

Third JCOMM Workshop on Advances in Marine Climatology (CLIMAR-III), Gdynia, Poland, 6-9 March 2008 Summary of Plenary Discussions and Recommendations

(Revised 1 October 2008)

Plenary Discussion A: Marine Data and Data Quality

(Led by Shawn Smith, Rapporteur Bridget Thomas)

Discussion

Users for marine climatology

It was recognised that the priorities for those working closely with marine climate data (e.g. the “CLIMAR community”) would depend, to a large extent, on the broader needs of all users of the data. Some user groups are well recognised, for example those involved in atmospheric reanalyses, air-sea interaction and long-term climate variability and trends. Other applications discussed included: seasonal forecasting; ecosystem researchers (a group represented for the first time at CLIMAR-III); climate change detection and attribution (a more specialised application than climate variability and change, e.g. the ad hoc International Detection and Attribution Group IDAG and the Expert Team on Climate Change Detection and Indices, <http://www.clivar.org/organization/etccdi/etccdi.php>); the European Water Quality Directive (<http://water.europa.eu/content/view/20/36/lang,en/>); the engineering community and the wider remote sensing community.

The NOAA Consolidated Observational Requirements List (CORL) was noted as a database of the requirements of all science groups within NOAA. [Post-meeting note: Presently CORL doesn't seem to be available or externally accessible.¹]

Known user requirements discussed include:

Ecosystem researchers—requirement for long, high-resolution time-series, e.g. of fisheries information.

Climate change detection and attribution—requirement for long time-series, global coverage not always needed. A key question is the representation of pre-industrial variability in climate models. CLIWOC data should prove valuable in helping to address this.

Engineering community—homogeneous information on winds and waves. The recent algorithm change for QuikScat winds was discussed which has resulted in large changes in higher wind speeds. Users found the withdrawal of the previous version and documentation of the changes problematic.

Satellite community—in situ data for unusual or extreme conditions are particularly useful (but noting that the historical record is under sampled). Parameters of interest include high winds and waves and strong temperature contrasts. It was noted that data meeting these criteria could be extracted from archived Research Vessel data. The importance of bringing together satellite and in situ experts, and their data, was stressed by several participants. Satellite community must express their needs to help allocate limited resources for in-situ observations.

¹ A range of user requirements are contained in the following documents:

GCOS, 2004: Implementation Plan for the Global Observing System for Climate in support of the UNFCCC (GCOS-92), the Global Climate Observing System, October 2004,

GCOS No. 92, WMO/TD No. 1219; Observing the Oceans in the 21st Century, edited by Chester J. Koblinsky and Neville R. Smith, 2001, GODAE Project Office, Bureau of Meteorology, Melbourne, Australia, 604pp.

OCEANOBS 99, proceedings of the International Conference on the Ocean Observing System for Climate, GCOS/GOOS/WCRP Ocean Observations Panel for Climate and the CLIVAR Upper Ocean Panel, Saint-Raphael, France, October 1999. [available from <http://oceanobs99.cls.fr/>]

The Ocean Observing System Development Panel, 1995: Scientific Design for the Common Module of the Global Ocean Observing System and the Global Climate Observing System: An Ocean Observing System for Climate. Department of Oceanography, Texas A&M University, College Station, Texas, 265pp

Weller, R.A. and P.K. Taylor, 1993: Surface Conditions and Air-sea Fluxes, CCC0-JSC Ocean Observing System Development Panel, 131pp, Texas A&M University, College Station, TX 77843-3146, 131pp.

The JCOMM Expert Team on Wind Waves and Storm Surges (ETWS) requests the CLIMAR community to contribute to the JCOMM Extreme Wave Data Base (contact Val Swail, <http://www.icomm-services.org/JCOMM-Extreme-Wave-Data-Base.html>)

Reanalysis community—The need exists to better link the land and marine data communities with reanalysis efforts. Steve Worley is a member of the AOPC/WOAP Working Group on Observational Datasets for Reanalysis (WG-ODR) and can link from the CLIMAR community to reanalysis applications.

Ease of use was noted as an important factor in whether a dataset actually gets used. The need for making products easier to use was stressed, for example making products available on model grids.

Priorities for data sources and products

The CLIMAR community has to balance the requirements for both continuity and quality. This is a complicated message to get across and needs discussion within the community on the best way to proceed, and also how to promote the conclusions of this discussion to funding agencies and observing system operators.

A strongly worded statement regarding the need for sustaining the observing system, in line with the GCOS Implementation Plan and Climate Monitoring principles was called for. The maintenance of a multi-platform, multi-variable observing system including Voluntary Observing Ships (VOS), the (Advanced) Along Track Scanning Radiometer ((A)ATSR), Argo (including extension to greater depth and also under ice) and satellite altimeters and scatterometers was thought to be essential.

There was also discussion on the dynamic and evolving nature of the observing system, and the need to incorporate new types of observations into the climate record. One important element is the transition from research observing systems to operational ones. Argo is a good example of an observing system, which started as a research project and is now starting the transition to a sustained, operational, program. It was noted that it was essential to consider all the user requirements when making the case for maintaining an operational system. The VOS is currently struggling to deliver the data that climate researchers require as the VOS are operated with priority given to weather prediction requirements. It is important to improve stability of funding for the observing system.

Funding the observing system is an ongoing challenge. Meteorological observations tend to be funded under operations while oceanographic measurements are primarily funded through research projects. Should the CLIMAR community take the lead in pushing for “operational” funding for parts of the ocean observing system? Craig Donlon noted that funds in Europe do exist for operational oceanography. [Post-meeting note: Smith feels that this will be a major discussion topic at OceanObs09. Several countries are moving towards “operationalizing” some aspect of their research vessel fleet, e.g., some sensors will be run on all cruises.] The funding challenge also is intertwined with the transition of research efforts to operational activities.

The importance of the delayed mode in providing higher quality data in delayed mode for marine climate applications was discussed. It was noted that it is not possible to perform real time QC suitable for all applications (e.g., time consuming visual data inspection is required to identify some problems, satellite data often require many levels of reprocessing long after real-time measurements are made).

The requirement for improved information for users was stressed. This partly relates to better documentation, but also to user education. One suggestion was to hold user workshops focusing on data and products from the CLIMAR community (possibly at AGU).

Priorities for data recovery and archaeology (Led by Rob Allan)

Rob Allan introduced the Atmospheric Circulation Reconstructions over the Earth (ACRE) Project to recover digitize and archive records, particularly for daily to sub-daily global historical surface

atmospheric pressure observations, but also other weather observations. (<http://brohan.org/hadobs/acre/data.html>). It was noted that there is much non-instrumental data at daily and sub-daily sampling in logbooks pre-1850. It could be useful as far back as 1680, to learn about pre-anthropogenic climate variability and change. Sources: UK, French, Dutch, far East, etc. Archivists don't necessarily catalogue things in a way that is useful—so it would help to create inventories. [Post-meeting note: The RECLAIM project is also noted as relevant to this discussion: [http://icoads.noaa.gov/reclaim/.](http://icoads.noaa.gov/reclaim/)]

Similarities with the Global Oceanographic Data Archaeology and Rescue (GODAR, <http://www.nodc.noaa.gov/General/NODC-dataexch/NODC-godar.html>) project, which feeds oceanographic data into the World Ocean Database (WOD, http://www.nodc.noaa.gov/OC5/WOD05/pr_wod05.html) were noted. One approach taken was to set up regional workshops and ask participants to bring their data, which was digitised and returned to them. It was found that this was a good way to engage regional scientists, and thus get access to more datasets. The near-surface data from WOD is currently being updated in ICOADS.

It was suggested that CLIMAR-III recommend to national meteorological and hydrological services to support recovery of historical data. It would be important to demonstrate the value of digitisation activities. For example, if it could be shown that the added data would help constrain transient climate response (is the temperature change at the time of CO₂ doubling), it would be an important result. IPCC 4AR noted the importance of digitisation of early 20th data. While progress is being made toward improving the World War II period data coverage, World War I still needs more effort. Study of the Pacific Decadal Oscillation was noted as requiring a full 20th century record.

The importance of imaging data as a stage of digitisation was discussed. Imaging has several advantages. The original document is preserved and the full information becomes available for a wide range of research, including any elements not targeted for digitisation. Working together, and providing information, means that duplication of effort can be avoided. Imaged documents may be suitable for digitisation by Optical Character Recognition (OCR), particularly if the image quality is good and the data are well-structured, for example in a table. For all digitisation methods it is important to make independent digitisations and compare the results. High quality imaging is an important step to preserve the historical document, allowing OCR or digitization to be completed on desired elements as resources allow. The images should also be made available to user communities beyond marine climatology.

There is also a clear need to engage those communities outside of marine climatology to take full advantage of ongoing and potential data archaeology. For example, ecologists and historians are very interested in marine logbook data, but they not have direct interest in the meteorological data contained in the log. They may be more interested in comments on species encountered or other notes made by captains and crew. When an OCR or digitization project is planned for historical logs, it would be beneficial to determine which entries are needed not only for marine climate, but also for other user communities, and to explore the possible pooling of resources for digitization across the interested communities.

Priorities for real time and delayed mode data (Led by Nicky Scott)

It was recognised that it was important to have agreed definitions for time frames for “Real-time” (RT), “Near-Real-Time” and “Delayed-Mode” (DM) data, as different user groups appear to categorise these in different ways. It was noted that DM data from the Global Collecting Centres has not been incorporated into ICOADS since 1997. It is therefore hard to gather information on the impact and importance of the DM as opposed to GTS data. ICOADS is not currently stored as a relational database so it is hard to query. ICOADS monthly updates to support climate monitoring would be valuable. Although the DM should be a mechanism for avoiding ship security and commercial issues, the call sign is sometimes masked even in DM. It was noted that both the DM and GTS data are needed for climate studies and that it was important for the CLIMAR community to demonstrate the value of each data stream. There has been a question about whether data from automatic systems are needed in DM. We need to send a strong message that we do need the DM.

It is also an obvious way around security issues (although the problem of masked call signs is creeping into the DM also). [Post-meeting note: The JCOMM Expert Team on Marine Climatology (ETMC) is co-ordinating a comparison of a number of GTS data streams for VOS data, as part of this the DM data from the GCC's will be compared to the GTS data.]

The WMO-mandated transition to Table Driven Codes such as BUFR will allow the expansion of variables and metadata that can be reported in real time. It was questioned whether the DM data would remain valuable once more information could be transmitted in real time on the GTS. It was however noted that if there is a reliance on GTS data only, then there is the possibility of losing data when there are attempts to reduce transmission costs, as happens periodically. It was also noted that when there are cheaper transmission methods available, such as e-mail, data sent in this way could be converted to the required format ashore.

Currently there are only small differences between the VOS GTS and delayed-mode formats (compare FM-13 and IMMT-3). Most of the additional parameters are related to QC and flagging, and only a small amount of additional metadata and element precision is available in DM. This was contrasted with the oceanographic case where DM data will be of significantly higher resolution, and precision, because of post-processing corrections. It was noted that the extra elements available in DM are important, but we need to communicate that to the observer, e.g., through observer's publications such as the *Marine Observer* (UK) or the *Mariners Weather Log* (US).

It was felt that there would always be requirements for data that are only economic to provide in DM, for example new oceanographic parameters, or additional metadata. There was a suggestion that it would be valuable to set up a short workshop to consider these issues.

Summary: There were reasons to consider whether it was still necessary to have a DM data stream as a high proportion of observations come via GTS. With BUFR format coming online for use with the GTS data, it will be possible to include many more fields. However the discussion showed that there were several ways in which DM data are still needed:

- BUFR won't be able to handle all forms of new data coming along,
- post-processing corrections can improve precision,
- in some cases there is higher resolution available in DM,
- DM provides a way around the security issues that are causing some observing countries to suppress the call sign of the reporting ships,
- for countries where the cost of transmission by GTS in RT is enough of an issue to prevent them sending observations, the use of DM would allow the data to get to the climate archives.

Outcomes

1. Recommendation to engage alternative user communities (e.g., coastal, marine engineering, ecosystems/biological researchers) for reanalysis of historical data, computation of air sea-flux climatologies, and assessing climate change/trends/variability.
2. Recommendation to improve emerging synergies with the satellite community (e.g., through GHRSSST, WIGOS). For example the satellite community needs information on extreme events. Specialized access is required jointly to satellite and in situ data (e.g., extending to the possibility of tying together satellite and ICOADS data).
3. CLIMAR community feels that there is a need for better outreach through education, development of appropriate documentation, and workshops, according to the different audiences (categorization). This would help quantifying uncertainties and make the data easily usable by the modellers and researchers. Work can be achieved via CLIVAR (Alexey Kaplan proposed to act as a CLIMAR relay).
4. Data recovery/archeology: Leverage multiple user requirements (e.g., ecosystem) and work at compiling early records (pre-1850) as well as filling the gap of the modern era. GODAR project data have been included in the World Ocean Database 2005. CLIMAR-III

- recommended that NMHSs engage further in the recovery of ship logbooks (digitization of 19th century data, plus training if necessary).²
5. Build registries or inventories of data recovery requirements
 - a. Possible additional contribution for JCOMM/DMPA
 - b. Helpful to bridge gap between marine meteorology and oceanography
 6. Assess the value of real-time and delayed mode data. Real-time QC needs to be developed for operational oceanography (speed of access) but the CLIMAR requirements need to be considered in those developments. There is a need for revising or enhancing QA/QC procedures and for improving metadata.
 7. Importance of sustaining the observing system, and the VOS, Argo, and satellite observations (e.g. altimetry) in particular. Argo should be extended under the ice and in the deeper ocean. The use of VOS data is threatened because of the decline of the VOS fleet and ship masking. The manual VOS observations are important because we have a long history of such data. New technologies are emerging (e.g. AUV, autonomous ships, gliders) and sufficient overlap must be provided with the current technologies.
 8. A small working group was proposed to work at refining priorities for the CLIMAR community.

Plenary Discussion B: Metadata and Data Management

(Led by Bob Keeley, Rapporteur Eric Freeman)

The importance of metadata was noted, and the issue of what needs to be done to preserve what we have and improve availability of metadata in the future was raised. The recent move by WMO to restrict availability to the *List of Selected, Supplementary and Auxiliary Ships*, Publication No. 47 (VOS metadata), was regretted. It was recommended that WMO should make Pub. 47 accessible to all interested researchers. However ship safety was noted as one concern, since in this publication a large amount of information on ships was available, and owners were worried that metadata can identify ships.

Outreach is very important to ensure that volunteers are informed of the importance of their observations:

- Must convince ship owners that there is no/negligible risk.
- Must educate ship owners/observers why scientists need these data.

Unfortunately some ships are not willing to release masked data at all because of a lack of confidence in their identity being protected. Scientists may not understand this reluctance, and so engagement is necessary to understand the issues on both sides. One approach might be to recruit ships that do not have worries about either security or commercial interests. There is an additional potential liability concern for countries and organizations receiving masked data, if data were inadvertently released to the public.

Basic metadata about the ship, rather than instrumentation, is available commercially from Lloyds' list. However one problem is that it does not store previous call signs. Historically metadata has been linked to ship callsigns but these can change if the ship is sold, or the same call sign can be re-used by a different ship. It is important to ensure that historical linkages can still be made. The possibility of using unique identifiers rather than ship names was raised.

It was noted that in some cases we may need to choose between masked data or no data. When data are available, can we keep them and have an assembly of call sign with data at a later time? A key issue is that the data are stored somewhere secure, until a solution can be found to the

² Post-meeting note: approved excerpt from the 60th Session of the WMO Executive Council (18-27 June 2008, Geneva):

3.5.3.6 The Council supported the continuing efforts in locating, digitizing and exchanging Marine Data and Metadata records and noted the need to promote and enhance such activities both nationally and internationally. It further urged Members to engage in Marine data rescue and to provide marine data, including metadata, to ICOADS and WMO-Pub. 47. It also expressed its deep appreciation that the National Marine Data and Information Service (NMDIS, China) had agreed at JCOMM-II to establish an Ocean Data Acquisition System (ODAS) metadata management centre for JCOMM. The Council urged Members to routinely submit appropriate metadata to the Centre and also to the JCOMM.

problem of ship masking. The IOC meeting in June is an opportunity for people to express their concerns.

DWD have developed a scheme to capture metadata and are willing to share it with others to help with metadata capture. It was noted that it would be desirable for original meteorological forms and manuscripts (e.g., logbooks) to be linked with the data. This happened with the CLIWOC database where metadata and data are side by side to help ensure the connections between them. The only caveat with this is that metadata must be known about to make it available, which is sometimes difficult for historical data. Linking data and metadata allows the user to trace back to the original source. Logbook numbers are a key example of this.

Where possible scanned images of logbooks or other historical records should be made publicly available. There is a need to share resources between the archivists, historians and scientists to rescue the data contained in these records. It was noted that about one thousand East India Company logbooks are now being imaged and it would be useful to have wide access. It is often not possible to remove the documents from their archive repositories so imaging must be performed on site. Access varies nationally and sometimes there are copyright issues that must be agreed with the archives.

The need was stressed for ICOADS and the CLIMAR community to be involved with discovery metadata initiatives, particularly within WMO. Data and metadata need to be part of the WMO Core Profile integrated in the WMO Information System (WIS, http://www.wmo.int/pages/themes/wis/index_en.html) and the WMO Integrated Global Observing Systems (WIGOS, http://www.wmo.ch/pages/prog/www/wigos/index_en.html).

It was emphasised that all those interested were welcome to add to a white paper on “bias corrected” (or more broadly “value-added”) ICOADS. The possible role of JCOMM within this project was discussed. JCOMM involvement was thought to be potentially valuable, but in the early stages needed to avoid burdening the project with unnecessary bureaucracy. It was noted that this project might be a way to further progress the internationalization of ICOADS. A project steering team should draw widely from interested groups.

Some issues with the bias corrected ICOADS project need to be overcome. Agreeing on a “best” correction for some variables will be difficult, and presenting many different possible adjustments has the potential to confuse users. The original data must remain available; adjustments will be available as additional fields.

Improved QC/QA was noted as an important area for this project, including in the areas of improved ship tracking, duplicate elimination and related QC improvements. The ICOADS metadata attachment is an example of the types of information that are useful to make more widely available. The issue of unique identifiers for each observation was raised. This would have links to the ICOADS project white paper, but would be valuable for a range of applications. Issues of QC methodological differences between meteorological and oceanographic applications were noted with particular concern for SST, which is used by both communities.

Outcomes

1. A team is forming to draft the white paper proposal for the extension of ICOADS to handle bias corrections and perhaps other components. There will be the possibility to have more than one bias correction. The original data should be preserved and made available. The links between data and homogeneity adjustments should be documented. Whether additional consolidated data sets are desirable should be investigated, however it is also important to continue having ready access to independent sources of observational data (e.g. VOS, buoys, Argo, XBTs).
2. Ship masking is a problem. As a climate record for data archaeology, the unmasked VOS data and metadata should eventually be released. One suggestion was to make an agreement with ship operators to get unmasked data into archives (perhaps immediately),

but not to release those data to the public without masking the call signs until certain conditions (e.g. ship changing ownership, retiring, scrapped, or after a certain period), to be negotiated, were met.

3. Imaged logbooks and historical records need to be made available as widely as possible. DWD has developed a scheme for managing metadata from historical ship logbooks and is willing to share its experience with the CLIMAR community (e.g. keeping the scanned versions and linking the recovered metadata with the original metadata).
4. Better management of the metadata is needed for satellite and in situ data. CLIMAR-III deplores the withdrawal of Pub. 47 and other mandatory publications from public access by WMO. This makes the cooperation of NMHSs with partner organizations much more difficult.
5. The CLIMAR community is willing to consider using unique identifiers down to the individual observation level, as well as attaching version control to observations, not just data sets.
6. The CLIMAR community should be working through WIS and WIGOS to ensure that the data sets that we produce are highly visible.

Plenary Discussion C: Marine Indices and Products

(Led by Val Swail, Rapporteur John Kennedy)

The meeting discussed the characteristics required from indices. Indices should cover a range of time and space scales, multi-decadal to daily, global to regional and be relevant to their target audience. They should be robust for detection, important and doable, and represent important impact-relevant aspects of the climate system and where possible link to the IPCC. It must be possible to calculate and update the indices from existing data. The workshop agreed that the indices must be prioritized due to limits in capacity. Indices can synthesize information and reduce noise by combining different components of the climate system. They should be based on homogenized and quality controlled datasets, well-understood models or reanalyses, or reliable predictions and should have a good signal to noise ratio. A subset of indices should be suitable for presentation to high-level decision makers. CLIMAR-III agreed that common climate indices should be developed for models and observations.

The workshop listed possible marine indices, i.e. (i) temperature - air and sea, (ii) humidity, (iii) wind and wave, (iv) storm surge, storm tide, inundation zones, (v) sea level, (vi) sea ice - global scale ice extent; regional ice extents; ice thickness and stages of development; iceberg propagation, (vii) sub-surface – salinity, temperature, heat content, water mass properties, (viii) biological – HAB, coral bleaching, and (ix) Atlantic Meridional Overturning Circulation strength.

The workshop then discussed what indices could be doable while noting that some of them already existed. It agreed to use the marine climatology “Wiki” website (<http://www.marineclimatology.net>) in the near future to tune the proposed indices.

The MCSS and GCCs can be used to produce indices operationally. It was stressed that any proposed index should be sustainable (i.e. the data required to produce an index should be sustained, e.g. if one is based on a mooring’s position; that mooring position should be sustained).

Outcomes

Synthesise report.

Plenary Discussion D: Workshop Outcomes

(Led by Scott Woodruff, Rapporteur Liz Kent)

International Journal of Climatology

The WMO *Guide to the Applications of Marine Climatology* (WMO/TD-No. 781, 1994) constitutes the “static part” of the *Guide*. It is not yet available in digital form but it is planned to scan it in 2008 through the NOAA Climate Database Modernization Program (CDMP). WMO copyright and

distribution policies will have to be explored. A full update has not yet been planned but the JCOMM Technical Report No. 13 (WMO/TD-No. 1081) *Advances in the Applications of Marine Climatology* constitutes the “dynamic part” of the *Guide* and is therefore envisioned to provide updates. A special issue (peer reviewed) of the Royal Meteorological Society *International Journal of Climatology* (IJC) will be published as one outcome from CLIMAR-III, representing a second revision of JCOMM TR No. 13.

The procedure will be similar to that for the IJC Special Issue, which followed the CLIMAR-II meeting (Volume 25, Issue 7: <http://www3.interscience.wiley.com/journal/110507133/issue>). For 18 months the access to papers will be through the journal, thereafter access will be open (<http://www.wmo.ch/pages/prog/amp/mmop/documents/Jcomm-TR/J-TR-13-Marine-Climatology/J-TR-13-REV1.html>). It was noted that the 2005 special Issue was very successful and is one of IJC's top cited issues.

Professor Sergey Gulev will again act as guest editor for the special issue. Authors of both the oral and poster sessions were strongly encouraged to submit papers. Each paper will be subject to peer review, one reviewer from the CLIMAR community, one from the wider scientific community and an editorial decision. The Special Issue has a page limit of 200 pages, if there are a large number of papers meeting the required standard, it may be necessary to include a request to shorten individual papers as part of the review and editorial process. [Post-meeting note: Workshop participants were notified 28 August 2008 about the plans and requirements for the Special Issue, including a deadline for submission of papers by 31 December 2008.] Although the Special Issue will appear as a collection, the possibility of early online access for individual articles was left open at this stage.

JCOMM and WMO Publications

A JCOMM Technical Report (CD-ROM) will also be published [Post-meeting note: IMGW will cover costs of producing this publication on CD-ROM], which will include abstracts and electronic (PDF) presentations from the authors. The Technical Report will be made available to the participants and to NMHSs.

The workshop recommended including an article on marine climatology in the *WMO Bulletin* with input from CLIMAR-III.

Air and Water

Mirosław Mietus presented the new Polish journal (of IMGW in Warsaw) *Air & Water* and invited CLIMAR-III participants to submit articles, and an invitation to submit papers will be sent out in due course. *Air & Water* will be published quarterly and the first issue is currently in press (<http://www.imgw.pl/internet/zz/a&w/index.html>). The journal is English-language and has a 15-strong international editorial board. Professor Mietus is a co-editor of the journal. The journal is published in both paper copy and electronically. The electronic copy becomes available as soon as the paper copy has been sent to the printers. The lead-time for publication in the journal is anticipated to be about 6 months. Those interested can be alerted by e-mail on publication.

Online availability questions

Both oral and poster presentations from CLIMAR-III will be made available online via the ICOADS meetings website (<http://icoads.noaa.gov/climar3/>).

The workshop agreed that the marine climatology Wiki website (<http://www.marineclimatology.net>) was underutilized. It is presently being used to record recommendations from past CLIMAR and MARCDAT workshops as well as to reference scientific papers, to list and document data-sets, and provide for useful links in the area of marine climatology. The Wiki could be used for the ICOADS bias correction pilot project, as well as for tuning the development of marine indices.

The profile of marine climatology and outreach activities

There was some discussion on how to improve the relatively low profile of research and developments in the area of marine climatology. It was noted that there was no general website to advertise and act as a focus for activities. [Post-meeting note: The domains www.climar.* seem to be unavailable, but “marcdat” domains may be. It would be possible to convert the top level of www.marineclimatology.net to a static website with the current Wiki site becoming a lower level section of the site.] The possibility of extending use of the ICOADS domain, as well as increasing use of the JCOMM website should also be explored. It was thought that the ICOADS website was probably not particularly appropriate for outreach activities. It was also suggested that the CLIMAR community should consider being more evangelical at meetings, playing an increased public relations and advocacy role.

The requirement for funding to allow enhanced promotion, such as a brochure was discussed. It was generally agreed that there was a strong need for education, both of the public and of scientific colleagues, in the area of marine climatology. Comparisons were made with CLIVAR and the idea of a CLIMAR project office was raised. Alexey Kaplan is a representative on the US CLIVAR Phenomena Observations and Synthesis Panel, co-chaired by Michael Alexander and Sarah Gille. He invited meeting participants to contribute to a primer on marine climatological issues currently being developed.

The idea of a steering team for ICOADS was floated. This would link to the activities described at the meeting by Shawn Smith for enhanced ICOADS products, but would have a somewhat broader remit.

Future workshops

The participants agreed that the CLIMAR-III workshop had been very successful and permitted to address new issues such as (i) increasing use of satellite information and products, (ii) the plan to establish a Pilot Project for bias correction of the ICOADS, and (iii) the introduction to other partner communities (e.g., ecologists).

The workshop agreed that the third international workshop on “Advances in the Use of Historical Marine Climate Data” (MARCDAT-III) should be organized in 2010. Possible venues are St John’s, Newfoundland, Canada, or Montreal, Ontario, Canada.

It recommended the organization of a fourth CLIMAR workshop in 2012, possibly in conjunction with the World Expo in the Republic of Korea. Germany also made an offer to organize it in at the Centre for Climate and Marine Research of the University of Hamburg. The workshop agreed that participation of experts from additional communities such as coastal engineers, harbour operations, biology, and ecology might be useful.