline them as possible to reduce redundancies (if any), standardize operations, and exploit appropriate modern technologies;

(ii.) Examine possibilities for convergence of the data management of the delayed-mode data, with real-time VOS data;

(iii.) Keep under review the International Maritime Meteorological Tape (IMMT) format, and suggest changes if necessary;

(iv.) Keep under review the Minimum Quality Control Standards (MQCS), and suggest changes if necessary;

(v.) Submit proposals to the JCOMM via the ET-MC for revising technical publications, in particular the WMO *Manual* (No. 558) and *Guide* (No. 471) *on Marine Meteorological Services*, to incorporate possible changes in the IMMT and the MQCS, and to reinvent the MCSS terminology;

(vi.) Review the International Maritime Meteorological Archive (IMMA) format, and suggest ways to reconcile the IMMT and IMMA formats;

(vii.) Establish and maintain a website to share relevant information;

(viii.) Collaborate and liaise with other groups (e.g., SAMOS and GOSUD), as needed, both to ensure access to expertise and appropriate coordination.

Tentative membership (from the ETMC, including both the GCCs as Co-chairpersons, and all respective RMs presently represented on the ETMC) include: Ms Elanor Gowland (Co-chairperson), Dr Elizabeth C. Kent, Frits B. Koek, Dr Alexander Vorontsov, Mr Wing-tak Wong, Mr Takashi Yoshida, Mr Scott D. Woodruff and Dr Reinhard Zöllner (Co-chairperson).

Proposed additional members (not on the ETMC) include: A representative from the US/NOAA/NCDC, Mr Graeme Ball (Chairperson of the OPA/SOT) and Ms Julie Fletcher (Chairperson of the OPA/SOT/VOS Panel).

Reporting mechanisms:

(a.) The Team will produce a project plan to guide operations for the next three years. The plan should explain the linkages to other components of the JCOMM, including the SOT and other pertinent programs.
(b.) The Team will establish an annual reporting mechanism to the ETMC and the SOT.
(c.) The Team will report to the ETMC and the SOT at their regular meetings.

APPENDIX B

DISCUSSION: CLIMATE QUALITY DATA FROM THE VOS - ROLE OF THE DELAYED-MODE.

Voluntary Observing Ships (VOS) are an essential component of the Global Climate Observing System (GCOS) providing information on several of the Essential Climate Variables (ECVs, including sea surface temperature, clouds, surface air temperature, humidity winds and pressure). The requirements for VOS as part of the GCOS include:

- Large number of observations adequately sampling in space and time (requires quantification);
- Known (preferably high) data quality;
- Identifiable platforms, known measurement methods, sufficient metadata;
- Monitoring and analysis of data quality;
- Wide range of variables (including SST, air temperature, humidity, wind speed, wind direction, cloud parameters, pressure, weather, waves, and ice);
- Consistency with (or quantifiable differences from) past observations;
- Feedback of monitoring and analysis results to VOS operators and observers.

In recognition of the sometimes variable or poor quality of VOS data taken (as a whole), the VOS Climate Project (VOSClim) was devised as a mechanism to improve the quality of VOS data, initially for a subset of ships, but in the longer term to raise data quality across the VOS. The VOSClim was originally envisaged as providing a high-quality dataset suitable for climate studies, and for the calibration and validation of a range of model and satellite products. The VOSClim Project also offered an opportunity to act as a reference model for ordinary VOS, to define and expand upon good observing practices, and to test methods for potential VOS improvements. The VOSClim is erroneously seen by some as the sole provider of VOS data for climate applications. The essential role of the wider VOS is providing ECVs to the GCOS, is therefore often overlooked.

It has been proven difficult to recruit ships to VOSClim, and the volume of data from the project has been relatively small. There are likely to be many ships not in the VOSClim project reporting high-quality data, and some within the project making poor quality observations. There are currently working groups and task teams looking at a wide range of related issues, including formats for real-time transmission of data, the provision of real-time metadata, and the delayed-mode requirements. Additionally, the United Kingdom Met Office is currently funding a project to produce metrics for the assessment of the adequacy of the surface marine meteorological observing system.

Although there have been problems regarding data availability on the project Data Assembly Center (DAC) website, and the BUFR template for real-time data transmission is not ideal, the mechanisms for data delivery established for the VOSClim Project remain valid, i.e. having all the necessary data (e.g. real-time data, model output, delayed-mode data, and metadata) available from an authoritative source is a good concept and a possible model for the entire VOS. On the other hand, the data redundancy that has developed as a result of these problems are also beneficial in some ways, and more deliberate steps such as mirroring the DAC holdings might be worthy of consideration in the future to provide continuing redundancy and guard against unforeseen problems.

Relying on the established VOS data delivery systems for climate-quality data has placed restrictions on content of the reports. An alternative approach for the future may be to more clearly distinguish between the real-time data (which serves the weather forecasting (i.e., numerical weather prediction, NWP) community) and the delayed-mode data (which serves climate research). This was the model that was utilized in the past when the GTS reports were a subset of the more comprehensive keyed logbook data. The distinction between the two streams is now blurred, and consequently some countries do not currently contribute to the delayed-mode data, which also have not yet been incorporated into the main research archive (the International Comprehensive Ocean-Atmosphere Dataset (ICOADS)) after 1997. The advantages/disadvantages of an approach that clearly distinguishes between the NWP and climate user requirements might be as follows:

Advantages:

- Ships and operators would be making an obvious contribution to the GCOS, which in turn would be good for shipping companies 'green' credentials;
- Ability to extend the ship report to include extra variables, precision and metadata important for climate quality;
- Ships with automatic weather stations (AWS) could log additional reports above those required for the NWP to disk for later 'delayed' transmission;
- Modern communications/data delivery systems would permit cheaper transmission costs - potentially reducing delayed-mode data receipt to hours or days, rather than months or years;
- Problems alleviated with real-time availability of ship identifiers/call signs. The GTS reports are eventually replaced with more complete delayed-mode reports in the climate record;
- Ability to design the observing system for climate, including enhanced 6 hourly reports from non-AWS ships for adequate spatial coverage;
- Benefits to the NWP through high-quality datasets (with error characterisation) available within a few weeks for model validation. (This approach is being taken by the WCRP SURFA Project in which the WCRP Working Group on Surface Fluxes and Working Group on Numerical Experimentation will be working together to provide flux data and a NWP model output for intercomparison.); and
- VOSClim ships could provide a subset for a pilot study.

Disadvantages:

- Can VOS operators be convinced to play a part in a climate observing system? The benefits of making observations for a forecast are perhaps more immediately obvious;
- The delayed-mode infrastructure would require modernising and reinvigorating, which has implications for the current role of the GCCs (and the proposed new role of TT-DMVOS);
- New methods of data delivery would have to be developed (but this is happening anyway);
- It would be harder (but not impossible) to associate reports with model output for quality control and assurance; and
- Additional resources would be required for monitoring, data analysis, and maintenance of climate archives.

APPENDIX C

MCSS SUMMARIES (MCS): ADDITIONAL BACKGROUND AND EXAMPLE (AIR TEMPERATURE, JANUARY 1991-2000)

Requirements for the tabular MCS (annual and decadal, for Areas of Responsibility) are still documented in the *Manual on* and *Guide to Marine Meteorological Services* (WMO-No. 558 and WMO-No. 471). Of the eight MCSS Responsible Members, some have not produced these summaries for many years (e.g., USA), if ever, and there are a variety of views on the value and need for modernization (e.g., transition to web-based technologies). As part of this discussion, it should be noted that the International Comprehensive Ocean-Atmosphere Data Set (ICOADS; Worley et al., 2005), for example, already provides near-global year-month summaries (10 statistics, such as the mean, median, and number of observations) using a 2°×2° or 1°×1° spatial resolution for 23 observed and derived marine variables.

Two ETMC Members, Dr E. Kent and Mr S. Woodruff, agreed to serve as the JCOMM Representatives on the Joint CCl-CLIVAR-JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI), and participated in its Second Session (Niagara-on-the-Lake, Canada, 14-16 November 2006), together with two additional JCOMM Representatives, Mr C. Folland and Mr V. Swail. As an outcome of the meeting, and in cooperation with the ETWS, development of a new set of marine climate indices was planned.

Furthermore, JCOMM (2005): "…noted that the work carried out by ETMC was strongly focused on marine meteorology. It urged the ETMC to include in its work plan for the current intersessional period, an examination of how both oceanographic climatologies and ice climatologies could be coordinated so as to be seen as an integrated product." Clearly this recommendation should have strong linkage with considerations of the future of the MCS. In addition, a complimentary activity might also consider the feasibility of a further developing stronger ties between the basic marine, oceanographic, and sea-ice observational data, in addition to higher-level climatological products, as has already been accomplished, to a limited degree in the ICOADS, with the blending together of surface marine and selected near-surface ocean profile temperatures.

Annex

Example