VOS CLIMATE PROJECT FOURTH PROJECT MEETING

London, United Kingdom, 21-22 July 2003

FINAL REPORT

JCOMM Meeting Report No. 23

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

GENERAL SUMMARY OF THE MEETING

1. OPENING

1.1 Opening of the meeting

1.1.1 The Fourth Project Meeting for the VOSClim Project was opened by the Project Leader, Ms Sarah North (United Kingdom), at 0930 hours on Monday, 21 July 2003, in conference room 1 of the International Maritime Organization (IMO), London, United Kingdom. Ms North welcomed participants to the meeting and to London. She was pleased to note that this meeting had a good attendance. She noted that although the project was now in its implementation phase, there remained a number of important issues to address to ensure that the project could progress towards its aim of becoming an operational programme. She wished the meeting a fruitful discussion.

1.1.2 On behalf of WMO and IOC, the Secretariat representative welcomed participants and wished everyone a very successful meeting and an enjoyable stay in London.

1.1.3 The list of participants in the meeting is given in *Annex I*.

1.2 Adoption of the agenda

1.2.1 The meeting adopted its agenda for the session, which is given in *Annex II*.

1.3 Working arrangements

1.3.1 The meeting agreed its working hours and other practical arrangements. The documentation for the meeting was introduced by the Secretariat.

2. STATUS REPORT

2.1 Report of the Project Leader

2.1.1 The Project Leader presented a report on the structure and implementation status of the project, and highlighted the main areas that needed to be addressed by the meeting. She was pleased to note that steady progress had been made since the last meeting of the project team (VOSClim-III) (Southampton, United Kingdom, 21-23 January 2002). A modest target of 200 participating ships was set at the start of the project and, by June 2003, a total of 89 ships had been notified to the Data Assembly Centre (DAC). Seven of the eleven countries that made provisional commitments to participate in the project at VOSClim-I had so far recruited ships.

2.1.2 She stressed that the success of the project was dependent upon the efficient operation of three distinct data streams — real time data, delayed mode data and ships metadata. She also emphasized the importance of ensuring PMO involvement.

2.1.3 She noted with appreciation that the Real Time Monitoring Centre (RTMC) and the Data Assembly Centre (DAC) were now functioning satisfactorily in accordance with their terms of reference, except for metadata collection and provision which would be discussed during the meeting.

2.1.4 The meeting expressed its appreciation to the Project Leader for her comprehensive and valuable report, which is reproduced in *Annex III.* Specific issues raised were discussed in detail under the relevant agenda items.

2.2 Report by the Scientific Advisers

2.2.1 Dr Elizabeth C. Kent (United Kingdom), Scientific Adviser to the project reported on the use of the data generated by the project for climate change studies, climate research and prediction. She had used a total of 40,228 VOSClim real time reports from about 80 ships for the period from February 2002 to April 2003. Comprehensive metadata from more than 40 ships were used. Data were compared with the Met Office (UK) Unified Model.

2.2.2 The meeting recognized that sufficient information for comprehensive research was not yet available. In particular, delayed mode data had not been available; the collection and dissemination of metadata was not functioning properly; information on logging software was not available; and more data were required to extend the range of analyses.

2.2.3 Some concern was expressed that SST was only contained in 75% of the observations so far reported. According to the current preliminary analysis, engine room intake (ERI) observations were not as bad as had been originally thought. Some participants pointed out that some ships were still making ERI observations in a totally unsatisfactory way. Although ship hull contact sensors had originally been recommended for the project, the meeting considered that all kinds of SST observations would contribute to the project, provided that the observations were made in an acceptable manner. The meeting also agreed that the collection of all kinds of SST observations (ERI, hull contact, buckets) would help in identifying best practices for SST observations in the future. The meeting agreed that efforts should be made to ensue that all basic surface meteorological variables, including SST are included in each report (**Action**: participants).

2.2.4 The meeting expressed its appreciation to Dr Kent for her comprehensive and valuable report as well as for her efforts on preparing the report under unfavourable circumstances. The full report is in *Annex IV*. Suggestions made by Dr Kent were further discussed under agenda item 3.2

3. SHIP RECRUITMENT

3.1 National reports

3.1.1 National reports from Australia, Canada, France, Germany, India, Japan, New Zealand, the United Kingdom, and the United States were presented to the meeting. The meeting was pleased to note the number of ships that had already been recruited and which were providing observations and metadata. The national reports are in *Annex V*.

3.1.2 The meeting recognized that problems could arise when recruited ships are scrapped, and when ships trading routes are changed. However, the meeting recognized that changes to ship routes do not necessarily have a negative effect so long as the ships are inspected by PMOs located overseas. In this regard, the meeting recognized the importance of further enhancing the international PMO network.

3.1.3 The meeting noted that the number of ships equipped with automated systems had been increasing.

3.2 Recruitment priority

3.2.1 The meeting agreed with Dr Kent's proposal that more data were needed to produce effective and reasonable scientific analyses. The meeting recalled that one of the aims of the VOSClim project was to assess systematic and random errors in the various types of observations contributing to the VOS as a whole. It was therefore desirable to obtain observations from as wide a range of observation systems as possible.

3.2.2 The meeting recognized the importance of increasing the number of observations. In this regard, the meeting noted with interest that some German VOSs independently decide to provide the additional observation elements by clicking the button devoted to VOSClim in the Turbowin software. It would be possible to increase the number of VOSClim ships by accepting such "self-recruiting" ships as VOSClim ships. The meeting agreed that, provided a PMO can eventually collect the necessary metadata and follow up their performance, any ships which are willing to provide the additional observation elements could be considered as a VOSClim recruitment, regardless of their observation systems. (**Action**: participants)

3.2.3 The meeting agreed that participants should notify the RTMC of any prospective ship names and call signs (see para 4.1.7). (**Action**: participants)

3.2.4 The meeting noted that as a consequence of this change in recruitment strategy, the continuous increase of VOSCim ships could increase the burden on the PMOs, especially in respect of follow up actions arising from monitoring information (see para 4.1.6).

3.2.5 The meeting recognized that biases caused by different kinds of instruments were smaller than those caused by situation/location of instruments. It noted that the purpose of the project was not an intercomparison of instruments. It recalled that the Ship Observations Team (SOT), at its first session (SOT-I) established a Task Team on Instrument Testing and Intercalibration, and that the second session of the SOT (SOT-II), to be held in the following week, would discuss this matter.

3.2.6 The meeting concluded that a greater number and variety of ships, irrespective of their observation methods and routes, should be welcomed to the project, PMOs should make every effort to ensure that all metadata are collected and reported, and that all observation variables are reported. The meeting emphasized that they should also take remedial actions as necessary and appropriate. (**Action**: participants)

4. DATA MANAGEMENT

4.1 Real Time Monitoring Centre

4.1.1 Mr Colin Parrett (United Kingdom) reported to the meeting on progress made by the RTMC in support of the project since VOSClim-III. The meeting expressed its appreciation to the RTMC for their efforts to ensure the quality of the VOSClim data.

Monitoring Statistics

4.1.2 Since the VOSCLIM-III meeting:

- The RTMC had added the three remaining variables (i.e. air temperature, relative humidity, and wind direction) to the list that is monitored. All six required project variables were therefore now being monitored.

- The RTMC had started to produce and disseminate monthly lists of those ships whose observations have been flagged as ‘suspect’.

4.1.3 The meeting recalled that the RTMC was now producing monthly ship statistics and monthly "suspect" lists. The meeting agreed that, in order to ensure the effectiveness of the monitoring process, details of national focal points, and the call signs of ships participating in the project, should be maintained and updated on the project web site. The meeting further agreed that the lists should also be sent to the RTMC when they are sent to the DAC for uploading to the web site (**Action**: participants, DAC).

4.1.4 On the basis of about 18 month's monitoring, the meeting noted with satisfaction that most of the criteria for the real time monitoring were set approximately at the correct levels.

However, the meeting agreed that the criteria for air temperature and relative humidity should be revised as below:

Variable	Bias limit	Standard deviation limit	Gross Error limit
Air Temperature (^{0}C)	2.0	4.0	10.0
Relative Humidity (%)	10	20	40

It was agreed that the RTMC should start using the criteria as from August 2003 (**Action**: RTMC). During the discussion on the new criteria, the meeting recalled that the purpose of monitoring using the criteria was not to make a complete high quality data set for scientific use, but to make a gross check to identify potentially serious problems, on which PMOs should take remedial action. The meeting agreed that if any particular problem on the monitoring criteria was detected (**Action**: RTMC), the matter should be raised at the next meeting.

4.1.5 The meeting recalled that at earlier meetings of the project team it had been suggested that weekly lists of 'suspect' ships should be produced and distributed by the RTMC, in order that remedial actions could be initiated by NMS's at the earliest opportunity. The meeting discussed this issue once again, but in view of the limitations on PMO resources, the meeting agreed that the monthly suspect list remained sufficient.

4.1.6 The meeting noted that although information on remedial actions taken by PMOs was important for the analysis, such information had not been made available. While noting the importance of this, the meeting agreed that it would not be appropriate at the present time to place any further burden on PMOs. However, at the same time, the meeting realized that most countries were keeping some records on PMO activities, including their remedial actions. While noting the importance of exchanging such information, the meeting considered that it would not be an appropriate time to establish a system. However, project focal points were invited to submit such national records to the DAC where appropriate (**Action**: participants). The meeting proposed that an internet forum, similar to those established for DBCP and Argo, could eventually be established at JCOMMOPS to promulgate this information.

4.1.7 The meeting agreed that the RTMC should additionally monitor observations made by prospective ships listed on the project website (**Action**: RTMC).

Data transfer

4.1.8 The RTMC is also responsible for ensuring the transfer of project ships' observations and the associated co-located model data to the DAC.

4.1.9 Since July 2002 the Met Office had been producing the VOSClim BUFR data on a daily basis and transmitting it to Washington via the GTS. These data were then available for onward transmission to the DAC and, following a request from the DAC to Washington, this transmission began in April 2003.

4.1.10 Up until May 2003 the transmission of the BUFR data to the DAC had continued in the form of binary files attached to e-mails which was sent once a week. Now that the data were being forwarded to the DAC from Washington, this e-mail transmission was no longer necessary and had been discontinued.

4.1.11 The meeting expressed its sincere appreciation to Mr Parrett and the RTMC for their valuable contribution to the project.

4.2 Data Assembly Centre

4.2.1 Mr Alan Hall (NCDC) reported to the meeting on progress made by the DAC in support of the project since VOSClim-III.

4.2.2 The meeting agreed that the BUFR observation/model data should be archived by the DAC (**Action**: DAC)

4.2.3 The meeting noted with appreciation that the DAC had been maintaining the project web site, which had been operational over a year. The new site address is:

http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html.

The meeting agreed that, as the website was the main focal point for the project, it should clearly promote its aims and aspirations, whilst at the same time providing users with easy access to the necessary data. Furthermore it was essential that ship details, such as call sign changes, be posted on the site at the earliest opportunity. The meeting recalled that the current web site provides observations, metadata, project information, and the recruitment/inspection form. The meeting agreed that the project web site should be linked to the VOS web site (**Action**: DAC). For the purpose of the further improvement of the web site, the meeting agreed that participants should send their comments on the web site to the DAC (**Action**: participants).

4.2.4 The meeting noted with satisfaction that observations from VOSClim ships could be downloaded from the web site in the IMMA format and that the observation location data by each ship could also be plotted. It agreed that both facilities were useful.

4.2.5 The meeting agreed that VOSClim focal points should send lists of national VOSClim ships to the DAC (Excel files) in the same format as the current ship list available on the web site (**Action**: participants). It was also agreed that the DAC would continue to post an assembled list of VOSClim ships (**Action**: DAC).

4.2.6 The meeting agreed that digital imagery of ships should be archived in the DAC (**Action**: DAC). Digital imagery includes ship and instrument photos. It agreed that VOSClim focal points should send digital images in jpeg format (6-7 images per ship on average) to the DAC (**Action**: participants). In accordance with the VOSClim recruitment instructions, digital image files should comply with the following naming convention.

xxxxxxxxx	IMO Number (a nine digit number, include leading zeros if applicable)
yyyymmdd	Year, month, day (Date of the photograph)
aaa….aaa	Short description of the photo

(Example: 005090660200201 23Starboard_Screen.jpg)

4.2.7 The meeting expressed its appreciation to Mr Alan Hall, Mr Dan Manns and the DAC for their efforts and valuable contribution to the project.

4.3 Global Collecting Centres

4.3.1 The meeting noted with appreciation the report of the Global Collecting Centre (GCC) within the framework of the VOSClim project presented by Dr Volker Wagner (Germany). The meeting noted with satisfaction that the completeness of parameters for VOSClim messages was generally better in comparison with the normal VOS data, and that the quality of VOSClim data was satisfactory.

4.3.2 The meeting recalled that the current Minimum Quality Control Standards (MQCS-IV) did not extend to the additional elements introduced for the VOSClim project. The meeting

considered a proposal by Dr Wagner and agreed with the MQCS proposed for these new elements as described in *Annex VI*. The meeting agreed that the revised MQCS should be distributed to participating Members as soon as possible for their use on a trial basis (**Action**: Secretariat). The meeting further agreed that the GCC Germany should submit this proposal to the next session of the Expert Team on Marine Climatology (ETMC) for their consideration (**Action**: GCC). It noted that if the ETMC agreed with the revision, a proposal to revise the Manual on Marine Meteorological Services (WMO-No. 558) would be submitted to JCOMM-II for its consideration.

5. METADATA

5.1 Mr David Evans (Australia) reported on the paper recruitment/inspection form. The meeting noted that no specific revisions for the paper version had been suggested since it was finalized in February 2002. The meeting agreed that the project should continue to use the current recruitment/inspection form and that the sample form and instructions, as well as the associated form should continue to be made available in the project web site.

5.2 Mr Evans then demonstrated the electronic DOS based version of the form. The meeting expressed its gratitude to Australia for their efforts to develop such a user friendly electronic form, which did not require specific software. However, the meeting recalled that most countries already had national data entry and archival systems. It therefore felt that introducing this new electronic form (i.e. new data entry system) into the project could cause unnecessary confusion and complexity. The meeting agreed that it would not be appropriate to use the electronic form as an official form for the project. However, the meeting agreed that the electronic form should be circulated to VOSClim focal points for their comments. Recognizing potential usefulness of the electronic form, the meeting agreed that it could be made available to any VOS operators upon request (**Action**: Australia).

5.3 The meeting noted with appreciation that Mr David McShane (USA) would investigate the possibility of producing a web based metadata input and archive system to possibly be hosted by the DAC (**Action**: Mr D. McShane). The meeting agreed that he should keep contact with the WMO Secretariat and JCOMMOPS when such a system was being developed. It was further proposed that the issues should be raised during the SOT-II (**Action**: Project Leader).

5.4 The meeting noted with regret that because of the delay in developing an electronic database of the WMO ship metadata catalogue (WMO-No. 47), VOS metadata, including those of VOSClim vessels, had not been operationally updated. The meeting was informed that, while the development of the database was now expected to be completed in a few months, the full data set might not be operationally available in the near future.

5.5 The meeting was informed that only a limited number of countries had been submitting metadata for Pub 47, and that some countries were still using old formats. The meeting agreed that VOSClim focal points should ensure that metadata are sent to the WMO on a quarterly basis in the new format (**Action**: participants).

5.6 The meeting agreed that participants should make every effort to send metadata for VOSClim ships to the DAC in semicolon delimited format on a quarterly basis, so that the VOSClim metadata can be obtained through the project web site (**Action**: participants, DAC).

5.7 The meeting noted that the new format of Pub 47 is not suitable for a number of observation practices, especially for automated systems. It also noted that use of footnotes is too complicated and not easy to use. It therefore agreed that revision of the Pub 47 should be considered. The meeting proposed that the VOS panel should be invited to consider the need for further revisions to certain fields in Pub 47 (**Action**: Project Leader).

Pending consideration by the VOS panel, participants were invited to send details of any proposed amendments to Pub 47 to the VOSClim Project Leader (**Action**: Participants).

5.8 The meeting recalled that SOT-I had suggested that, instead of the reduced (10m) wind, the original wind data should be reported and that this suggestion had been endorsed by the Management Committee at its second session (February 2003). Considering that Turbowin (version 2.1,2 onwards) used the reduced (10m) wind, the meeting noted that it was necessary to report which version of the electronic logbook was being used as an interim procedure. The meeting agreed that the type and version of the electronic logbook should be reported in footnotes (**Action**: participants).

5.9 The meeting agreed that participants should send nationally used current and historical marine observing practice documents (handbooks/guidelines/instructions to observers) to the Scientific Advisors (**Action**: participants).

6. PROJECT PROMOTION

6.1 Newsletter

6.1.1 VOSClim-II and III recognized that a newsletter would be an essential component of the project, providing a means of informing and communicating with participating ships as well as meteorological services, data centres, users and other participants.

6.1.2 The Project Leader presented the draft Newsletter. The meeting expressed its appreciation to Ms North for her efforts to assemble the information for a newsletter. The meeting agreed the contents of the draft issue. It also agreed that additional contributions, especially photographs, should be sent to the Project Leader and the Secretariat by the end of August 2003 (**Action**: participants). It was agreed that the Newsletter should be issued in September 2003 via the project web site (**Action**: Project Leader, Secretariat and DAC)

6.1.3 The meeting agreed that a scientific article in the Newsletter would be important for the promotion of the project. It agreed with appreciation that Dr Kent would continue to provide such an article for the future issues (**Action**: Scientific Advisor).

6.1.4 The meeting noted with regret that *The Marine Observer* which had been published by the Met Office UK would likely be discontinued. The meeting recalled that *The Marine Observer* was used as an international newsletter regarding VOS. The meeting also recalled that the SOT-I had noted; that an international newsletter for VOS would be useful, and that the VOSClim Newsletter might also be expanded for use with all VOS. The meeting agreed that an international VOS Newsletter should be developed, and a part of which should be devoted to the VOSClim project. It agreed such a proposal should be submitted to the coming session of the SOT VOS panel (**Action**: Project Leader).

6.2 Certification and other promotional materials

6.2.1 The meeting recalled that the certificates of appreciation, and of participation, had been developed and were now being used. However, it was unclear how many certificates had been issued or whether project focal points were keeping records of issued certification. The meeting agreed that a common criteria for issuing certificates of appreciation addressed to persons was needed, but could not be easily developed. The meeting recommended that, for the moment, only certificates of participation addressed to VOSClim ships should be issued (**Action**: participants).

7. PORT METEOROLOGICAL OFFICER INVOLVEMENT

7.1 It was recognized that Port Meteorological Officer (PMO) participation was essential to the success of the project. To ensure regular inspection of project ships preference is

normally given to recruiting ships that regularly return to a home port. However, the uncertainties of ship management and chartering meant that ships may change their trading routes with very little notice. The meeting noted that this had already happened to a number of project ships. In such cases the observing standards may decline, and it is often difficult to arrange overseas inspections to resolve any observational or instrumentation problems that may arise. Moreover it can delay the download and collection of delayed mode project data.

7.2 The meeting recognized that a more coordinated approach to the inspection of VOSClim ships overseas should be considered. It agreed that due to the international nature of the project, active cooperation between PMOs on a global basis was required e.g. to respond to monitoring problems, or to inspect project ships that may have been subject to changes in their trading routes. In this regard, the meeting noted with interest that a web forum had been proposed for the JCOMMOPS web site.

7.3 The meeting noted that the second International Workshop for Port Meteorological Officers would take place immediately following the project meeting (23 - 25 July 2003). The meeting expected that the workshop would provide a good opportunity to discuss enhancement of PMO activities.

8. REVISED ACTION PLAN

8.1 The meeting reviewed the action plan prepared by the VOSClim-III (*Annex VII*) and agreed with the revised action plan as in *Annex VIII*.

9. DATE AND PLACE OF THE NEXT MEETING

9.1 The meeting agreed that a fifth project meeting would be required, to review progress in implementation, consider possible modifications to the project structure and operations in the light of experience especially based on the new recruitment strategy, and to review the results from users. The meeting further agreed that the meeting could be held in conjunction with the VOS panel meeting to be held during the next session of the SOT. The Project Leader and the Secretariat were requested to make the necessary arrangements and to inform participants accordingly (**Actio**n: Project Leader and Secretariat).

10. CLOSURE OF THE MEETING

10.1 In closing the meeting the Project Leader, Sarah North, expressed her appreciation once more on behalf of all participants, to IMO, for hosting the meeting and providing such excellent support and facilities. She also thanked participants for their valuable input to what had been a very successful meeting. She wished everyone a successful implementation of the project. The meeting expressed its sincere appreciation to Ms North for her leadership on the project.

10.2 The Secretariat representative expressed her appreciation to Ms North for her excellent chairmanship. She also expressed her gratitude to IMO. She thanked Captain Gordon Mackie for his very kind support as a local organizer, not only for the PMO workshop but also for this meeting.

10.3 The fourth project planning meeting for the VOSClim Project closed at 1825 hours on Tuesday, 22 July 2003.

Annex I

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Annex II

AGENDA

1. OPENING

1.1 Opening of the meeting
1.2 Adoption of the agenda
1.3 Working arrangements

2. STATUS REPORT

2.1 Report of the Project Leader
2.2 Report by the Scientific Advisers

3. SHIP RECRUITMENT

3.1 National reports
3.2 Recruitment Priority

4. DATA MANAGEMENT

4.1 Real Time Monitoring Centre
4.2 Data Assembly Centre
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5. METADATA

6. PROJECT PROMOTION

6.1 Newsletter
6.2 Certification and other promotional materials

7. PORT METEOROLOGICAL OFFICER INVOLVEMENT

8. REVISED ACTION PLAN

9. DATE AND PLACE OF THE NEXT MEETING

10. CLOSURE OF THE MEETING

Annex III

STATUS REPORT OF THE PROJECT LEADER

1. Steady progress has been made since the last meeting of the project team (VOSClim-III) (Southampton, UK, January 2002) and the project has now successfully entered its implementation phase.

2. This progress has been made during a period when many VOS operators have been faced with increasing limitations on their resources. However, despite such challenges, almost all the key components of the project are now in place, and scientific analysis of the project datasets is now underway. The project is therefore proceeding in the right direction towards its proposed goal of becoming a fully operational long-term operational programme.

3. A modest target of 200 participating ships was set at the start of the project and, by June 2003, a total of 89 ships had been notified to the Data Assembly Centre (DAC). Although the take up rate to the project has been slower than had perhaps been hoped for, this figure nevertheless represents almost twice the number of ships that participated in the forerunner VOSP-NA project in the late 1980's. However, over 40 additional ships have been listed as potential future recruits on the project website.

The majority of countries that undertook to recruit ships at the outset of the project have done so - of the eleven countries that made provisional commitments to participate in the project at VOSClim I, seven have so far recruited ships. It is hoped that the current meeting will regenerate interest and thereby help to increase the rate of recruitment.

4. The success of the project is dependent upon the efficient operation of three distinct data streams - real time data, delayed mode data and ships metadata. These three data streams have been activated as follows;

4.1 Real time data

Real time observations from VOSClim ships are being transmitted in exactly the same manner as for normal VOS. The observations are sent in WMO SHIP Code (FM13-XI Ext.), almost exclusively via Inmarsat (as Code 41 observations) for subsequent inclusion on the GTS.

The RTMC thereafter extracts the six prime observed variables from the GTS – pressure, relative humidity, air temperature, sea temperature, wind speed and wind direction – and co-locates them with the associated model field values. In accordance with international data transmission requirements the RTMC encodes these datasets into BUFR Code (FM94-XI Ext.) for subsequent transfer to the DAC. Despite some initial BUFR decoding problems, transmission of the BUFR data, which comprises a list of 47 elements, began in July 2002. Initially the data was being sent via the GTS as far as Washington, but following a request from the DAC data began being transmitted onwards from Washington in April 2003.

4.2 Delayed mode data

The delayed mode observations, including the additional code groups prescribed for the project, can be recorded on paper or electronic logbooks. The use of electronic logbooks (e.g. TurboWin, SEAS or OBSJMA) are recommended by the project, and are being used by most participants. Delayed mode data generated by electronic logbooks like TurboWin in IMMT-2 format are being downloaded routinely by Port Meteorological Officers. Ideally the data are collected on a three-monthly basis, although there have been several cases where ships have changed their trading patterns and collection of the delayed mode data has been delayed.

Minimum quality control procedures (MQCS version IV) should be applied to the collected delayed mode observation datasets before they are sent in parallel to the two GCC's located in

Hamburg and Edinburgh. (A new software package was developed in 2002 to assist in the application of minimum quality control procedures). The GCC's then check/add data quality flags, clarifying special problems bilaterally, and thereafter send the VOSClim data to the DAC on a quarterly basis. This process is now active and the first quarterly dataset was dispatched to the DAC in March 2003.

4.3 Metadata

In order to quantify random and systematic errors, full metadata on the observational methods on board project ships is needed. This metadata, which includes details of each ships' arrangements and information about the type and exposure of the meteorological instruments, is being collected by the Port Meteorological Officers at the time of recruitment using the dedicated VOSClim recruitment form. As this form is currently only available in hardcopy format, most National Met Services transcribe the collected metadata into the required text delimited format prescribed by WMO (for WMO Publication 47).

In July 2002 the WMO wrote to all its members operating VOS requesting them to submit their quarterly VOS metadata to WMO in the new extended format which had earlier been agreed for VOSClim ships. Accordingly, the metadata requirements for VOS and VOSClim are now the same, except archiving photos. It had been hoped, therefore, that the project website might be able to simply link to the metadata (i.e. in the latest extended format) on the WMO website. Unfortunately this has not yet been possible, as difficulties were experienced in making the latest metadata available as a database on the WMO website. Pending the resolution of this issue VOSClim team members were requested to provide their ships metadata direct to the DAC, in spreadsheet or text delimited format. In addition, as an interim measure, team members were requested to also make the information available to the Southampton Oceanography Centre to expedite their scientific analysis. The next session of the ETMC is planned to be held in mid-2004.

Following the VOSClim-III meeting the codes used in Publication No. 47 for vessel type (vssl) were reviewed in the light of new requirements for more detailed information about different ship types and designs. Revised and extended codes have now been drafted with a view to providing a more representative indication of current ship categories whilst, as far as possible, ensuring consistency with the existing codes. The proposed new codes will be referred to the JCOMM Expert Team on Marine Climatology for approval.

5. The RTMC began producing monthly monitoring statistics for the real time observed data at the start of 2002. In May 2002 the RTMC began producing monthly 'suspect' lists of ships whose observations failed to meet the monitoring criteria specified for the project. All six variables (listed in para 4.1 are now being monitored. VOSClim participants are taking action to resolve any monitoring problems for ships that have been flagged as suspect.

In accordance with its Terms of Reference the RTMC is therefore now fulfilling all its allocated responsibilities.

6. Similarly the DAC has recently taken action to fulfill the remaining duties under its Terms of Reference. Despite some delays caused by converting from their previous marine archive format to the COADS archive format, the DAC recently made the project data available to users via the project website in IMMA format. Real time and delayed mode data sets for 73 of the participating ships are now available for browsing (as graphical plots) or FTP download from the website.

7. The DAC is also responsible for maintaining the project website - which is the focal point, and primary means of information exchange, for the project. The website (http://lwf.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html) has been active for over a year now and includes up-to-date lists of all the participating ships, the monthly observation monitoring statistics supplied by the RTMC, downloadable datasets of the observations and associated model data, and copies of the necessary project documentation and certification. Limited metadata (based on the earlier pre-extended format) is also available via the website.

8. In addition to the printed copies of the project brochure published at the start of the project, soft copies can also be downloaded from the website. This brochure is essential for promoting the project to potential ship recruits, shipping companies and other interested parties. The brochure has also been incorporated in the latest release of the TurboWin software (version 3.03).

9. Together with the website, the project newsletter provides an important avenue for exchanging information and for keeping all those involved in the project – both ashore and at sea – aware of the latest developments. For a variety of reasons production of the first issue of the project newsletter was delayed. However a draft for the first issue will be presented at the current meeting for the project teams consideration. Once approved it is intended to make the newsletter available for download via the project website. Port Met Officers will then be able to download and print copies locally for placing upon project ships.

10. The format for the Certificate of Appreciation (for presentation, unsigned, to ships observers) and the Certificate of Participation (for presentation, signed, to participating ships) was finalized in July 2002, and copies made available for pdf download from the project website. Certification is one of the ingredients necessary to maintain observer's interest in the project. Several framed Certificates of Participation have already been issued to project ships and presentation details will be included in the project newsletters.

11. Although the project is now established in all major respects, and the necessary project tools are in place, there remain a number of issues to be addressed before the project can be considered as being fully operational. Some of these issues are raised in the attachment to this paper (**Appendix**) for the team's consideration.

12. VOSClim-IV takes place immediately prior to the Second International Workshop for Port Met Officers and the second session of the JCOMM Ship Observations Team. There will therefore be an excellent opportunity to further promote the project amongst PMOs and other marine interests, and to forward proposals for their further consideration.

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Appendix: 1

Appendix

Issues remaining to be considered by the Project Team

1 PMO Inspection regimes & cooperation

To ensure regular inspection of project ships preference is normally given to recruiting ships that regularly return to a home port. However, the uncertainties of ship management and chartering mean that ships may change their trading routes with very little notice. This has already happened to a number of project ships. In such cases the observing standards may decline, and it is often difficult to arrange overseas inspections to resolve any observational or instrumentation problems that may arise. Moreover it can delay the download and collection of delayed mode project data.

A more coordinated approach to the inspection of VOSClim ships overseas should therefore be considered and will be the subject of a separate paper.

2 Suitable ships – global coverage

Selecting project ships by targeting those that are on liner trades (i.e. those routinely returning to a home port) limits, to some extent, the level of global spatial coverage being achieved by the project. Many of the best quality observing ships are trading worldwide, and are not therefore being considered for the project. Many tankers and bulk carriers would make excellent candidate ships if it were not for the fact that they are not routinely returning to a home port.

As a consequence there appears to be a predominance of liner trade ships, and notably container ships – which are subject to variable air flows distortions depending on their container stowage arrangements. Consideration should therefore be given to whether there needs to be a wider scope of ship designs participating in the project. Increased international liaison between Port Met Officers would be needed to ensure the active participation of ships that are trading on a worldwide basis.

3 Procedures for resolving observation problems

Although national focal points and PMOs are now responding to monitoring problems identified by the project monitoring statistics, there is currently no mechanism to record the remedial actions that have been taken. Such a mechanism could help to avoid duplication of effort by Port Met Officers and to ensure that problems are rectified at the earliest opportunity. Moreover it could be used to assess any trends that may be developing e.g. double application of the height correction to pressure observations on ships using TurboWin software.

4 Instrumentation – Ships' AWS

Many VOS operators are developing programmes to increase the use of automatic weather systems on their VOS and, already, a quarter of the ships recruited to the VOSClim project are equipped with automatic systems. Bearing in mind that one of the aims of the project is to uncover systematic instrument errors consideration should perhaps be given to maintaining the right 'mix' of manual and automatic instruments.

5 Instrumentation –Wind heights

Although most VOS report wind speed and direction without height correction applied, electronic coding software like TurboWin reduce winds to 10 meters (in accordance with WMO technical guidance). To the users it is not therefore immediately clear whether the winds have been reduced or not. At the last JCOMM SOT session it was, perhaps controversially, suggested that reduced (10m) wind speeds were no longer essential for operational meteorology and that it was more valuable for climate studies if the original wind data were reported. It was therefore agreed that the

WMO guidance should be amended and that a recommendation to this effect should be put forward for consideration at JCOMM-II.

This recommendation, if approved, will have implications for software packages like TurboWin which automatically report the reduced wind. It also highlights the need for observation reports and metadata to include information on whether original wind or the reduced winds values are reported – especially during any transition period. Consideration should therefore be given to how this information might best be obtained in the short term.

6 Metadata Requirements

Although revised metadata codes for vessel types have been drafted since VOSClim III there are several other areas where the metadata coding might benefit from revision. For instance there are no codes for reporting the type of electronic logbooks (e.g. TurboWin, SEAS or OBSJMA) being used or the version of the software. This information is therefore having to be recorded as footnotes to the metadata. Other areas, which could improved, include the communication codes (phGr and prSt) which are rather dated, and the ship route information (which is recorded on a national basis, and does not therefore lend itself to data interrogation).

7 Inspection forms

Transcription of the metadata from the VOSClim inspection reports submitted by Port Met Officers is extremely time consuming. As National Met Services are increasingly faced with limitations on their time and resources it is essential that this metadata can be collected efficiently with the minimum of manual intervention. This is even more important now that the extended metadata requirements apply to all VOS.

The development of electronic inspection forms will help to reduce the effort involved in this task, especially if they directly code the data into the latest metadata format. Digitisation of the metadata should, however, commence at the time of initial collection when the Port Met Officer is on board. It is envisaged that the use of PDA's will assist in this respect.

The current hard-copy VOSClim survey form is entitled a Recruitment/Update/Derecruitment Advice form and, as agreed at VOSClim III, should also be used for routine inspections. However, as this form primarily records only the metadata fields required by WMO Pub 47, and does not include space for barometer check readings, it is not really suitable for routine inspections. National inspection forms therefore tend to be used for routine inspections (as the many of ships' details and metadata will be unchanged from the initial recruitment routine). It is suggested that consideration should be given to developing a separate standard inspection form.

8 Certification – Awards

It is unclear at present how many certificates have been issued to VOSClim observers and ships, or whether project focal points are keeping records of issued certification. However, if every participating observer were to be issued with a certificate of appreciation this could become an onerous task.

It is suggested, therefore, that consideration might be given to developing a common criteria for issuing certification. Consideration might also be given to presenting awards/plaques to the highest quality VOSClim ships/observers.

9 Website

As the website is the main focal point for the project it should clearly promote its aims and aspirations, whilst at the same time providing users with easy access to the necessary data. Furthermore it is essential that ship details, such as call sign changes, be posted on the site at the

earliest opportunity. Access to the metadata (in the latest extended format) and to the digital imagery also remain to be addressed.

Consideration should therefore be given to the possible need for enhancements to the website, bearing in mind that updates should ideally be as automatic as possible.

Inclusion of digital imagery on the website, which includes ship and instrument photos, could represent a significant task as it may require considerable manual intervention. Digital imagery also includes schematic diagrams and ship arrangement plans, which will need to be scanned to digital format. In accordance with the VOSClim recruitment instructions (attached to the report VOSClim III) digital image files should comply with the following naming convention

xxxxxxxxx	IMO Number (a nine digit number, include leading zeros if applicable)
yyyymmdd	Year, month, day
aaa….aaa	Short description of the photo

(Example: 00509066020020123Starboard_Screen.jpg)

10 Future developments – data transmission

The VOSClim project offers an opportunity to act as a model for ordinary VOS, and to test out potential VOS improvements. Consequently, as the project develops, and the as the scientific analysis gets under way, the project team is increasingly going to be in a position to make proposals about the upgrading of ordinary VOS.

For instance consideration could be given to requiring all VOS to report the VOSClim additional delayed mode data. For ships equipped with electronic software like TurboWin this would be relatively simple, and would require little extra work by the observers. Consideration could also be given to possible methods of speeding up the collection of the additional delayed mode data from ships.

Similarly consideration could perhaps be given to speeding up the collection of metadata by transmitting this in real time together with the observation. Whilst this would inevitably increase transmission costs it would allow a direct, uncorrupted stream of data from the acquisition site whilst reducing the downstream involvement of VOS operators ashore. The data might then be fed directly to a central database

Bearing in mind that changes to alphanumeric codes like Ship Code are no longer permitted, consideration could also be given to sending the additional project code groups in BUFR code. Electronic logbooks could then be programmed to automatically code the observation to BUFR ready for transmission. In this regard consideration is already being given to adding a BUFR-encoding module to the TurboWin software programme.

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Annex IV

VOSCLIM: PRELIMINARY SCIENTIFIC RESULTS JULY 2003

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Summary and Status

- The Voluntary Observing Ship (VOS) Climate Project (VOSClim) delayed mode data is not yet available. Therefore no analysis using the delayed mode variables has been possible and we are not able to discuss any issues related to the merging of the real time and delayed mode data streams.
- The collection and dissemination of metadata is not functioning properly. At the time of analysis metadata was not available for all participating countries and the official supply route through the World Meteorological Organisation (WMO) Marine Programme web site is not operational.
- The recent introduction of logging software, such as TurboWin, which height corrects wind speed before transmission means it is vital to have information on the type of logging software used. A standard system for providing this information needs to be established, preferably within the report itself or alternatively in the metadata.
- Although it has been possible to demonstrate some scientific results, more data are required to extend the range of analyses possible. It is particularly desirable that countries such as Japan and the remainder of the European Countries which contribute a significant amount of VOS data (for example France and Russia) should start to recruit ships. It is also important that the United States continues to participate and increases its involvement.
- Although the quality control (ensuring the data collected are of good quality) issues are being adequately covered with routine monitoring and alerts to Port Meteorological Officers, quality assurance (the post-collection flagging of suspect data) has not yet been addressed. If the VOSClim dataset is to be valuable as a high-quality dataset both quality control and quality assurance standards need to be developed along with a strategy for their operational implementation.

- It is desirable to obtain observations from as wide a range of observation types as possible. One of the aims of VOSClim is to assess systematic and random errors in the various types of observations contributing to the VOS as a whole. To this end we need, for example, to recruit more ships using buckets to measure sea surface temperature (SST). The participation of all countries which are significantly involved in the VOS programme would be welcomed.

- It is of some concern that SST is only contained in 75% of observations so far reported in the VOSClim project. It was an aim of VOSClim that ships should report all of the basic surface meteorological variables. For flux calculations the inclusion of all variables in each report is particularly valuable. Historically, humidity variables have often been missing from VOS reports, however they are included in almost all of the VOSClim reports.

- It should be noted that in reports from fully automated systems, variables such as cloud amounts and types which it is not possible to determine automatically are absent. The inclusion of a mechanism to manually input such variables into the synoptic reports should be considered. Wave and swell observations and icing reports are other candidates for manual inclusion.

1. INTRODUCTION

This report describes a very preliminary analysis of the Voluntary Observing Ship Climate Project (VOSClim) dataset. The data has only recently become available and much of the time since has been taken up with reformatting the various datastreams and combining the data and metadata. This preliminary analysis was started before the official VOSClim realtime data was available, the delayed mode data is still not yet available. It was however thought to be important to start the analysis as data have been collected for a couple of years.

The project is the successor to the VOS Special Observing Program - North Atlantic (VSOP-NA, Kent and Taylor 1991, Kent et al. 1993). In the VSOP-NA 46 ships operating in the North Atlantic were recruited and metadata collected. Extra variables were included in the reports which were then merged with model output. The VSOP-NA was a two year experiment. VOSClim is the logical extension to the VSOP-NA. The new project attempts to have global coverage and more ships and, if successful, will become operational. It is hoped that we will be able to determine whether the results of the VSOP-NA are valid for other regions and time periods. The VSOP-NA used the output of a finer resolution model in

both space and time, it is hoped in the present study that improvements in the model physics and numerical implementation will overcome the decrease in resolution.

This report will first describe the VOSClim data and metadata and briefly cover important features of the model output (Section 2). The dataset characteristics (Section 3) and observation types by country are then summarised (Section 4.1). The remainder of Section 4 describes the dataset by variable including summaries of ship minus model differences, ship by ship, and some preliminary scientific investigations. Conclusions are drawn in Section 5.

2. DATA STREAMS

2.1 Real Time Data

The real time data stream consists of Global Telecommunication System (GTS) ship observations from the VOSClim ships which have been merged with output from the Met Office Numerical Weather Prediction (NWP) model by the Met Office (acting as the Real Time Monitoring Centre, RTMC). Monthly summaries are produced giving details of those ships reporting data falling outside quality assurance criteria. Data are forwarded by the RMTC to the NCDC, Asheville, NC; the US National Climatic Data Center acting as the Data Collection Center (DCC). These data are now available from the DCC website[1] in International Marine Meteorological Archive (IMMA) format. However, for the analysis reported here the realtime data were obtained from Scott Woodruff of the Climate Diagnostics Center (CDC) in BUFR (Binary Universal Form for the Representation of Meteorological Data) format and reformatted to NetCDF (Network Common Data Form) using a modification of a program supplied by Colin Parrett of the Met Office. The data converted and analysed cover the period February 2002 to April 2003. In this period there were 40228 VOSClim real time reports, of which 22105 were at the principal reporting hours of 00, 06, 12 and 18 GMT and therefore co-incident with the model output.

2.2 Model Output[2]

The model output used as a comparison standard is the UK Met Office Unified Model forecast. The global model has a horizontal resolution of 0.83° longitude and 0.56° latitude giving an approximate resolution of 60km in mid-latitudes and has 38 levels in the vertical. In the horizontal the u wind components are east-west staggered from temperature and the v wind components are north-south staggered. In the vertical temperature, humidity and vertical velocity are staggered from pressure, density and horizontal wind. The pressure is analysed at the surface, while the wind is nominally at 10m, and the air temperature and

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1 http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html

2 Includes information from the Met Office operational numerical modelling site http://www.met-office.gov.uk/research/nwp/numerical/operational/index.html

relative humidity are at 1.5m. Whereas the surface pressure is a prognostic variable within the model, the model background values for wind, T and relative humidity are produced within the boundary layer scheme used in the model; this incorporates surface stress information and a sophisticated interpolation scheme to produce consistent values for the three variables.

Firstly the observation processing extracts all the observations that have been received, applies quality assurance and reformats them ready for use by the model. External files are then incorporated to update climatological fields and also fields that have their own standalone analysis, such as the SST. The data assimilation scheme is then run. This adjusts the model background field, which is a forecast from a previous model run, towards the new data received from the observations.

The global model is run twice a day to produce forecasts for up to 6 days (144 hours) ahead. These main runs are initialised with data valid at 0000Z and 1200Z and are started at approximately 0305Z and 1505Z respectively. The data assimilation scheme uses observations that have been made within 3 hours of the initial data time, i.e. the 1200Z run uses observations made between 0900Z and 1500Z. To maintain the assimilation cycle, there are intermediate runs with data times of 0600Z and 1800Z, which are run at approximately 1300Z and 0100Z respectively. These only produce forecasts to 9 hours ahead in readiness for the next main run. It can be seen that these are run with a delay of 7 hours from the initial data time whereas the main runs only have a delay of 3 hours. Therefore, to maintain consistency, forecasts from 0000Z and 1200Z are repeated at 0715Z and 1820Z respectively. These forecasts are only to 9 hours ahead and provide the background for the next intermediate run.

The SST field is generated independently from the model as a combination of the previous analysis, climatology and one day's data. It is produced daily from an analysis of SST reports from ships, buoys, ocean profile data and satellite SST from the Advanced Very High Resolution Radiometer (AVHRR) instruments on NOAA-16 and NOAA-17. The SST analysis is nominally assumed to be at a depth of 1 metre. Coefficients are used for the satellite product (determined by calibrating against drifting buoy observations) to convert the AVHRR skin temperature to a bulk temperature, as measured by the ships. The background field for the SST analysis is simply the previous day's analysis, which is first incremented towards the climatological SST field, to ensure that there is always temporal variation of the SST field even if an area is devoid of observations for a substantial period.

More information on the model can be found in Met Office (2002), Lorenc et al. (1991) and Cullen et al. (1997).

2.3 Delayed Mode Data

Delayed mode data will be available from the website hosted at the DCC in IMMA format but were not available in time to be included in the analyses presented here. Delayed mode data are collected from the ships and forwarded to the Global Collecting Centers (GCCs) from where it is sent to the DCC. The delayed mode report (which would formerly have been a logbook report) contains extra parameters requested as part of the VOSClim project. The extra parameters are ships heading, speed and course at the time of the observation, the height of the deck cargo above the summer load line and the departure of the load line from the water level and the relative wind speed and direction at the observation time. The requirement for a delayed mode data stream followed the refusal of the WMO Commission for Basic Systems (CBS) to allow the extension of the ship code for the reporting of these extra parameters in a special VOSClim group.

2.4 Metadata

Vital to the success of the project is the availability of metadata describing the participating ships' characteristics, meteorological instruments and observing practice. It was planned that the WMO should provide the metadata, but to date they have been unable to do so. The VOSClim metadata have therefore been processed at SOC as an interim measure.

The priority of the WMO Marine Meteorology and Oceanography Program has been to fulfil their obligations to provide current VOS metadata in an operational mode to participating countries. Unfortunately there are few resources left to provide historical metadata to the climate research community who are increasingly realising the importance of associating metadata with individual ship observations in climate databases such as the International-Comprehensive Ocean Atmosphere Data Set (I-COADS, Diaz et al. 2002, Woodruff et al 1998). Whilst the familiar orange publication "List of Selected, Supplementary and Auxiliary Ships" (e.g. WMO 1994) has continued in production, electronic text files containing the ship metadata are no longer regularly available. Annual electronic files were available for the period 1973 to 1997, quarterly files for 1998 and the first quarter of 1999. Since then only one file has been made available (the last quarter of 2001). In 2002 an extended metadata format was introduced which was later adopted by the VOSClim project as its metadata standard. Unfortunately the WMO have not yet been able to provide electronic data in this new format.

Raw metadata files from individual countries were provided to SOC by the WMO in a semicolon-delimited format for the countries participating in VOSClim, some in the old short format and some in the extended format. Metadata was also provided in other formats by some participating countries (e.g. Canada). These were combined with the short format file for the end of 2001 to give metadata information for most of the VOSClim ships. Extensible Markup Language (XML) format was chosen for the output database. Pictures of many of the

ships and instrument locations are available for reference if required to help interpret the results of the analysis. In addition metadata from the Lloyds register of shipping have been purchased and have been combined with the WMO metadata. The Lloyds register information has restricted access and cannot be provided to users outside SOC.

2.5 Combined Dataset

Due to the non-availability of the delayed mode data no fully combined dataset of realtime, delayed mode and metadata has yet been developed. However the realtime data and WMO and Lloyds metadata have been merged to provide details of instrumentation, observation heights and methods and information about the ship itself for individual reports.

3. DATASET CHARACTERISTICS

3.1 Distribution of Reports

Over 40,000 VOSClim realtime reports have been collected by 75 different ships from 7 countries (Australia, Canada, Germany, India, the Netherlands, UK and US) and merged with output of the Met Office NWP Model. Of these 40,000 reports just over half are made at the major reporting hours (00, 06, 12 and 18 UTC) and are therefore co-incident with model output (Figure 1). Several ships are making reports at the intermediate reporting hours (03, 09, 15 and 21 UTC). The remainder are largely from the Canadian automated systems that make hourly reports. Whilst all the reports are an important contribution to the high quality dataset, the reports co-incident with model output are particularly valuable for the assessment of VOS data quality.

The realtime reports show a wide geographical coverage (Figure 2). Whilst the coverage has similarities to that of typical VOS reports there are a large number of reports in the Canadian Arctic and perhaps some evidence of a slightly more uniform global distribution than for the entire VOS. Figure 3 shows the number of reports per month between February 2002 and April 2003. Reports are still being collected but reports after April 2003 have not been analysed here. Figure 4 shows the reports received from each ship over the analysis period and shows when different countries started providing data to VOSClim.

4. Preliminary Analysis

4.1 Introduction

Although the delayed mode parameters are not yet available some preliminary analysis using only the combined realtime data and metadata is possible.

Table 1 shows the reporting characteristics for the countries providing data between February 2002 and April 2003. Appendix 1 summarises the metadata for each of the ships. Canada has provided the most reports from its 13 ships, which are mostly coastguard and research vessels and icebreakers with automated systems giving hourly reports. Figure 5

shows that the majority of the reports are in high latitudes near the Canadian coast. These ships are small, all less than 100m length. There are also three Canadian merchant vessels.

	Total Reports	Pressure	Wind Speed	Wind Direction	Air Temp.	SST	Humidity	Cloud Cover
		%	%	%	%	%	%	%
Australia	2530	99.8	99.7	99.7	99.8	57.8	99.6	98.5
Canada	25536	99.9	100.0	100.0	99.8	63.0	95.3	6.4
GB	9617	99.8	99.8	99.8	99.7	97.9	99.1	96.2
Germany	819	100.0	100.0	100.0	99.5	99.0	99.4	88.5
India	1281	99.1	99.7	99.5	99.6	38.6	85.6	95.9
Netherlands	122	100.0	99.2	99.2	100.0	42.6	99.2	96.7
US	307	99.3	100.0	100.0	99.7	34.5	0.3	96.4

Table 1: Reporting Characteristics by Country. The total number of reports for each country is given along with the percentage of those reports that contain each of the main meteorological variables.

The Canadian ships usually report pressure, wind speed and direction with every report, humidity 95% of the time but SST in only 63% of the reports. A particular concern with the automated reports is the lack of cloud cover information, which is traditionally a manual observation. The cloud cover is used make estimates of solar radiation that are needed to correct daytime air temperature measurements (see Section 4.3) so it is important that cloud cover variables continue to be reported. Alternatively long and shortwave radiation sensors could be installed to directly measure the radiative fluxes. All the Canadian ships report anemometer winds[3] at heights between 11 and 28 metres, use screens to measure the air temperature and only one uses a bucket to measure the SST, the others using hull contact sensors or the HATS (High Accuracy Temperature Sensor) system. The logging software has been written especially for the automated systems and no height correction is applied to the data transmitted (R Fordyce pers. comm.).

Great Britain contributes the next greatest volume of reports from 25 recruited ships that are mostly container ships but with some refrigerated cargo ships, cruise liners and research vessels. The coverage is good with reports being made in all ocean basins (Figure 5). The

[3] Information about the method of wind speed measurement described in this section has been derived from the real time data. This was necessary as the WMO metadata format does not include information about whether the ship reports visual or anemometer winds. The wind flag from the data file was extracted for each report and summarised for each ship to give the predominant reported measurement method.

British ships report all of the variables consistently. All the ships predominantly report visual winds and the air temperature and humidity measured in screens. There is a mixture of SST methods with hull contact sensors being the most common (following the implementation of recommendations from the VSOP-NA) but with a significant number of ships using engine intake thermometers or buckets. The British ships are using the TurboWin logging software. Although most British wind reports are visual there is a significant minority of anemometer reports and the TurboWin software will have adjusted these to 10 metres height before transmission.

The six Australian ships are a mixture of different types of merchant ship ranging in size from 100 to 300 metres length. As expected most operate in the Western Pacific and Indian Oceans (Figure 5). All of them report mostly visual winds and use screens to measure the air temperature and humidity. Half of the Australian ships report bucket SST and half engine intake SST. All variables are reported consistently except SST which is reported just over half of the time. The logging software is TurboWin so any anemometer-derived wind speeds will have been corrected to 10 metres height.

Indian ships are a mixture of different merchant ships typically about 200 metres in length. Most reports are in the Northern Indian Ocean, Western Pacific and through to the Mediterranean. They consistently report pressure, winds, temperature and cloud cover. Humidity is contained in 85% of the reports but SST in less than 40%. There was no metadata file available in time to be included in the analysis so Appendix 1 contains little information about these ships. However they mostly report visual winds and earlier metadata suggests they use whirling psychrometers to measure air temperature and humidity.

The six German ships are all container ships about 300 metres in length. Reports have been received from the North Pacific and routes through from Northern Europe to the Pacific via the Indian Ocean (Figure 5). They all report visual winds, engine intake SST and use sling psychrometers to measure the air temperature and humidity (Appendix 1). Data logging uses TurboWin software.

The US ships have only recently been recruited (see Figure 4) but are all container ships and appear to be sister ships reporting in the Pacific. Winds are a mixture of visual and anemometer, SSTs are measured using engine intake thermometers and most use sling psychrometers to measure the air temperature and humidity although one uses a screen. Again no new metadata was available so information about instrumentation has been taken from metadata current at the end of 2001. It is believed that the US ships use the SEAS logging program and that no height corrections are applied to the transmitted data.

The sole Netherlands ship is the Research Vessel Pelagia, which reports all variables consistently except SST (43%). Reports have been received from the Eastern North Atlantic. It reports visual winds, engine intake SST and screen air temperature and humidities. The type of logging software is unknown but is expected to be TurboWin.

This simple breakdown of the percentage of the reports containing each variable has highlighted two important issues. Historically, in the VOS as a whole, humidity has been the most poorly reported variable with just over half of reports containing all of the variables necessary to calculate latent heat flux. However in the VOSClim subset the problem variables seems to be SST with three countries reporting SST less than half of the time and two countries about 60% of the time. Britain and Germany are the only countries reporting SST consistently. Apart from the US ships, humidity is contained in almost all of the VOSClim reports. The other issue is the lack of cloud cover variables with automatic reports that was noted earlier when discussing the reports from Canadian vessels.

4.2 SST

Figure 6a summarises the reported ship SST difference from the model for each of the ships contributing data in the analysis period. The largest differences are for Canadian ships. This can be attributed to the region they are operating in (Figure 5) and their hourly reporting. In the Canadian high latitudes the model may not be performing well in regions where there is sea ice. In addition any reports that are not co-incident in time with the model output will have larger random errors. These effects can be eliminated by only analysing 6-hourly reports and excluding any data for which the model 'surface type' indicator does not have the value 'sea'. This will also exclude any data close to land where the model output will not be representative of the marine environment sampled by the ship. The remaining data is plotted in Figure 6b. All the data from several Canadian ships has been excluded and the ship data and model output are more consistent. Most of the ships report SST to within ±1°C of the model but some differences are as much as 4°C. It should be noted that real time monitoring of the data takes place and any ships consistently reporting biased values will be visited by PMOs and their instruments and observing practices checked. The British ship with the largest bias reported data only up to May 2002 when the monitoring process was spinning up. SST from most of the British and German ships agrees fairly well with the model. The Canadian and Australian reports are more scattered but this may be partly due to problems in the model, in high latitude regions or in data sparse regions. Only three Indian ships report SST and two of these have biases of more than 2°C. The US ships report SST infrequently, only half reporting any data and these being very scattered, the averages having been made up from only a few values.

On average the SST is 0.3°C warmer than the model with a standard deviation of 1.4°C. For bucket SST (927 reports) the mean bias (observation - model) is -0.4 ± 1.5 °C, for engine

intake SST 0.4±1.5°C (9598 reports) and for hull contact sensors 0.4±1.2°C (6218 reports). These figures should be interpreted with care. There are few bucket reports, one third of which come from a single ship. If we believe that hull sensor SST is the best quality this would suggest that the model SST field may be a few tenths cold. Recent analysis of I-COADS SST in the period 1970 to 1997 suggests that engine intake SSTs have improved in quality over this period (Kent 2002) and do not show the previously observed bias (Saur 1963, James and Fox 1972). This work is ongoing (Kent and Taylor 2003, Kent and Challenor 2003 and Kent and Kaplan 2003) but the bias between the hull sensors and engine intakes in the present study is small and therefore supports this conclusion to some extent. In this simple comparison we have not yet analysed the possible effect of different methods being used in different regions, and of any non-independence of VOS and model SST.

Figure 7 shows histograms of the difference between ship and model SST for reports identified from the in-file metadata as engine intake (black), bucket (red) and hull sensor (blue). SST from bucket reports is more often colder than the model SST, that from engine intakes and hull sensors often warmer. There is some evidence of a warm tail in the engine intake SST compared to the hull sensors and this may be due to warming of the intake water by the ships engines. The bucket SST is colder and has a cold tail, this may be evidence of cooling of the water in the bucket in conditions of strong heat loss.

4.3 Air Temperature

Figure 8 shows the average ship - model air temperature differences for each ship in the same format as Figure 5b. Again only data co-incident in time with the model and for ocean-only areas are used. All of the ships report air temperature, on average, to within ±2°C of the model prediction and most to within ±1°C. Although the biases between ship and model values are typically smaller for air temperature than for SST the standard deviations of the differences are greater which may be indicative of greater small scale variability or poorer model predictions of air temperature. VOS air temperature values are not assimilated into the global model, however if the ship also takes temperature profiles using radiosondes as part of the Automated Shipboard Aerological Programme (ASAP) then the surface values from that ship will have been assimilated into the model.

Figure 9 shows the well-known diurnal heating error in VOS air temperature observations demonstrated using observations between 20°S and 20°N. The difference between VOS and model air temperature has been plotted as a function of local time of day (grey crosses). Also plotted are two-hourly averages of the same data (black squares). Midday heating errors, due to solar heating of the sensor environment in poorly ventilated conditions, are typically greater than 1°C for this tropical subset of data. There is also evidence of heat storage by the ship as the differences are slightly greater in the afternoon

than in the morning. Work is ongoing to develop a correction for these errors which we can use to recover the daytime temperatures (Berry et al. 2003).

Air temperatures on the VOSClim ships are measured at heights between 3.5 and 37 metres. They therefore need to be adjusted for the temperature gradient in the lower atmosphere and corrected to a common height, usually 10 metres. The model air temperature is nominally at 1.5 metres and so the ship air temperatures have been typically reduced to 10 metres (and therefore warmed) and the model air temperatures raised to 10 metres (and therefore cooled). The mean difference before height correction is 0.2±1.5°C, for nighttime air temperatures the difference is -0.2±1.3°C. After height correction the differences are 0.5±1.4°C for all data and 0.2±1.2°C for nighttime data. It should be noted that at low levels in the atmosphere the gradients in both temperature and humidity are large so height correction from 1.5 to 10 metres may be introducing some quite large errors into the model data.

4.4 Humidity

Figure 10a shows the relative humidity difference from the model for each ship and Figure 10b the specific humidity differences. The ships usually report dewpoint temperature and the model humidity variable is relative humidity so specific humidity has been calculated for both model and ship data. Several of the ships do not measure humidity but, in this time period, have contributed only a few observations so the percentage of reports containing humidity is high (Section 4.1). Ship specific humidities are 0.4±1.5 g kg^{-1} higher than the model. Following height correction (from the height of air temperature measurement for the ships and from 1.5 metres for the model) to 10 metres the differences increase to 1.1±1.8 kg^{-1}. The VSOP-NA results suggested that the ships were overestimating the humidity (Kent et al. 1993) and this seems to be confirmed by the VOSClim ships. If the atmospheric humidity is overestimated then the heat loss from the ocean by evaporation will be underestimated which is supported by the results of heat budget studies using VOS data (Josey et al. 1999).

4.5 Pressure

Most of the ships report pressure on average to within ±2 mb of the model prediction (Figure 11). Pressures from the VOS are assimilated into the model so the model and ship pressures are not independent. The mean bias between the ships and the model was 0.3±1.8mb (ship pressures slightly higher than model pressures). For digital aneroid barometers (13201 reports) the mean bias was 0.4±0.8mb, for aneroid barometers (1074 reports) 0.2±1.7mb, for mercury barometers (257 reports) 0.9±2.8mb and for ships' aneroid barometers (555 reports) 0.3±2.3mb. Digital aneroid barometers seem to give pressures most consistent with the model and make up over 90% of observations in this dataset. Although numbers of observations are small, the mercury barometer does not seem to perform very well.

Pressure should be corrected for height and temperature on the ship, either by the ships officers or by the logging program. Figure 12a shows the mean pressure difference from the model averaged by the height of the barometer. There is no evidence for systematic under or over correction.

Figure 12b shows the mean pressure difference from the model, averaged in ranges of the model wind speed at the time of the observation. At wind speeds above about 8 ms^{-1} there is some evidence for a systematic reduction of the ships pressure but at lower wind speeds results are more scattered. These results will need further careful analysis as we know that occurrences of low pressure are correlated with the occurrence of high wind speeds so we need to ensure that we are not aliasing other effects in our analysis. However this may indicate an under prediction of the model pressure and may be related to the model resolution.

4.6 Wind Speed

Figure 13 shows the mean ship - model wind speed as reported for each of the ships. Although the scatter is large the mean winds are usually within 2ms^{-1} of the model prediction. There are a few ships reporting very biased wind speeds. The model wind speed is nominally a 10 metre value and the ships which use anemometers have anemometer heights between 11 and 51 metres. The mean difference between ship and model wind speeds is 0.8±2.8 ms^{-1}. This bias is the same for both visual and anemometer winds. If the winds are height adjusted to 10 metres using the anemometer heights from the metadata the mean difference reduces slightly to 0.4±2.7 ms^{-1}.

It has in the past not thought to be important to height correct VOS wind speeds before assimilation into weather forecast models, wind speeds from ships are given a low priority in assimilation schemes. Wind speeds have therefore traditionally been reported at the measurement height. For climate studies errors of the size of the height correction are important and observed trends in wind speed have been attributed to the increasing height of anemometer on merchant ships (e.g. Cardone et al. 1990). Climate researchers have for several years been height correcting the winds in I-COADS using the metadata contained in WMO Report No. 47 (e.g. Kent and Taylor 1997) although it should be noted that this metadata has not recently been reliably available, see Section 2.4). However, a WMO report (Shearman and Zelenko 1989) recommended that VOS winds should be corrected on board to 10 metres height using a neutral stability formulation. It is believed that this recommendation was not generally implemented until version 2.1 of the TurboWin logging software applied a correction to the wind speed (Martin Stam pers. comm.). We now have the situation that some GTS wind speed reports have been already been corrected to 10 metres and some have not, depending on the type and version of the logging software used on the ship. There is no indicator value for this contained within the report. Presently there is no dedicated space in the metadata format for the type of logging software as in the mid-1990s

when the revised metadata format was developed this development was not anticipated. Details of the logging software are requested in the VOSClim ship recruitment form which has been adopted by the VOS as a whole. This information has been included in the metadata format as a footnote but it would be better if one of the footnote columns could be dedicated for this important information.

Figure 14 shows the ship wind speed averaged in ranges of model wind speed separately for visual and anemometer reports. At low wind speeds the ship winds are higher than the model winds. This is an artefact of the averaging process and is well understood (Hinton and Wylie 1985). In all model wind speed ranges the visual winds are higher than the model winds. No adjustment to the Beaufort Scale has been applied but the differences between the anemometer and visual winds in this study are slightly smaller than adjustments commonly used (e.g. Lindau 1995). In the mid wind speed range, where the averaging process works best the height corrected winds are very close to (but slightly below) the model winds speeds. At high wind speeds the averaging process would tend to force the ship winds to be lower than the model winds. Since the ship winds are higher than the model winds, it seems likely that differences between the model and both visual and anemometer winds are significant and that the model is probably under predicting the higher wind speeds.

5. Conclusions

The VOSClim data has been collected for over two years and the analysis of a little over a year's data has been described in this report. The real time data is now available from the DCC website although an alternate dataset which was available earlier was analysed here. Delayed mode data has been sent from the GCCs to the DCC but has not yet been made available on the DCC website. For a fuller scientific analysis it will be necessary to combine the two datasets. At the moment it is not clear how difficult it will be to identify the same reports from the two datastreams which have been subject to different logging, transmission, quality assurance and formats.

A major problem is the non-availability of extended format metadata from the WMO. Indeed, it seems possible that metadata for the 1950s will be digitised through a US initiative and made available to the climate community before that for 1999 to 2003 becomes available from the WMO. This is not a problem that is specific to VOSClim, climate researchers and NWP centers more generally are suffering because these metadata are not being made available promptly. It is vital that more resources are made available for the metadatabase and that the priority of both historical and current metadata for climate studies is raised.

Some scientific analysis of the dataset has been possible in the time available. It has been possible to demonstrate that the random errors in the combined ship and model dataset are small enough to allow the examination of, for example, radiative heating errors in the

ship's air temperatures and differences between SST measured using different methods. However, in the limited time available it has not been possible to perform rigorous analyses allowing for regional effects and any possible errors in the model.

VOSClim has two main aims and it is important that both these are realised. The first is the creation of a high quality dataset with known error characteristics for use in climate and data validation studies. It is therefore important that both quality control and quality assurance criteria are developed and implemented. It is vital that both the scatter and the bias present in the reports are quantified. It is the determination of these errors that is the second aim of VOSClim

At SOC we have obtained some funding from the UK Ministry of Defence (through the Met Office) to allow the further analysis of the VOSClim dataset. This is timetabled to run from early 2004 till mid 2005. Consideration needs to be given to the priorities and funding both for scientific analysis of the data and the development of the VOSClim datastreams into a high quality dataset for research.

ACKNOWLEDGEMENTS

Valuable help and information for this report has been provided by Ron Fordyce, Elanor Gowland, Daniel Mans, David McShane, Sarah North, Colin Parrett, Martin Stam and Scott Woodruff. We also acknowledge use of the Ferret program for analysis and graphics in this paper. Ferret is a product of NOAA's Pacific Marine Environmental Laboratory. (Information is available at www.ferret.noaa.gov)

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FIGURES

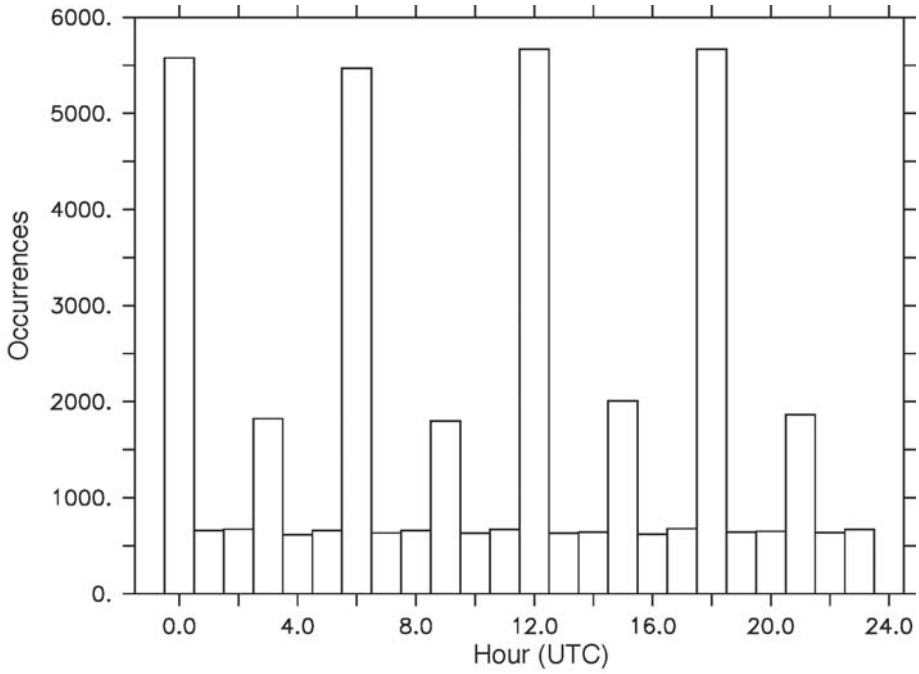

Figure 1: Histogram of reporting hours for realtime data for the period February 2002 to April 2003.

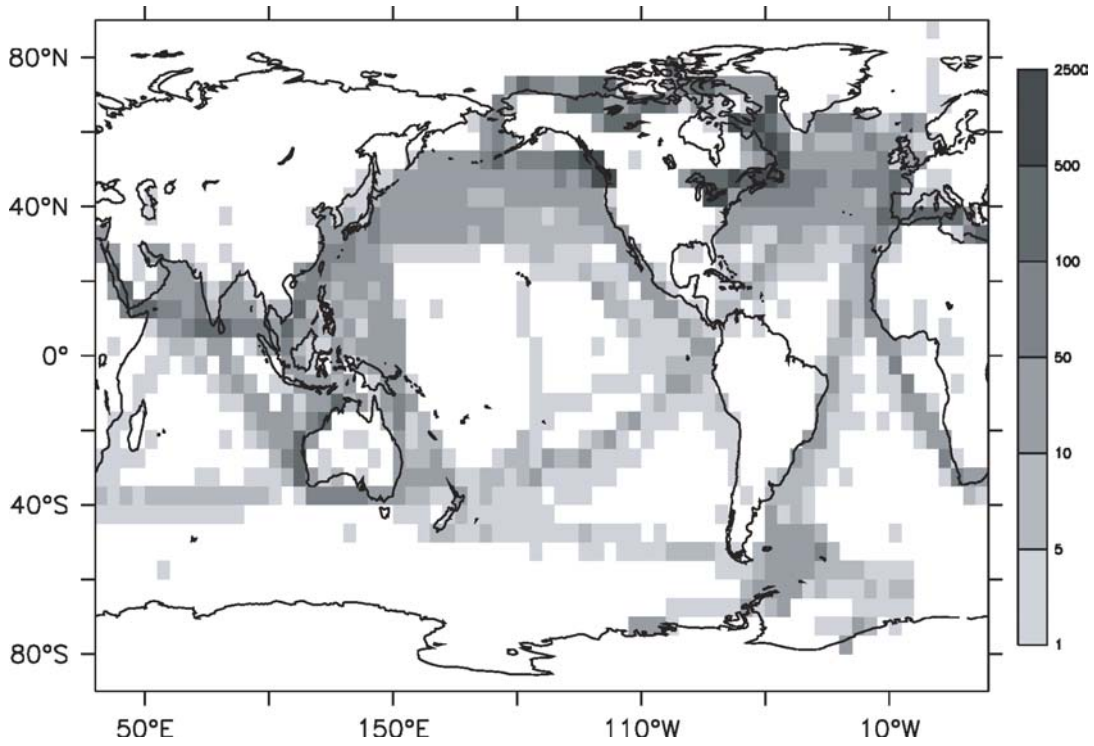

Figure 2: Map of 5° observation density for realtime data for period February 2002 to April 2003.

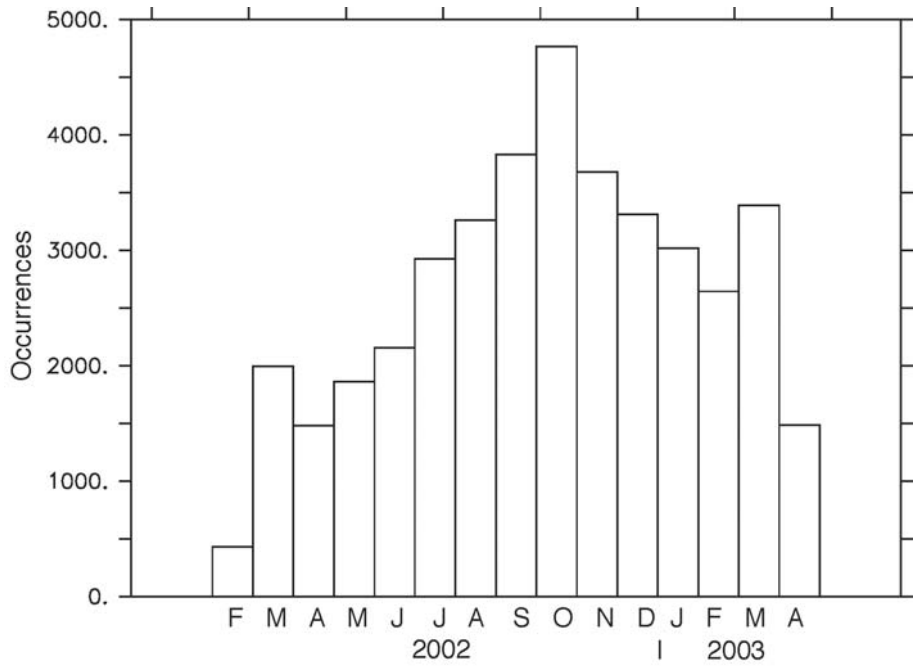

Figure 3: **Histogram of number of reports per month for the period February 2002 to April 2003.**

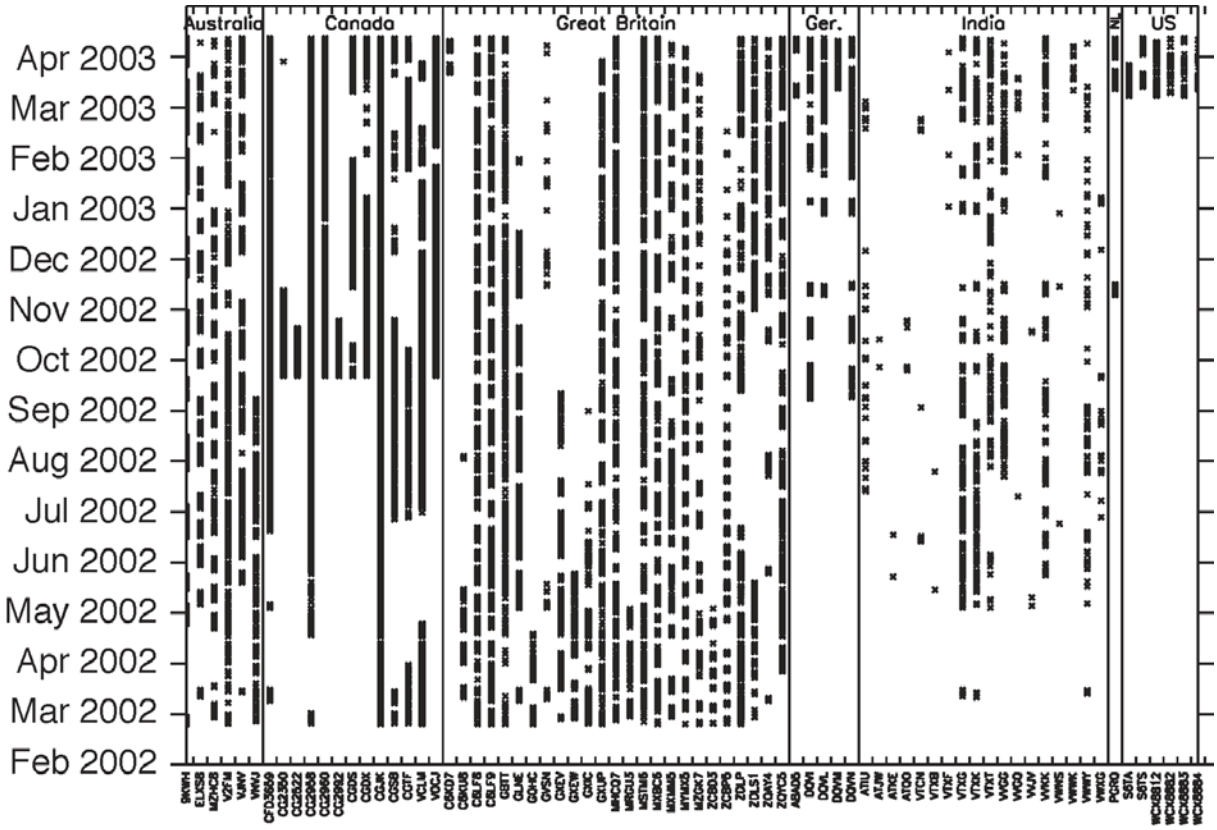

Figure 4: **Breakdown of reporting times for individual ships and countries.**

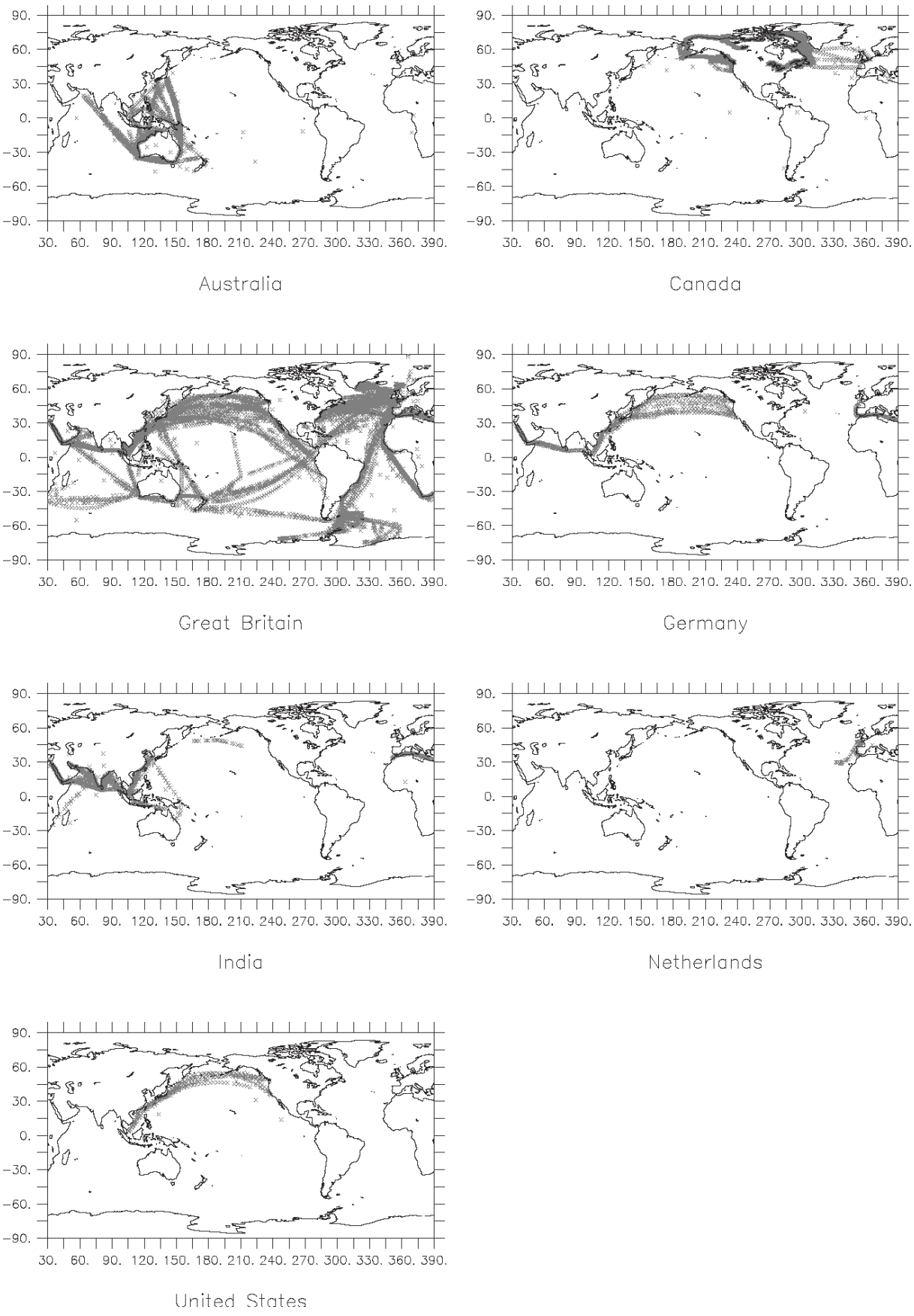

Figure 5: Global distribution of reports by country for the period February 2002 to April 2003.

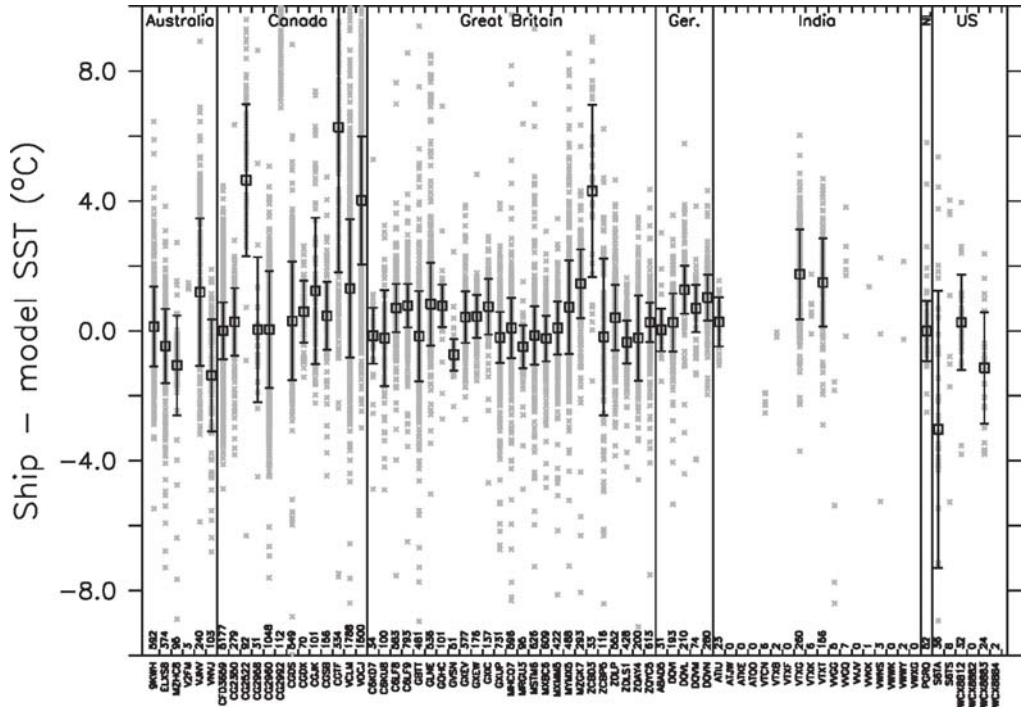

Figure 6a: **Comparison of SST data from ship and model. The mean and standard deviation of SST difference (ship - model, °C) is plotted for each ship, indicated by callsign. The individual data points are also shown and the number of points given. All data has been used. The error bars represent the standard deviation of the data.**

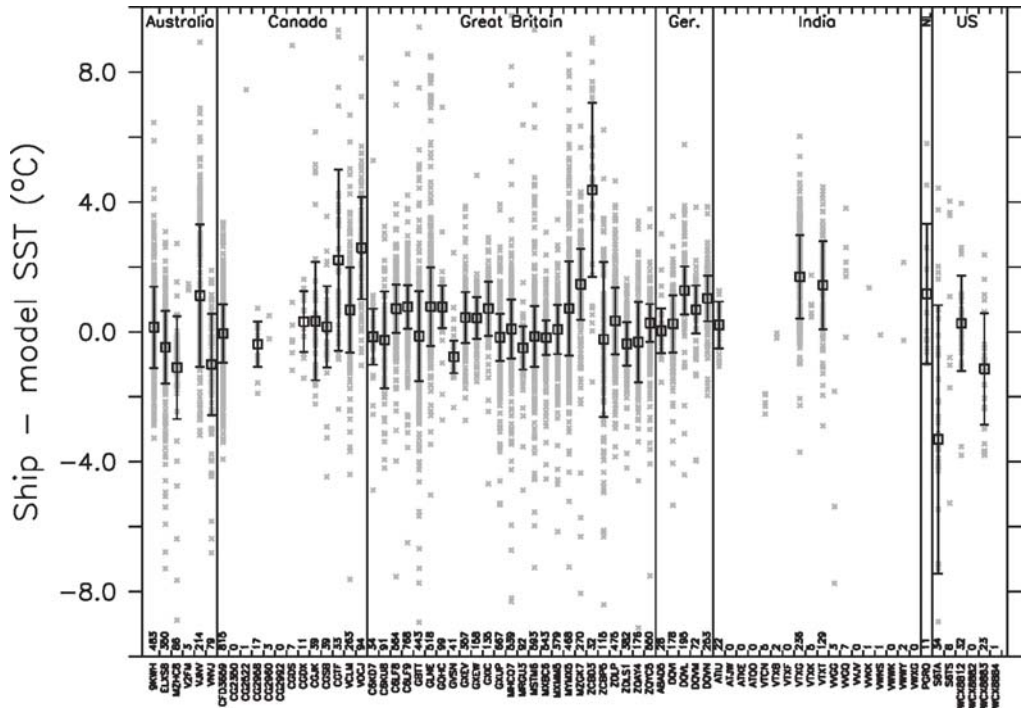

Figure 6b: **As Figure 5a but only for SST reports for which the model surface type is 'sea' and for reports co-incident with model times.**

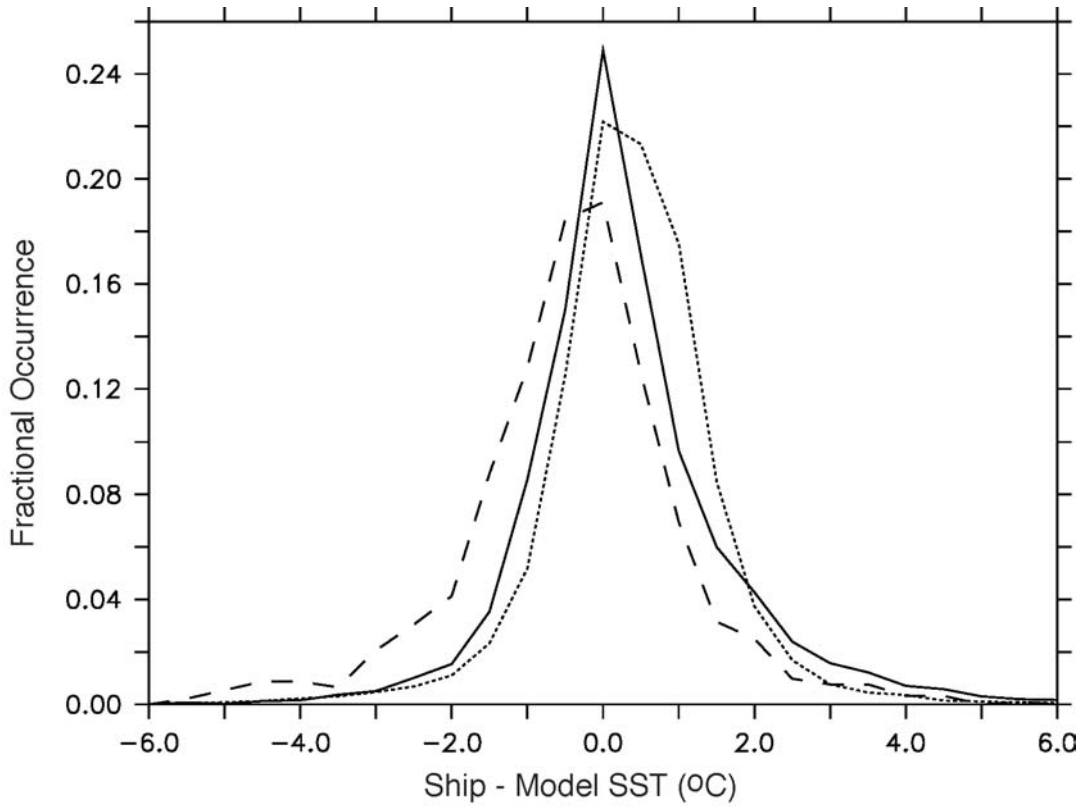

Figure 7: **Histogram of ship - model SST differences for different types of observation method. Solid = engine intake, long dash = bucket and dotted = hull sensor. The metadata used is that contained in the file only.**

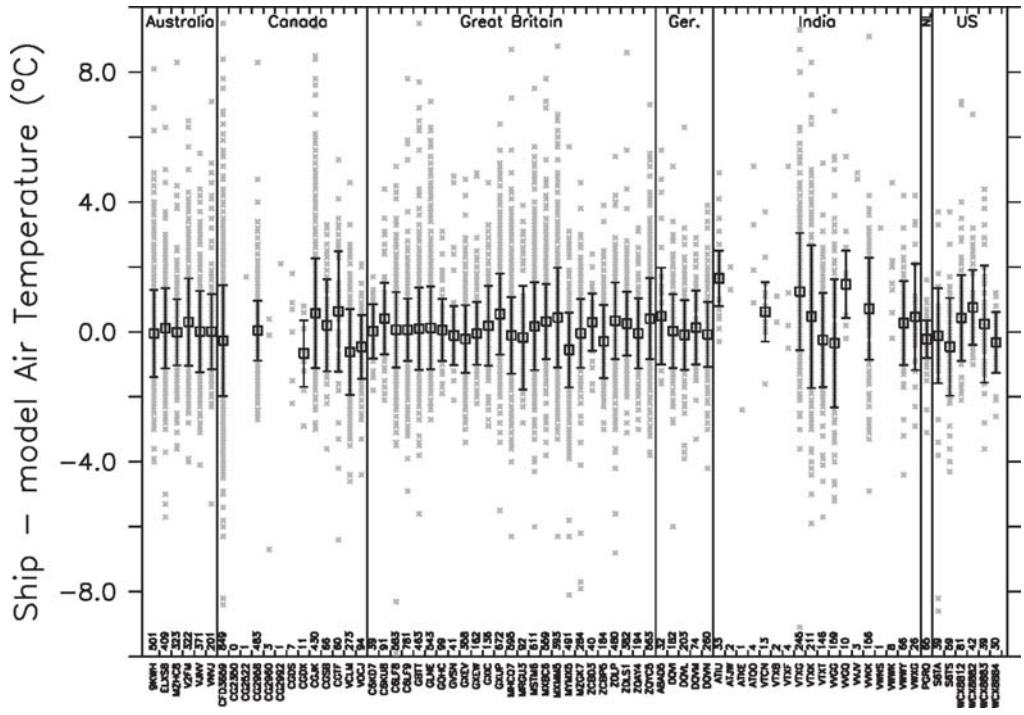

Figure 8: **As Figure 6b but for ship - model air temperatures from the VOSClim ships. No height correction has been applied.**

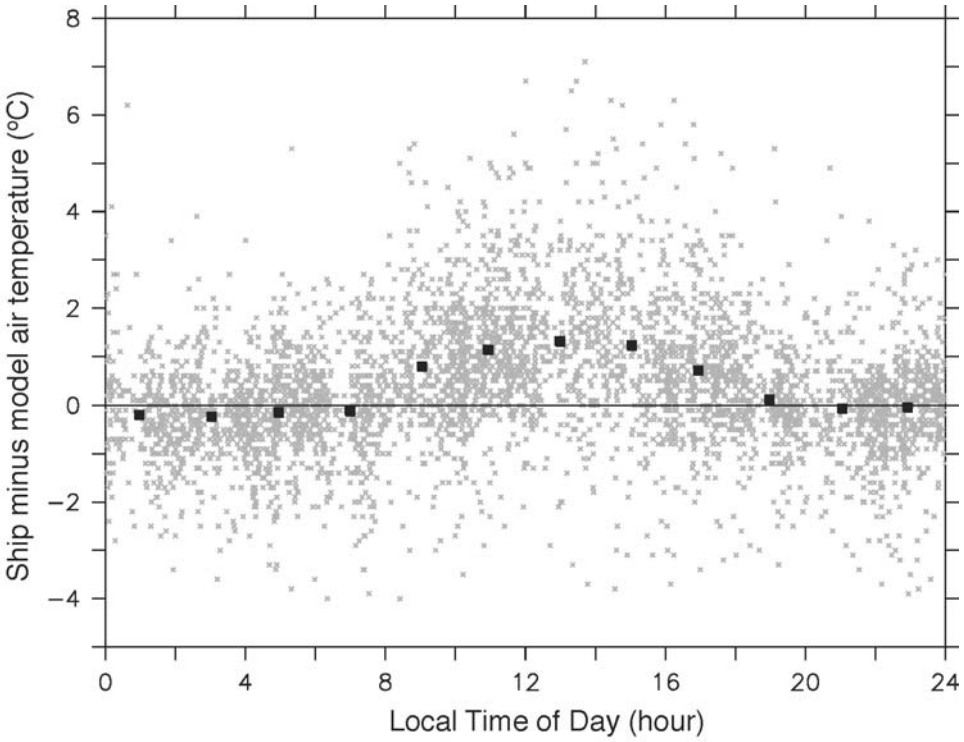

Figure 9: **Ship - model air temperature difference (°C) plotted against local time of day for VOSClim observations between 20°S and 20°N. No height correction has been applied.**

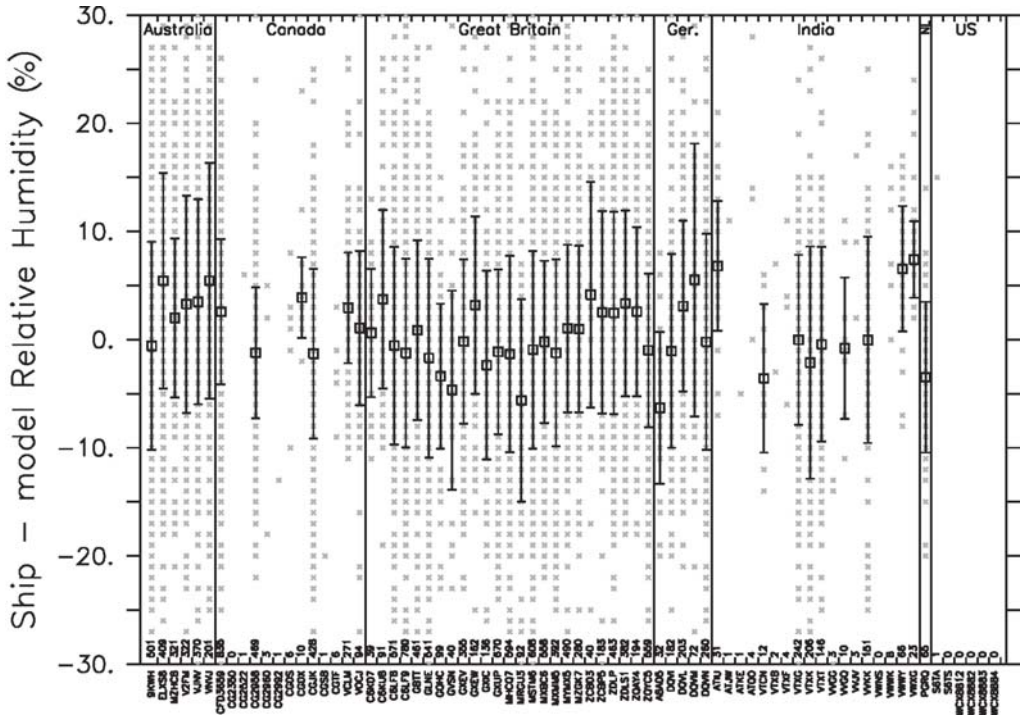

Figure 10a: **As Figure 6b but for ship - model air relative humidity (%). Humidity has not been corrected for height.**

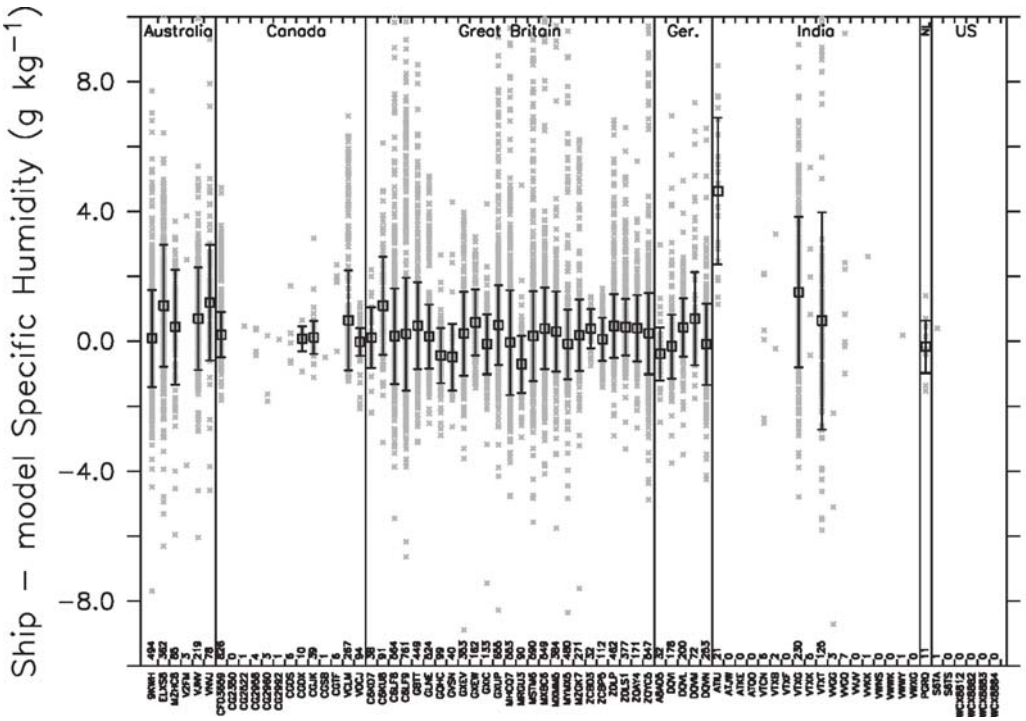

Figure 10b: As Figure 6b but for ship - model specific humidity (g kg^{-1}). Humidity has not been corrected for height.

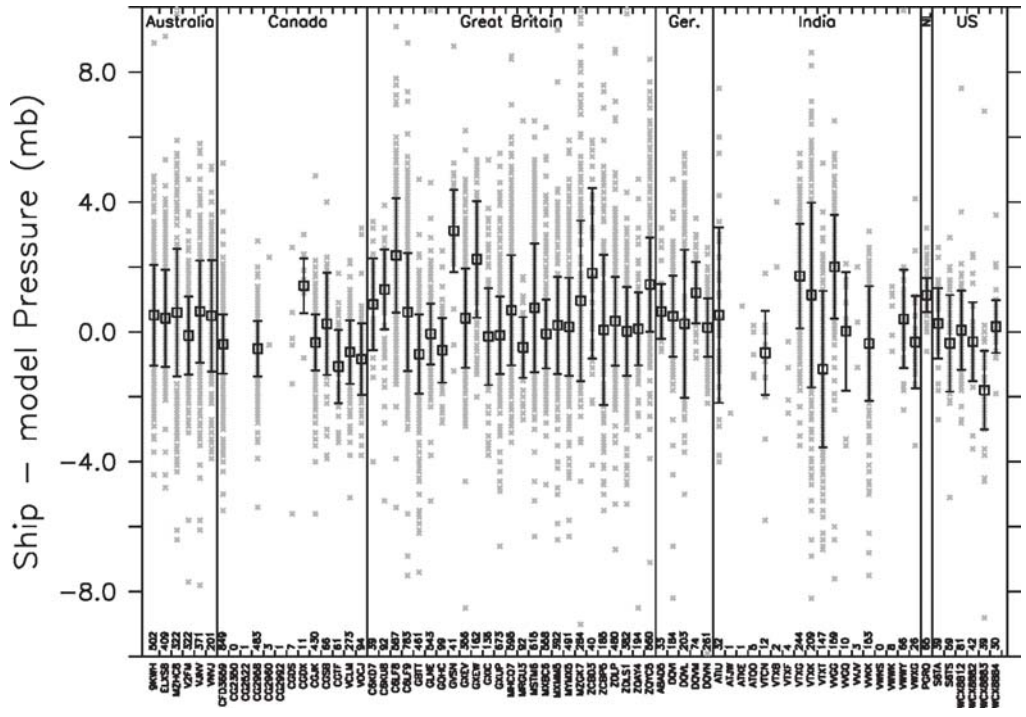

Figure 11: As Figure 6b but for ship - model pressure differences (mb).

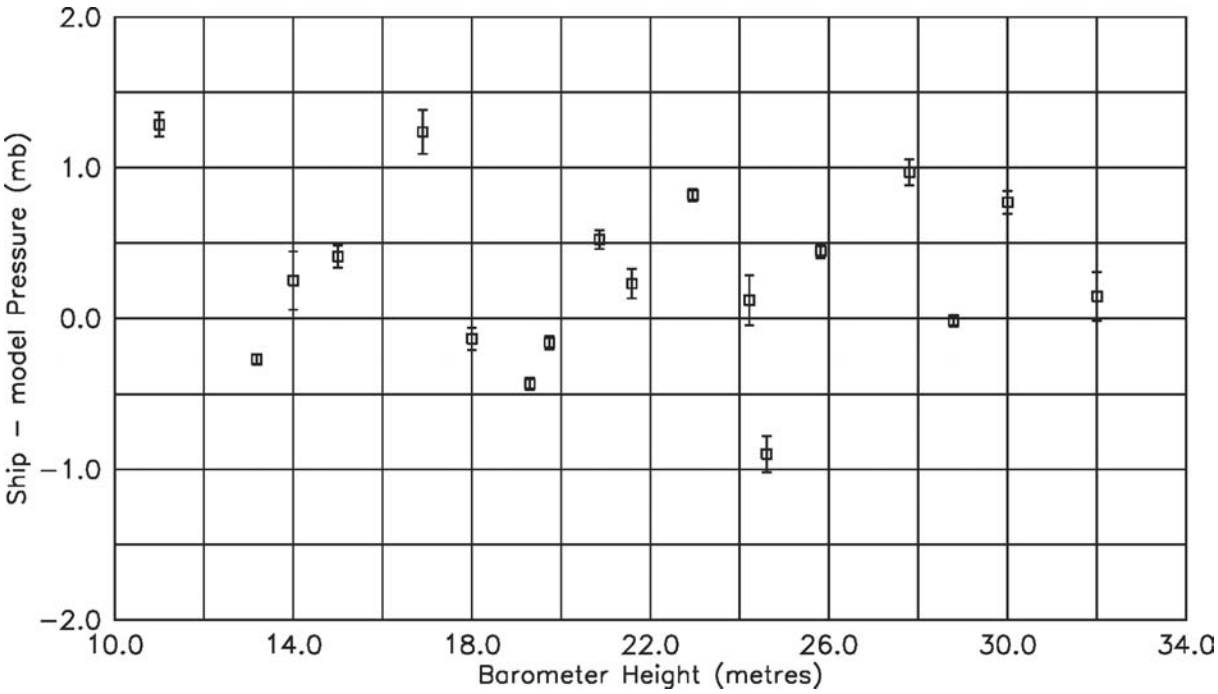

Figure 12a: Ship - model pressures (mb) averaged against the height of the barometer (metres). The error bars represent the standard deviation of the data.

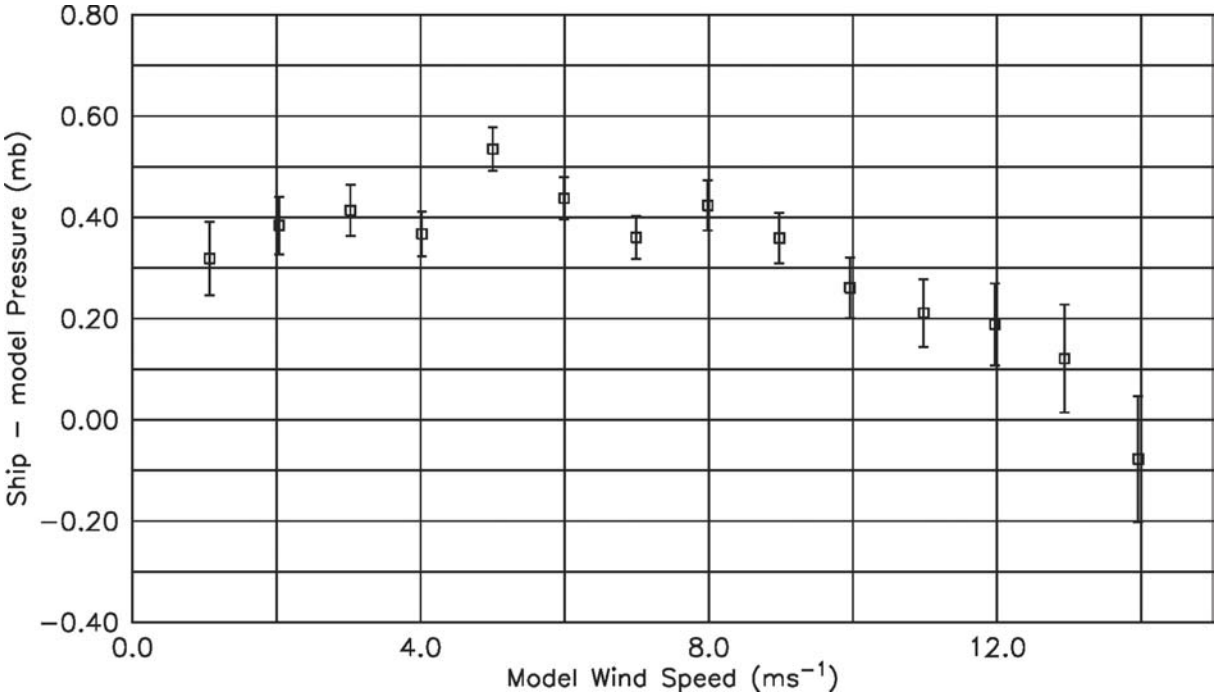

Figure 12b: Ship - model pressures (mb) averaged against the model wind speed (ms^{-1}). The error bars represent the standard deviation of the data.

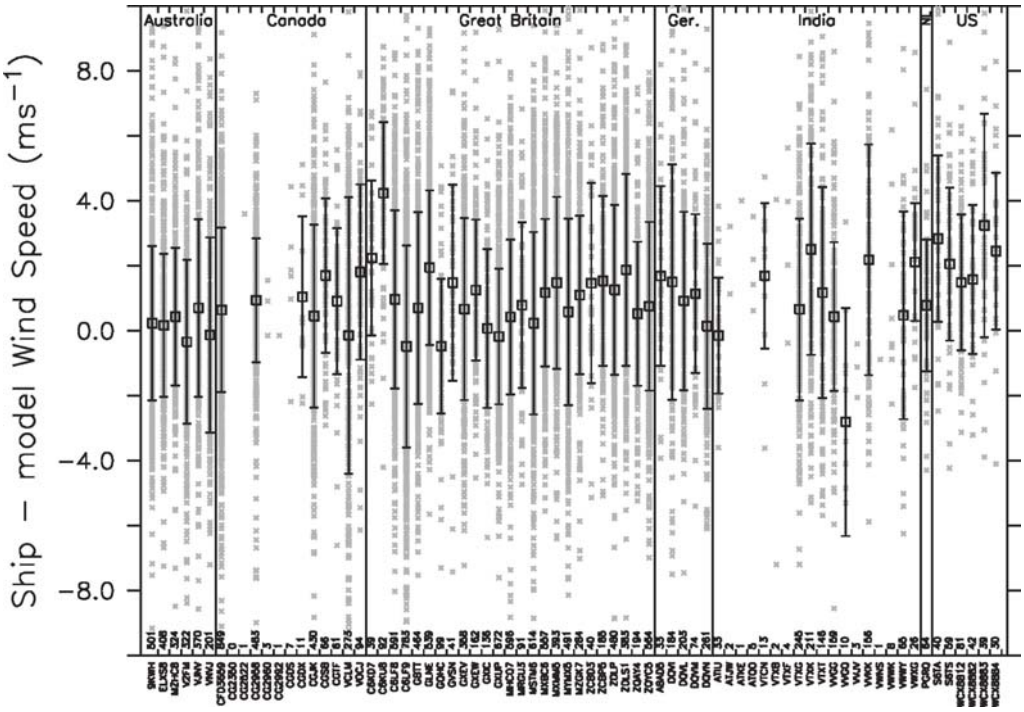

Figure 13: **As Figure 6b but for ship - model wind speed (ms^{-1}). Wind speeds have not been corrected for height.**

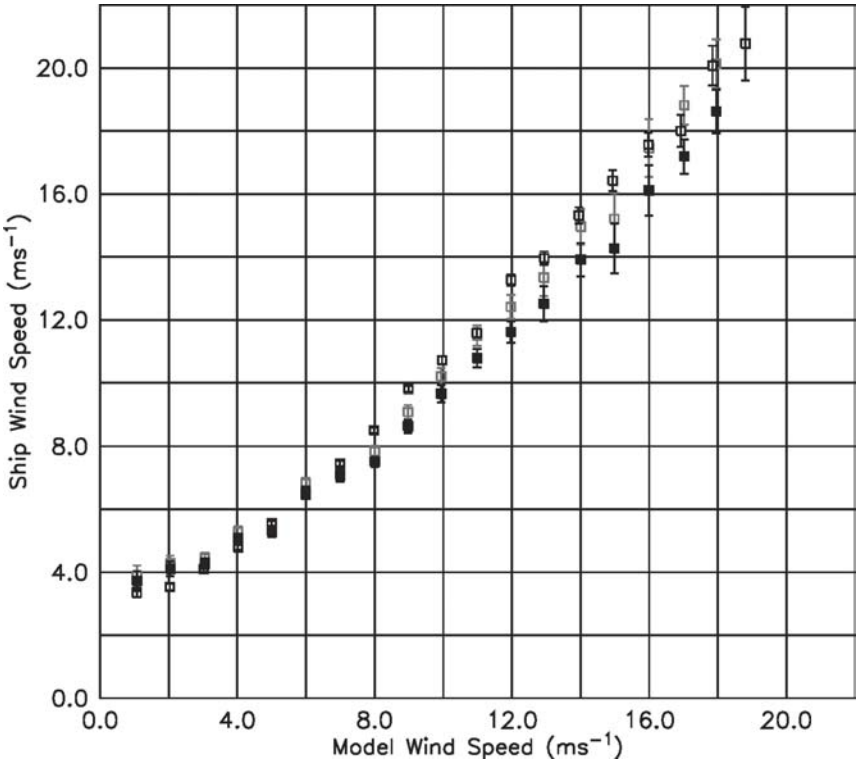

Figure 14: **Ship wind speed against model wind speed for visual winds (open black), anemometer winds as reported (grey) and height corrected anemometer winds (solid black). The error bars represent the standard deviation of the data.**

APPENDIX

Callsign	Ship Name	Ship Type	Country	Length	Br'dth	Draft	Freeb'rd	Anem. Height	Barom. Height	Therm. Height	Visual Obs Height	SST Depth	Logging Software	Visual/ Anemom.	SST Method	Air Temp Method
9KWH	Al Messilah	Livestock Carrier	Australia	185.8	32.0	9.0	4.0	35.0	20.6	20.6	20.6	9.0	TW2.12	V	C	S
ELXS8	Pacific Triangle	Bulk Carrier	Australia	299.8	50.0	17.0	6.0	51.0	37.0	37.0	37.2	10.0	TW2.12	V	BU	S
MZHC8	Arafura	Container Ship	Australia	240.7	32.0	12.0	7.0	41.4	25.6	25.6	25.6	11.5	TW2.12	V (A)	C	S
V2FM	Kimberley	General Cargo	Australia	105.0	16.0	7.0	7.0	....	18.0	18.0	18.0	....	TW2.12	V	BU	S
VJNV	Nivosa	Crude Oil Tanker	Australia	265.2	45.0	14.6	5.0	40.0	22.8	22.5	22.8	3.0	TW2.12	V	C	S
VNVJ	Australian Pride	Liquid Tanker	Australia	182.2	32.1	13.1	2.2	....	21.5	21.5	21.5	....	TW2.12	V	BU	S
CFD3659	Newfoundland Otter	Tanker	Canada	60.0	14.0	....	1.1	....	13.3	15.2	12.3	1.0	AVOS	A	HC	S
CG2350	CCGS Limnos	Research Vessel	Canada	44.8	9.8	2.6	1.0	12.0	7.3	3.5	6.5	1.0	AVOS	A	HATS	S
CG2522	CCGS Dumit	Buoy/Lighthouse Vessel	Canada	50.9	12.2	1.2	1.4	11.6	9.1	10.50	7.5	1.0	AVOS	A	HATS	S
CG2958	CCGS John P. Tully	Research Vessel	Canada	68.9	14.5	4.5	2.8	28.0	23.4	26.5	14.5	2.0	AVOS	A	HATS	S
CG2960	Samuel Risley	Buoy/Lighthouse Vessel	Canada	69.7	13.7	5.8	0.6	16.5	13.2	14.7	12.0	4.0	AVOS	A	HATS	S
CG2992	CCGS Eckaloo	Buoy/Lighthouse Vessel	Canada	49.0	13.4	1.4	1.2	11.4	9.2	10.4	7.4	1.0	AVOS	A	HATS	S
CGDS	CCGS Griffon	Buoy/Lighthouse Vessel	Canada	71.3	14.9	4.6	1.8	23.0	19.2	22.2	17.0	2.0	AVOS	A	HATS	S
CGDX	Des Groseilliers	Icebreaker	Canada	98.3	19.5	7.4	3.5	23.0	19.0	21.8	15.5	5.0	AVOS	A	HATS	S
CGJK	CCGS Sir Wilfrid Laurier	Buoy/Lighthouse Vessel	Canada	83.0	16.2	6.1	1.7	24.0	19.5	22.5	15.0	2.0	AVOS	A	HATS	S
CGSB	Pierre Radisson	Icebreaker	Canada	98.3	....	7.2	....	....	14.0	....	....	....	AVOS	A	BU	S
CGTF	Terry Fox	Coastguard	Canada	88.0	17.8	2.0	0.9	....	21.6	22.9	20.6	2.0	AVOS	A	HC	S
VCLM	MV Arctic	Bulk/Oil Carrier	Canada	220.8	22.9	11.5	3.8	19.0	19.0	8.0	....	....	AVOS	A	HATS	S
VOCJ	Lief Ericson	Passenger/Ro-ro Cargo	Canada	157.3	24.3	5.5	2.0	....	24.6	28.8	23.6	4.0	AVOS	A	HC	S

Callsign	Ship Name	Ship Type	Country	Length	Br'dth	Draft	Freeb'rd	Anem. Height	Barom. Height	Therm. Height	Visual Obs Height	SST Depth	Logging Software	Visual/ Anemom.	SST Method	Air Temp Method
C6KD7	Chiquita Belgie	Refrigerated Cargo	GB	158.1	24.4	10.0	....	....	22.0	22.0	....	....	TW2.12	V	BU	S
C6KU8	Scottish Star	Refrigerated Cargo	GB	150.8	22.0	8.7	7.3	....	16.9	17.6	17.6	....	TW2.12	V	BU	S
C6LF8	St.Lucia	Refrigerated Cargo	GB	158.1	24.4	10.0	5.0	34.5	22.6	25.0	23.2	4.2	TW2.12	V	HC	S
C6LF9	Dominica	Refrigerated Cargo	GB	158.1	....	10.0	....	....	23.0	....	....	3.0	TW?	V	HC	S
GBTT	Queen Elizabeth 2	Cruise Ship	GB	293.5	32.0	9.9	7.2	35.0	28.9	28.4	29.0	8.2	TW2.12	V	C	S
GLNE	Discovery	Research Vessel	GB	90.1	14.0	5.5	....	....	13.0	....	....	3.0	TW2.12	V	HC	S
GQHC	Berlin Express	Container Ship	GB	252.0	32.1	11.0	5.7	....	24.3	24.3	....	3.5	TW2.12	V	HC	S
GVSN	Oriana	Cruise Ship	GB	260.0	32.2	7.9	....	....	30.0	30.0	....	5.0		V	HC	S
GXEV	Resolution Bay	Container Ship	GB	248.6	32.2	12.0	9.4	....	27.8	27.5	28.6	3.6	TW2.12	V	HC	S
GXEW	Mairangi Bay	Container Ship	GB	248.6	32.2	12.0	9.4	....	27.8	27.5	28.6	4.6	TW2.12	V	HC	S
GXIC	Pegasus Bay	Container Ship	GB	258.5	....	13.0	....	....	26.0	....	....	3.0	TW2.12	V	C	S
GXUP	City Of Cape Town	Container Ship	GB	258.5	32.3	13.0	11.0	....	28.6	28.3	29.4	10.8	TW2.12	V	HC	S
MHCQ7	Peninsular Bay	Container Ship	GB	292.1	....	13.0	....	....	26.0	....	....	3.0		V	HC	S
MRGU3	Singapore Bay	Container Ship	GB	292.1	32.2	13.0	....	....	30.0	....	....	3.0		V	HC	S
MSTM6	Providence Bay	Container Ship	GB	292.1	....	13.0	....	....	30.0	....	....	3.0		V	HC	S
MXBC6	P&O Nedlloyd Southampton	Container Ship	GB	299.9	42.8	14.0	10.4	46.0	35.9	35.9	35.2	14.0	TW3.0	V	C	S
MXMM5	City Of London	Container Ship	GB	188.1	30.0	11.5	15.3	37.5	25.7	25.3	26.2	9.0	TW2.12	V	C	S
MYMX5	P&O Nedlloyd Genoa	Container Ship	GB	210.1	32.2	12.8	....	....	29.0	31.0	....	3.0		V	C	S
MZGK7	Glasgow Maersk	Container Ship	GB	292.1	32.3	13.5	8.2	....	28.7	28.2	29.5	1.0	TW2.12	V	BU	S
ZCBD3	Canmar Fortune	Container Ship	GB	216.1	32.2	10.8	....	....	24.0	....	....	....		V	BU	S
ZCBP5	Canmar Honour	Container Ship	GB	245.0	32.2	10.8	8.2	35.0	25.7	26.1	27.5	8.0	TW2.12	V	HC	S
ZDLP	James Clark Ross	Research Vessel	GB	99.0	....	6.5	....	....	15.0	....	....	....	TW3.02	V	HC	S
ZDLS1	Ernest Shackleton	Research Vessel	GB	80.0	....	7.4	....	....	20.0	....	....	3.0		V	C	S
ZQAY4	Grasmere Maersk	Container Ship	GB	292.1	32.3	13.5	8.2	36.5	28.8	28.5	29.5	1.0	TW3.0	V	BU	S

Callsign	Ship Name	Ship Type	Country	Length	Br'dth	Draft	Freeb'rd	Anem. Height	Barom. Height	Therm. Height	Visual Obs Height	SST Depth	Logging Software	Visual/ Anemom.	SST Method	Air Temp Method
ZQYC5	P&O Nedlloyd Shackleton	Container Ship	GB	299.9	42.8	13.5	....	....	37.0	....	....	4.0	TW2.12	V	C	S
A8AD5	Hanjin Philadelphia	Closed Container	Germany	282.1	32.2	12.0	4.3	....	36.0	36.0	36.0	10.0	TW3.0	V	C	SL
DQVI	Pudong Senator	Container Ship	Germany	294.1	32.2	13.0	4.4	....	35.0	35.0	35.0	12.0	TW2.12	V	C	SL
DQVL	Pugwash Senator	Container Ship	Germany	294.1	32.2	13.0	4.4	....	35.0	35.0	35.0	12.0	TW2.12	V	C	SL
DQVM	Portland Senator	Container Ship	Germany	294.1	32.2	13.3	4.4	....	35.0	35.0	35.0	12.0	TW2.12	V	C	SL
DQVN	Pohang Senator	Container Ship	Germany	294.1	32.2	13.0	4.4	....	35.0	35.0	35.0	12.0	TW2.12	V	C	SL
ATIU	Harshavardhan	Passenger/General Cargo	India	....	....	....	....	....	....	....	....	....		V	BU	W
ATJW	Satya Murti	Crude Oil Tanker	India	....	....	....	....	....	....	....	....	....		V		W
ATKE	Chhatrapati Shivaji	Crude Oil Tanker	India	....	....	....	....	....	....	....	....	....		V		W
ATQO	State Of Tripura	General Cargo	India	....	....	....	....	....	....	....	....	....		V		
VTCN	Lok Pratima	Bulk Carrier	India	....	....	....	....	....	....	....	....	....		V		W
VTXB	Nancowry	Passenger/General Cargo	India	....	....	....	....	....	....	....	....	....		V		W
VTXF	Nanga Parbat	LPG Tanker	India	....	....	....	....	....	....	....	....	....		A		W
VTXG	Tirumalai	Liquid Tanker	India	....	....	....	....	....	....	....	....	....		V		W
VTXK	Sabarimala	Liquid Tanker	India	....	....	....	....	....	....	....	....	....		V	BU	W
VTXT	Annapurna	LPG Tanker	India	....	....	....	....	....	....	....	....	....		A		W
VVGG	Rajiv Gandhi	Container Ship	India	....	....	....	....	....	....	....	....	....		V		W
VVGQ	Kanpur	Bulk Carrier	India	....	....	....	....	....	....	....	....	....		V		W
VVJV	Hardwar	Bulk Carrier	India	....	....	....	....	....	....	....	....	....		V		W
VVKK	Patliputra	Bulk Carrier	India	....	....	....	....	....	....	....	....	....		V		W
VWNS	Chm Piru Singh PVC	Crude Oil Tanker	India	....	....	....	....	....	....	....	....	....		V		W
VWWK	Major Shaitan Singh	Crude Oil Tanker	India	....	....	....	....	....	....	....	....	....		V		

Callsign	Ship Name	Ship Type	Country	Length	Br'dth	Draft	Freeb'rd	Anem. Height	Barom. Height	Therm. Height	Visual Obs Height	SST Depth	Logging Software	Visual/ Anemom.	SST Method	Air Temp Method
VWWY	Havildar Abdul Hamid PVC	Crude Oil Tanker	India	....	....	....	....	....	....	....	....	....		V		W
VWXG	A B Tarapore PVC	Crude Oil Tanker	India	....	....	....	....	....	....	....	....	....		V		W
PGRQ	Pelagia	Research Vessel	Netherlands	66.1	13.0	4.0	2.0	13.0	11.0	....	....	2.0		V	C	S
S6TA	APL China	Container Ship	US	....	....	....	....	....	....	....	....	....		V		
S6TS	APL Japan	Container Ship	US	....	....	....	....	37.0	....	....	....	....		A	C	SL
WCX8812	APL Singapore	Container Ship	US	....	....	....	....	32.0	....	....	....	....		V (A)	C	S
WCX8882	APL Thailand	Container Ship	US	....	....	....	....	37.0	....	....	....	....		V (A)	C	SL
WCX8883	APL Korea	Container Ship	US	....	....	....	....	37.0	....	....	....	....		V (A)	C	SL
WCX8884	APL Philippines	Container Ship	US	....	....	....	....	37.0	....	....	....	....		A	C	SL

Key V = Visual Wind, A = Anemometer Wind (in brackets indicates secondary use), BU = Bucket SST, C = Engine Intake SST, HC = Hull Contact SST, HATS = High Accuracy Temperature Sensor SST, S = Unventilated Screen Air Temperature, SL = Sling Air Temperature, W = Whirling Psychrometer Air Temperature

Annex V

NATIONAL REPORT - AUSTRALIA

Current status

1. Six vessels from the Australian VOF have been recruited into VOSClim, viz. Al Messilah (9KWH), Arafura (MZHC8), Japonica (C6SU3), Kimberley (V2FM), Nivosa (VJNV), Pacific Triangle (ELXS8).

2. All ships are using TurboWin.

3. Paper forms, and some digital photographs, have been sent to the DAC.

4. Errors notified through the “VOSClim ship suspect list” have been followed up.

Plans

5. It is hoped a second group of 4-6 vessels will be recruited during next 12 months. Most of these vessels will be equipped with ShipAWS.

Difficulties

6. As noted previously, recruitment of suitable vessels is made difficult by the removal of many of the longer-serving, and therefore older, vessels from service. Another issue is that many otherwise suitable vessels have had their routes changed, often to relatively short-term contracts.

7. At present, the ShipAWS does not report in the IMMT-2 format, however discussions are being held with the manufacturer to resolve this issue.

8. Another issue with the ShipAWS software is that is does not contain the same quality control algorithms as TurboWin. Discussions have been initiated with KNMI to investigate the feasibility of the ShipAWS interfacing to the TurboWin software – thus marrying the ShipAWS’s superior temporal coverage with TurboWin’s excellent manual input terminal capability, quality control algorithms, and IMMT-2 output.

NATIONAL REPORT - GERMANY

VOSClim Recruitment:

Presently 10 German Container vessels participate in the VOSClim Project. Three joined in 2002, another seven this year. This is near to our target of ca. 15 ships. There seems to be a principal general willingness of observers to take part in the project and to do the additional work. But as a countermove, an equipment with our notebooks is expected, which is difficult to realize at the moment due to budgetary constraints let alone the regular replacement of defective hardware.

Sometimes we find the phenomenon of "self-recruiting". Observers click the VOSClim recruitment button in Turbo Win and regularly filling in all requested information. We still discuss how to deal with that. An official status as VOSClim ship and a good instruction of observers should be reached.

Generally (except research vessels) the technical equipment on German ships does not fully meet the precision requirements of the project. Temperatures are at an accuracy of ca. 0,3 °C and the pressure reading at 0,2 hPa. Special instruments should to be purchased, to improve the data, but the present budgetary situation is the limiting factor.
The wind measuring equipment on board the recruited ships are property of the ships and are not almost reliable. We therefore recommend to continue with the wind estimate. Consequently the relative wind information is missing. We are considering to take over the maintenance of the ships' instruments, but it is still an open question if we would be able to provide a service for the different brands on board or to replace them by DWD instruments; both options are again a question of money and resources.

The manual recruitment form is used and the metadata of the German VOSClim ships are sent to the DAC. They will also be sent to WMO together with the complete update of the whole German VOS fleet (ca. 815 ships) in due course. Pictures of the project ships are available, mostly downloaded from the Internet, as own pictures of total views can mostly not be provided by the PMOs.

German VOSClim ships are integrated in the general German VOS award system and equipped with the project certificate as downloaded from the project home page.

The past shortcomings in the data provided by German VOSClim ships based upon erroneous use of Turbo Win, which was abolished. We draw the conclusion, that the introduction of the software to observers has to be done more carefully.

The routes (**Fig 1)** are mostly the North Pacific but with regular returns to Hamburg.

Plans are to further increase the number of VOS in the project and to upgrade the instrumentation as soon as possible.

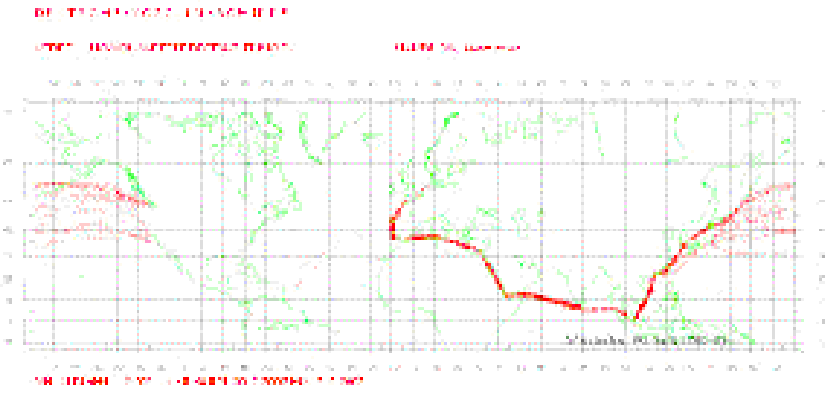

Fig. 1: Routes of German VOSClim ships

NATIONAL REPORT - JAPAN

VOSClim ship recruitment

Japan is preparing to make the five research vessels of the Japan Meteorological Agency (JMA) to participate in VOSClim project in 2003. These vessels routinely make oceanographic and marine meteorological observation in the western North Pacific along fixed lines from 2 to 4 times a year (Table). These vessels are equipped with automated marine meteorological observation/transmission system and acceptable error ranges of the observational data are 5 deg (in wind direction), 0.5 m/s (in wind speed), 0.5 degC (in air temp., dew point temp., and sea surface temp.), 0.3hPa (in sea level pressure), respectively. True wind averaged for 10-minutes is calculated automatically using ship's course, speed, heading, and relative wind. These vessels report the data via SHIP message hourly except for non-instrumental observation data which are reported 3-hourly. They also participate in ASAP and SOOP.

We are to examine the possibility to recruit other vessels as a future target.

Table List of ships planning to participate in VOSClim project

Ship name	Callsign	IMO Number	Obs. Num. in 2002
Ryofu Maru	JGQH	134996	2843
Keifu Maru	JPBN	136935	2896
Kofu Maru	JDWX	8716112	2277
Chofu Maru	JCCX	8602438	2393
Seifu Maru	JIVB	9053452	2296

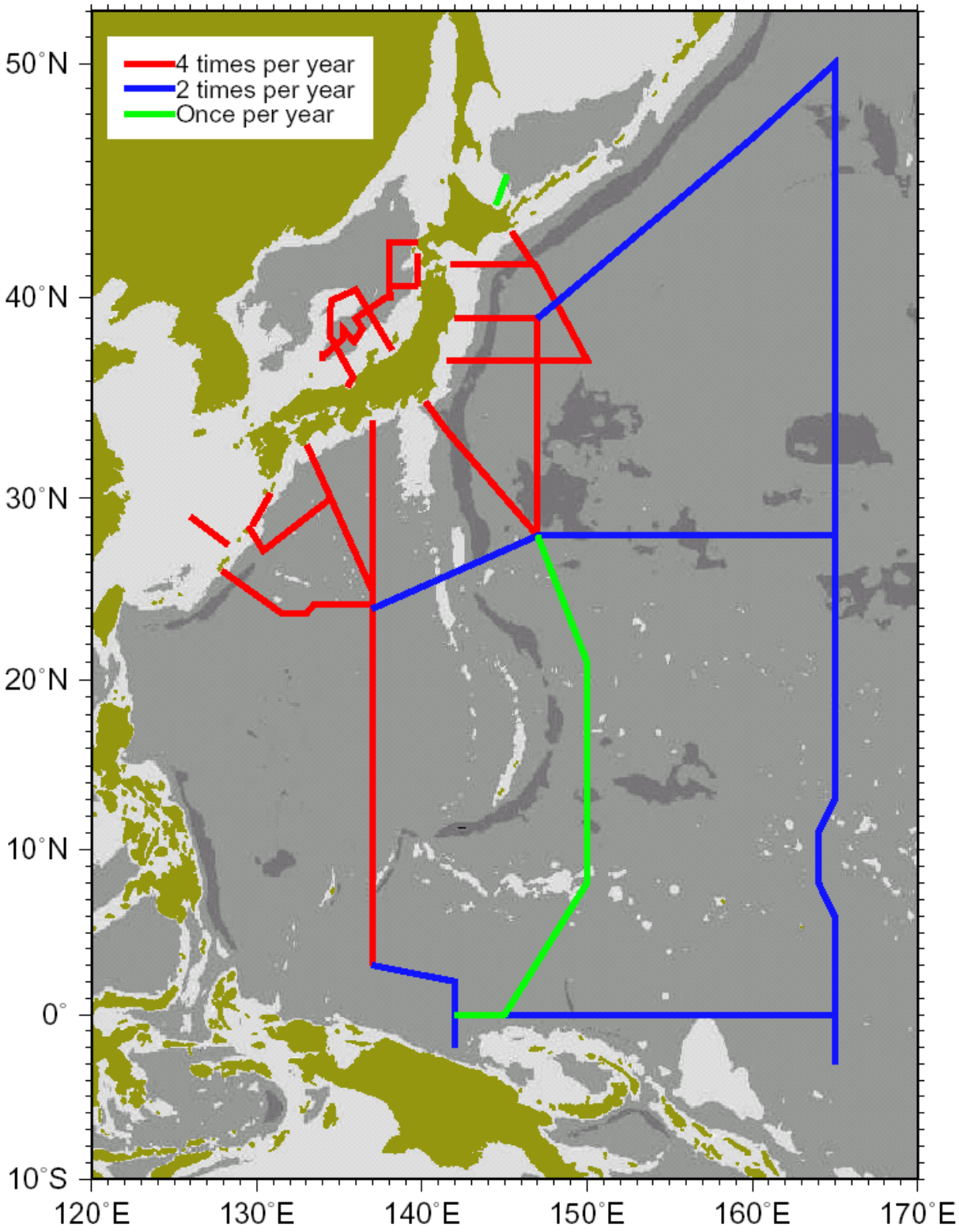

Figure Typical observation line of JMA's research vessels

NATIONAL REPORT – UNITED KINGDOM

Status of Participation

1. At the commencement of the project the UK undertook to recruit 30 voluntary observing ships to participate in the project. Recruitment began in August 2001, and VOSClim brochures were provided to potential participants to encourage interest.

2. A total of 26 UK ships have since been recruited to the project and 5 withdrawn — leaving a total of 21 ships currently participating in the project (as of June 2003). A list of UK ships recruited to the project is at **Appendix A**.

3. Of the 5 UK ships withdrawn from participation 4 were withdrawn because they had come to the end of their service lives and were destined for the breakers yard. The loss of these ships is regretted, as they were some of the best UK observing ships. A fifth ship was withdrawn because its observing standards had fallen significantly (see also para. 12 below)

4. UK VOSClim ships are trading on a global basis. The main routes are;

- UK to West Indies
- UK/Europe to Australia/New Zealand
- UK/Europe to East coast of USA
- UK to North Atlantic to East Coast of North America
- UK to S. Atlantic, Antarctic
- UK/N. Europe to Far East (via Suez)
- UK to Western South America, via Panama
- UK to South Africa

5. A hard-copy VOSClim recruitment form is completed by our Port Met Officers (PMOs) for each ship recruited. The majority of UK ships have been recruited from our London, Southampton and Hull Port Met Offices. Completed recruitment forms are returned to Met Office Marine Networks Headquarters (currently in Bracknell, but due to relocate to Exeter at the end of this year) where the details are maintained on a central database.

6. Relevant metadata is extracted from the database for submission to WMO (for inclusion in WMO Publication No 47) and to the DAC. Details of the metadata for both active and withdrawn UK project ships is attached at **Appendix B** to this report in the required text delimited format.

7. Digital Photos of each recruited ship, together with photos of the instrument locations have been taken for each recruited ship. Basic sketches of the general arrangement showing the location of instruments have also been made by visiting Port Met Officers. Photos and arrangement drawings have been made available to the DAC (and also to the Southampton Oceanography Centre to assist with their data analysis)

8. UK project ships are advised to estimate the wind speed and direction from the sea state and are not presently provided with dedicated calibrated anemometers. Although most of the UK project ships are equipped with their own ships anemometers, these are rarely ever calibrated – nevertheless, wherever possible, metadata for these instruments is also collected by our PMO's at the time of recruitment.

9. All participating UK ships are equipped with electronic logbooks installed on notebook computers loaned by the Met Office. VOSClim compliant TurboWin software (version 2.12 software or higher) is used for automatically coding the observations. The majority of ships were recently upgraded to the latest version 3.03 TurboWin software.

10. Delayed-mode IMMT-2 format log files and associated TurboWin log files are routinely downloaded to floppy disk by visiting Port Met Officers (three monthly, whenever possible). The disks are returned to Met Office Marine Networks for initial vetting and the IMMT-2 data is subsequently sent to Edinburgh Met Office for application of QC procedures.

11. Real-time data is being received from participating ships in a timely fashion (i.e. within our mesoscale model cut off time of HH+115 minutes). Action is taken whenever UK ships' observations are flagged as 'suspect' in the monthly project monitoring statistics.

12. In so far as the project is concerned the UK also acts as the Real Time Monitoring Centre (RTMC) and as one of the two Global Collecting Centres (GCCs). Reports on these functions will be the subject of separate documents to be submitted to the meeting under agenda items 4.1 and 4.3.

Problems Experienced

13. A number of problems have been experienced with respect to UK participating ships recruited since the last meeting of the project team. These include

- **Ships changing charter/ trading routes**
  Shortly after recruitment to the project two UK project ships took on new charter party agreements resulting in changes to their usual trading routes. As these ships no longer return to the UK we have been unable to formally inspect them since November 2001. Furthermore we have been unable to download their IMMT-2 log files. It is understood, however, that this charter party may be changing again soon and that the vessels are expected to return to the UK in July.

- **Notebook computer problems**
  One of the aforementioned two ships, which are absent from the UK, has also had a problem with its notebook floppy disk drive. As a consequence the ships staff have been unable to download the IMMT-2 data onboard, and return the delayed mode data to the UK.

- **Ships being scrapped**
  As mentioned in para 3 above, four of the best UK observing ships recruited to the project reached the end of their service lives and were subsequently scrapped. The fact that they were to be scrapped was not known at the time of recruitment, although it was recognised that these ships were likely to be replaced by newer vessels at some point

- **Ships failing to observe – difficulties in arranging inspections**
  On one recruited ship which had been absent from the UK for almost a year it was discovered upon inspection that the notebook computer was missing and that observations had ceased. This case highlights the need to maintain a regular inspection regime

- **PMO illness**
  Unfortunately one of our Port Met Officers was unable to work for several months during 2002 due to illness. Although temporary PMO cover was arranged, the inspection regime and recruitment plans suffered as a consequence

- **Data monitoring problems**
  Monitoring of pressure observations from project ships revealed that some ships observers had been applying the height correction to their observations twice i.e they had not realised that TurboWin automatically applied the correction and they had been additionally applying the height correction drawn from the barometer height correction card provided to each UK observing ship. Action was taken in each case and the observers soon corrected their procedures. In liaison with KNMI additional cautionary wording was added to the TurboWin program to warn observers against this error.

Future Plans

14. Plans are in hand to recruit a further 9 UK ships to the project i.e. in order to bring the total number of UK ships actively participating in the project up to the proposed level of 30. This will hopefully be achieved before the end of 2003

15. In April 2003 the EUCOS Surface Marine Program commenced. Although this program is still in its initial design phase (which will last two years) it is envisaged that all UK VOS and VOSClim ships may eventually additionally contribute to this integrated program.

Appendix A

List of Recruited UK VOS-Clim ships (June 2003)

No	Ship Name	Call Sign	Date Recruited	Date Withdrawn	IMO Number
1	**Peninsular Bay**	MHCQ7	06-Oct-2001		8808628
2	**Scottish Star**	C6KU8	10-Sep-2001	12-May-03	8315994
3	**St.Lucia**	C6LF8	30-Aug-2001		9038323
4	**Dominica**	C6LF9	15-Aug-2001		9038335
5	**Queen Elizabeth 2**	GBTT	10-Dec-2001		6725418
6	**Oriana**	GVSN	23-May-2002		9050137
7	**Resolution Bay**	GXEV	26-Oct-2001	17-Sep-02	7417575
8	**City of Cape Town**	GXUP	05-Sep-2001		7510901
9	**Providence Bay**	MSTM6	20-Oct-2001		9080613
10	**P&O Nedlloyd Southampton**	MXBC6	18-May-2002		9153850
11	**CanMar Honour**	ZCBP5	03-Sep-2001		9165360
12	**James Clark Ross**	ZDLP	10-Sep-2001		8904496
13	**City of London**	MXMM5	28-Aug-2001		9137703
14	**Ernest Shackleton**	ZDLS1	19-Sep-2001		9114256
15	**Glasgow Maersk**	MZGK7	12-Sep-2001		9193420
16	**P&O Nedlloyd Genoa**	MYMX5	05-Aug-2002		9168219
17	**P&O Nedlloyd Shackleton**	ZQYC5	23-Jan-2002		9211494
18	**Discovery**	GLNE	19-Feb-2002		5090660
19	**Mairangi Bay**	GXEW	12-Oct-2001	31-Jul-02	7417563
20	**Berlin Express**	GQHC	17-Aug-2001	31-Jul-02	7218383
21	**Grasmere Maersk**	ZQAY4	10-Sep-2002		9193276
22	**Maersk Gateshead**	VQBW2	05-Dec-2002		9235543
23	**Pegasus Bay**	GXIC	01-Sep-2001	1-Nov-02	7510896
24	**Chiquita Belgie**	C6KD7	16-Mar-2003		9015204
25	**Newport Bay**	MQEC7	05-Apr-2003		9005558
26	**Chiquita Nederland**	C6KD9	27-Apr-2003		9015199

Appendix B

Metadata for Active UK VOS-Clim ships
(in WMO Pub 47 delimited format - June 2003)

CanMar Honour;:ZCBP5;:9165360;:GB;:CC;:AV;:245.0;:32.2;:8.2;:10.8;:13.1;:194.8;:21;:5;:3;:14;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:27.2;:;:WH;:;:hPa;:;:19012001;:;:MER;:;:ZEAL 2/C - BS
692;:;:S;:;:3;:;:26.7;:;:1;:;:P;:;:S;:;:HC;:BU;:8;:;:OS7;:;:35;:0;:27.8;:;:11;:;:194.8;:0;:2.5Port;:0;:Daeyang;:;:3;:;:;:27.5;:OT;:;:;:;:;:;:;:T;:;:I;:C;:;:;:;
:05062003;:othl;:;:;:;:;:;:;:;:;:;:;:;:Notebook computer with TurboWin software version 3.02;:;:;:;:;:;:;:;:;:;:;

Chiquita Belgie;:C6KD7;:9015204;:GB;:BS;:AV;:158.1;:24.4;:10.7;:10.0;:13.2;:135.5;:21;:5;:3;:25;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:29.5;:;:WH;:;:hPa;:;:08042002;:;:MER;:;:2/C - BS
692;:;:S;:;:3;:;:30.3;:;:1;:;:P;:;:S;:;:BU;:C;:1;:;:OS7;:;:;:;:;:;:;:;:;:;:;:;:;:;:;:;:3;:;:;:30;:OT;:;:;:;:;:;:T;:;:C;:I;:Y;:;:;:26112002;:othl;:;:;:;:;:;:;:;:;:;:;:Noteboo
k computer with TurboWin software version 3.03;:;:;:;:;:;:;:;:;:;:;

Chiquita Nederland;:C6KD6;:9015199;:GB;:BS;:AV;:158.1;:24.4;:2.8;:10.0;:10.5;:135.5;:21;:5;:3;:25;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:22;:;:WH;:;:hPa;:;:08042002;:;:MER;:;:ZEAL 2/C - BS
692;:;:S;:;:3;:;:20.1;:;:1;:;:P;:;:S;:;:BU;:;:1;:;:OS7;:;:;:;:;:;:;:;:;:;:;:;:;:;:;:;:3;:;:;:21.1;:OT;:;:;:;:;:;:T;:;:Y;:I;:C;:;:;:05062003;:othl;:;:;:;:;:;:;:;:;:;:;:Noteboo
k computer with TurboWin software version 3.03;:;:;:;:;:;:;:;:;:;:;

City Of Cape Town;:GXUP;:7510901;:GB;:CC;:AV;:258.5;:32.3;:11.0;:13.0;:12.4;:161.7;:21;:5;:3;:19;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:28.6;:;:WH;:;:hPa;:;:31071996;:;:MER;:;:ZEAL 2/C - BS
692;:;:S;:;:3;:;:28.3;:0;:1;:0;:P;:;:S;:;:HC;:BU;:10.8;:;:OS7;:;:;:;:;:;:;:;:;:;:;:;:;:;:;:;:3;:;:;:29.4;:OT;:;:;:;:;:;:T;:;:Y;:I;:C;:;:;:17042002;:othl;:;:;:;:;:;:;:;:;:;:;
:Notebook computer with TurboWin software version 3.02;:;:;:;:;:;:;:;:;:;:;

City of London;:MXMM5;:9137703;:GB;:CC;:AV;:188.0;:30.0;:15.3;:11.5;:12.4;:169.7;:21;:5;:3;:22;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:25.7;:;:WH;:;:hPa;:;:17021999;:;:MER;:;:ZEAL 2/C - BS
692;:;:S;:;:3;:;:25.3;:0;:1;:0;:P;:;:S;:;:C;:BU;:9;:;:OS7;:;:37.5;:;:32.2;:;:10;:;:173;:;:1;:;:Thomas
Walker;:;:3;:;:;:26.2;:OT;:;:;:;:;:;:T;:;:Y;:I;:C;:;:;:17042002;:othl;:;:;:;:;:;:;:;:;:;:;:Notebook computer with TurboWin software version
2.12;:;:;:;:;:;:;:;:;:;:;

Discovery;:GLNE;:5090660;:GB;:RV;:AV;:90.2;:14.0;:2.4;:5.4;:;:40.0;:20;:5;:3;:17;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI & ZAMBRA PRECISION
ANEROID MK 2;:;:14;:;:WH;:;:hPa;:;:23012002;:;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS
692;:S;:S;:7;:7;:17;:17;:1;:1;:P;:P;:S;:S;:HC;:BU;:2.5;:;:OS7;:;:17.1;:0;:13.1;:0;:10;:;:44;:0;:5;:0Port;:T.
WALKER;:;:3;:31102000;:;:14.5;:OT;:XBT;:;:;:;:;:T;:;:C;:I;:;:;:;:11122002;:othl;:;:;:;:;:;:;:;:;:;:;:Notebook computer with TurboWin software
version 2.12;:;:;:;:;:;:;:;:;:;:;

Dominica;:C6LF9;:9038335;:GB;:BS;:AV;:158.1;:24.4;:5.0;:10.0;:7.6;:136.0;:21;:5;:3;:25;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI & ZAMBRA
PRECISION ANEROID MK 2;:;:22.6;:;:WH;:;:hPa;:;:11082000;:;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS
692;:S;:S;:7;:7;:25;:25;:1;:1;:P;:P;:S;:S;:HC;:BU;:4.2;:;:OS7;:;:34.5;:0;:27.8;:0;:10;:;:137.5;:0;:0;:0;:MALLING;:;:3;:;:;:23.2;:OT;:;:;:;:;:;:T;:;:C
;:I;:Y;:;:;:17042002;:othl;:;:;:;:;:;:;:;:;:;:;:Notebook computer with TurboWin software version 2.12;:;:;:;:;:;:;:;:;:;:;

Ernest Shackleton;:ZDLS1;:9114256;:GB;:RV;:AV;:80.0;:17.0;:4.1;:7.4;:7.0;:12.0;:20;:5;:3;:6;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI & ZAMBRA
PRECISION ANEROID MK 2;:;:13;:;:WH;:;:hPa;:;:18061999;:;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS
692;:S;:S;:7;:7;:16.1;:16.1;:1;:1;:P;:P;:S;:S;:HC;:BU;:7.3;:;:OS7;:;:22.4;:0;:18.2;:;:OT;:;:15.2;:0;:4.3PORT;:0;:DIEF
MALLING;:;:3;:;:;:13;:OT;:;:;:;:;:;:T;:;:Y;:C;:I;:;:;:17042002;:anmL;:othl;:;:;:;:;:;:;:;:;:;:Anemometer on port side signal mast on monkey
island;:Notebook computer with TurboWin software version 3.02;:;:;:;:;:;:;:;:;:;

Glasgow Maersk;:MZGK7;:9193240;:GB;:CC;:AV;:292..0;:32.3;:8.2;:13.5;:14.7;:218.7;:21;:5;:3;:14;:4;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:28.7;:;:WH;:;:hPa;:;:09081999;:;:MER;:;:ZEAL 2/C - BS
692;:;:S;:;:3;:;:28.2;:0;:1;:0;:P;:;:S;:;:BU;:;:1;:;:OS7;:;:;:;:;:;:;:;:;:;:;:;:0;:;:;:3;:;:;:29.5;:OT;:;:;:;:;:;:T;:;:C;:I;:Y;:;:;:17042002;:othl;:;:;:;:;:;:;:;:;:;:;:Note
book computer with TurboWin software version 3.02;:;:;:;:;:;:;:;:;:;:;

Grasmere Maersk;:ZQAY4;:9193276;:GB;:CC;:AV;:292.0;:32.3;:8.2;:13.5;:14.7;:218.7;:21;:5;:3;:22;:4;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:28.7;:;:WH;:;:hPa;:;:26042000;:;:MER;:;:ZEAL 2/C - BS
692;:;:S;:;:3;:;:28.5;:0;:1;:0;:P;:;:S;:;:BU;:;:1;:;:OS7;:;:36.5;:0;:28.3;:0;:10;:;:223.7;:0;:0;:0;:;:;:3;:;:;:29.5;:OT;:;:;:;:;:;:T;:;:C;:I;:Y;:;:;:16092002;
:othl;:;:;:;:;:;:;:;:;:;:;:Notebook computer with TurboWin software version 3.02;:;:;:;:;:;:;:;:;:;:;

James Clark Ross;:ZDLP;:8904496;:GB;:RV;:AV;:99.0;:18.8;:3.5;:6.3;:5.0;:41.2;:20;:5;:3;:6;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI & ZAMBRA
PRECISION ANEROID MK 2;:;:15.5;:;:WH;:;:hPa;:;:08062001;:;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS
692;:S;:S;:7;:7;:18;:18;:1;:1;:P;:P;:S;:S;:HC;:BU;:4;:;:OS7;:;:20.5;:0;:13.6;:;:6;:;:6.2;:0;:0.5;:0;:GILL
ULTRASONIC;:;:3;:;:;:15.5;:OT;:R;:;:;:;:;:T;:;:Y;:I;:C;:;:;:17042002;:othl;:;:;:;:;:;:;:;:;:;:;:Notebook computer with TurboWin software version
2.12;:;:;:;:;:;:;:;:;:;:;

Maersk Gateshead;:VQBW2;:9235543;:GB;:CC;:AV;:292.0;:32.3;:8.2;:13.5;:14.7;:218.7;:21;:5;:3;:22;:4;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI &
ZAMBRA PRECISION ANEROID MK 2;:;:28.7;:;:WH;:;:hPa;:;:08042002;:;:MER;:;:ZEAL 2/C - BS
692;:;:S;:;:3;:;:28.5;:;:1;:;:P;:;:S;:;:BU;:;:1;:;:OS7;:;:36.5;:;:28.3;:;:10;:;:223.7;:;:0;:;:;:;:3;:;:;:29.5;:OT;:;:;:;:;:;:T;:;:C;:I;:Y;:;:;:16122002;:othl;:;:;
:;:;:;:;:;:;:;:Notebook computer with TurboWin software version 3.02;:;:;:;:;:;:;:;:;:;:;

Newport Bay;:MQEC7;:9005558;:GB;:CC;:AV;:292.1;:32.2;:8.2;:13.0;:15.0;:221.4;:21;:5;:3;:22;:;:;:;:;:;:;:;:;:;:;:DA;:;:NEGRETTI & ZAMBRA
PRECISION ANEROID MK 2;:;:29;:;:WH;:;:hPa;:;:24081999;:;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS
692;:S;:S;:3;:3;:29;:29;:1;:1;:P;:P;:S;:S;:HC;:BU;:;:1.5;:OS7;:;:36;:;:27.8;:;:10;:;:226.5;:;:3.3P;:;:;:;:3;:;:;:30.8;:OT;:;:;:;:;:;:T;:;:C;:I;:Y;:;:;:0506
2003;:othl;:;:;:;:;:;:;:;:;:;:;:Notebook computer with TurboWin software version 3.02;:;:;:;:;:;:;:;:;:;:;

Oriana;:GVSN;:9050137;:GB;:PV;:AV;:261.0;:37.0;:::8.2;:::49.0;:21;:5;:3;:27;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;:::30.1;:::WH;:::hPa;:::29091995;:::ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS 692;:S;:S;:3;:3;:30.2;:30.2;:1;:1;:P;:P;:S;:S;:HC;:BU;:6.7;:::OS7;;;;;;;;;;;;;;;;;;;;;;;;;;;3;;;;:30.2;:OT;;;;;;;;;;:T;;;:I;:C;:Y;;;;;:05062003;:othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 3.0;;;;;;;;;;;;;;;;;;

P&O Nedlloyd Genoa;:MYMX5;:9168219;:GB;:CC;:AV;:210.1;:32.2;:10.2;:16.0;:20.4;:153.8;:21;:5;:3;:14;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;:::29.1;:::WH;:::hPa;:::23122001;:::MER;:::ZEAL 2/C - BS 692;:::S;:::3;:::29.2;:::1;:::P;:::S;:::C;:BU;:14.5;:::OS7;;;;;;;;;;;;;;;;;;;;;;;;;;;3;;;;:29.2;:OT;;;;;;;;;;:T;:::I;::C;;;;;;:05062003;:othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 3.03;;;;;;;;;;;;;;;;;;

P&O Nedlloyd Shackleton;:ZQYC5;:9211494;:GB;:CC;:AV;:299.9;:42.8;:6.3;:13.5;:33.0;:228.3;:21;:5;:3;:22;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;:::37;:::WH;:::hPa;:::20012003;:::MER;:::ZEAL 2/C - BS 692;:::S;:::3;:::0;:0;:1;::0;:P;:::S;:::C;:::11.3;:::OS7;;;;;;;;;;;;;;;;;;;;;;;;;;;3;;;;:34.9;:OT;;;;;;;;;;:T;:::I;:C;;;;;;:05062003;::othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 2.12;;;;;;;;;;;;;;;;;;

P&O Nedlloyd
Southampton;:MXBC6;:9153850;:GB;::CC;:AV;::299.9;:42.8;::10.4;::14.0;::15.0;::225.3;:21;::5;::3;::22;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;;;:35.9;;;:WH;;;:hPa;;;:09091994;;;:MER;;;:ZEAL 2/C - BS 692;;;:S;;;:3;;;:35.9;:0;:1;::0;:P;;;:S;;;:C;::BU;::14;;;:OS7;;;:46;:0;:28.5;;;;;;;231.3;:0;:4.2port;:0;;;;;:1;;;;;:35.2;:OT;;;;;;;;;;:T;;;:C;:I;;;;;;:17042002;:othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 3.02;;;;;;;;;;;;;;;;;;

Peninsular Bay;:MHCQ7;:8808628;:GB;:CC;:AV;:292.1;:32.2;:8.2;:13.0;:15.0;:221.4;:21;:5;:3;:4;:23;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;;;:30.5;;;:WH;;;:hPa;;;:13041993;;;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS 692;:S;:S;:3;:3;:30.5;:30.5;:1;:1;:P;:P;:S;:S;:HC;:BU;:4.1;;;:OS7;;;:36;:0;:27.8;;;:10;;;:226.5;:0;:3.3PORT;:0;:Nippon Elec Instruments;;;:3;;;;;:30.8;:ot;;;;;;;;;;:T;;;:Y;:I;:C;;;;;:17042002;:othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 2.12;;;;;;;;;;;;;;;;;;

Providence Bay;:MSTM6;:9080613;:GB;:CC;:AV;:292.1;:32.2;:8.2;:13.0;:15;:221.4;:21;:5;:3;:4;:23;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;;;:30.5;;;:WH;;;:hPa;;;:08091997;;;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS 692;:S;:S;:3;:3;:30.5;:30.5;:1;:1;:P;:P;:S;:S;:HC;:BU;:1.5;;;:OS7;;;:36;:0;:27.8;;;:10;;;:221.4;:0;:3.3PORT;:0;:Nippon Elec Instruments;;;:3;;;;;:30.8;:OT;;;;;;;;;;:T;;;:Y;:I;:C;;;;;:17042002;:othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 3.03;;;;;;;;;;;;;;;;;;

Queen Elizabeth 2;:GBTT;:6725418;:GB;:PV;:AV;:293.5;:32.0;:7.2;:9.9;:0.0;:72.5;:21;:5;:3;:27;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;;;:28.9;;;:WH;;;:hPa;;;:22041998;;;:MER;;;:ZEAL 2/C - BS 692;;;:S;;;:3;;;:28.4;:0;:1;::0;:P;;;:S;;;:C;;;:8.2;;;:OS7;;;:35;:0;:28;;;:9;;;:73;:0;:3.5;:0;:Propellor Vane;;;:3;;;;:29;:OT;;;;;;;;;;:T;;;:Y;:I;:C;;;;;:17042002;:othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 2.12;;;;;;;;;;;;;;;;;;

St.Lucia;:C6LF8;:9038323;:GB;:BS;:AV;:158.1;:24.4;:5.0;:10.0;:7.6;:136.0;:21;:5;:3;:25;;;;;;;;;;;;;;;;;:DA;:::NEGRETTI & ZAMBRA PRECISION ANEROID MK 2;;;:22.6;;;:WH;;;:hPa;;;:11082000;;;:ELE;:MER;:ROSEMOUNT 4A - BS 1904;:ZEAL 2/C - BS 692;:S;:S;:7;:7;:25;:25;:1;:1;:P;:P;:S;:S;:HC;:BU;:4.2;;;:OS7;;;:34.5;:0;:27.8;;;:10;;;:137.5;:0;:0;:0;:Malling;;;:3;;;;;:23.2;:OT;;;;;;;;;;:T;;;:Y;:I;:C;;;;;:17042002;:othI;;;;;;;;;;;;;;;;;:Notebook computer with TurboWin software version 2.12;;;;;;;;;;;;;;;;;;

Metadata for <u>Withdrawn</u> UK VOS-Clim ships
(in WMO Pub 47 delimited format)

Berlin Express;GQHC;7218383;GB;CC;AV;251.3;32.1;5.7;11.0;10.0;163.8;21;5;3;2;;;;;;;;;;DA;;Negretti & Zambra Precision Aneroid Mk 2;;24.3;;WH;;hPa;;11082001;;ELE;MER;;Zeal 2/C - BS
692;S;S;3;3;24.3;24.3;1;1;P;P;S;S;HC;BU;3.5;;OS7;;;;;;;;;;;;;;;3;;;24.3;OT;OT;;;;;T;;C;I;;;;17082001;othI;othI;;;;;;;;;Dell notebook computer with TurboWin Software version 2.12;Ozone monitor - Tei (for Max Planck Institute) ;;;;;;;;

Pegasus Bay;GXIC;7510896;GB;CC;AV;258.5;32.3;11.0;13.0;12.4;161.8;21;5;3;2;;;;;;;;;;DA;;Negretti & Zambra Precision Aneroid Mk 2;;28.6;;WH;;hPa;;17021999;;MER;;Zeal 2/C - BS 692;;S;;3;;28.3;;1;;P;;S;;HC;BU;10.8;;OS7;;45.6;;34.4;;12;;166.9;;0.8 stbd;;Munro Mk II SN 1164/1;;3;;;30.0;OT;;;;;;T;;C;I;;;;01092001;othI;;;;;;;;;;Kerry notebook computer with TurboWin Software version 2.12;;;;;;;;;

Scottish Star;C6KU8;8315994;GB;BC;AV;150.7;22.0;7.3;8.7;0.0;92.0;21;5;3;27;;;;;;;;;;DA;;Negretti & Zambra Precision Aneroid Mk 2;;16.9;;WH;;hPa;;20102001;;MER;;Zeal 2/C - BS
692;;S;;3;;17.6;;1;;P;;S;;BU;;;;OS7;;;;;;;;;;;;;;;3;;;17.6;OT;;;;;;T;;C;I;;;;10092001;othI;;;;;;;;;;Dell notebook computer with TurboWin Software version 2.12;;;;;;;;;

Mairangi Bay;GXEW;7417563;GB;CC;AV;248.6;32.2;9.4;12.0;15.0;156.4;21;5;3;2;;;;;;;;;;DA;;Negretti & Zambra Precision Aneroid Mk 2;;27.8;;WH;;hPa;;12031993;;MER;;Zeal 2/C - BS
692;;S;;3;;27.5;;1;;P;;S;;HC;BU;4.6;;OS7;;;;;;;;;;;;;;;3;;;28.6;OT;;;;;;T;;C;I;;;;12102001;othI;;;;;;;;;;Dell notebook computer with TurboWin Software version 2.12;;;;;;;;;

Providence Bay;MSTM6;9080613;GB;CC;AV;292.1;32.2;8.2;13.0;15.0;221.4;21;5;3;4;23;;;;;;;;;DA;;Negretti & Zambra Precision Aneroid Mk 2;;30.0;;WH;;hPa;;08091997;;ELE;MER;;Zeal 2/C - BS
692;S;S;3;3;30.5;30.5;1;1;P;P;S;S;HC;BU;1.5;;OS7;;36.0;;27.8;;10;;221.4;;3.3 port;;Nippon Elec. Instruments;;3;;;30.8;OT;;;;;;T;;C;I;;;;20102001;othI;;;;;;;;;;Dell notebook computer with TurboWin Software version 2.12;;;;;;;;;

NATIONAL REPORT - UNITED STATES

Implementation of VOSClim

1. The U.S. intends to recruit 50 voluntary observing ships to participate in the Voluntary Observing Ship Climate (VOSClim) project. Initially some 50 were identified in 2000, but due to various reasons many of those are no longer viable candidates. The actual recruiting of vessels began in June 2002 and by December 2002, a total of 13 ships had been recruited. A list of U.S. VOS ships that have been recruited to the project is attached as Appendix.

2. Those recruited have been targeted based upon their recent observing record, their routes traveled, and the frequency with which they return to U.S. ports serviced by our Port Meteorological Officers (PMOs).

3. Each recruiting PMO completes a hard copy recruitment form and takes digital pictures of the vessel. These are forwarded to the Data Assembly Center (DAC) with electronic copy of the requisite data in semi-colon delimited format also being sent. VOSClim brochures were provided to the PMOs for their recruitment efforts as well as placed in the Spring/Summer edition 2002 of the *Mariners Weather Log*.

4. All participating U.S. ships estimate the wind speed and direction from the sea state. While many of the U.S. VOS participant vessels have anemometers, none of them are calibrated or tested for accuracy and are therefore not used for VOS observations. U.S. VOSClim observations are forwarded to the National Weather Service (NWS) via Shipboard Environmental (Data) Acquisition Software (SEAS) version 2.30. SEAS VOSClim Observational data conforms to IMMT-2 format.

5. Reinvigoration of PMO recruitment efforts is underway and we anticipate having recruited 50 VOSClim vessels by calendar years end.

6. We are beginning the process of preparing a VOS modernization initiative which if approved and funded at desired levels will provide the U.S. VOS program with a mix of automated and manually observing ships with the first automated systems becoming operation in FY06.

Ship Name	Call Sign	Date Recruited	Date Withdrawn	IMO Number	Recruiting Country
APL Japan	S6TS	27-Aug-2002		9074391	USA
APL China	S6TA	17-Jun-2002		9074389	USA
APL Singapore	WCX8812	27-Aug-2002		9074547	USA
APL Korea	WCX8883	27-Aug-2002		9074535	USA
APL Thailand	WCX8882	27-Aug-2002		9077123	USA
APL Philippines	WCX8884	27-Aug-2002		9077276	USA
President Truman	WNDP	10-Feb-2003		8616283	USA
President Adams	WRYW	2-Jul-2002		8616434	USA
APL Kennedy	WRYE	28-Mar-2003		8616295	USA
President Jackson	WRYC	28-Feb-2003		8616300	USA
President Polk	WRYD	15-Apr-2003		8616922	USA
Horizon Spirit	WFLG	11-Jun-2002		7729459	USA

Annex VI

MQCS FOR VOSCLIM (Proposal)

VOSClim MQC		**Date: 06 May 2003**	
Element	Condition	Action	Remarks
87	HDG ≠ 000 – 360	Correct manually and Q_{22} = 5, otherwise Q_{22} = 4	
	HDG = ΔΔΔ, ///	Q_{22} = 9	
88	COG ≠ 000 – 360	Correct manually and Q_{23} = 5, otherwise Q_{23} = 4	
	COG = ΔΔΔ, ///	Q_{23} = 9	
89	SOG ≠ 00 – 99	Correct manually and Q_{24} = 5, otherwise Q_{24} = 4	
	SOG = ΔΔ, //	Q_{24} = 9	
	SOG > 33	Correct manually and Q_{24} = 5, otherwise Q_{24} = 3	Container vessels of the latest generation of are steaming 25 - 30 kts at full speed + 1- 3 kts by wind and/or current -> Max Value: 33 kts
90	SLL ≠ 00 – 99	Correct manually and Q_{25} = 5, otherwise Q_{25} = 4	
	SLL = ΔΔ, //	Q_{25} = 9	
	SLL > 32	Correct manually and Q_{25} = 5, otherwise Q_{25} = 3	Containers staks above main deck consist of max 6 - 7 layers. Height of a standard container: 2,591m + 10cm space between each layer -> 2,70 m per layer. Total height above deck 7 x 2,70 = 18,90 m. + freeboard**:** biggest German Gastanker: 7,5 m . It follows for SLL : 27m. Criterium: **SLL_{max} = 32 m** proposed to allow for bigger freeboard
91	s_L ≠ 0, 1	Correct manually and Q_{26} = 5, otherwise Q_{26} = 4	
	s_L = Δ, /	Q_{26} = 9	
	hh ≠ 00 – 99	Correct manually and Q_{27} = 5, otherwise Q_{27} = 4	
	hh = ΔΔ, //	Q_{27} = 9	
	hh > = 13	Correct manually and Q_{27} = 5, otherwise Q_{27} = 3	Assuming a max draft of 23 m -> minimum or ballast draft max: 23 x 0,5=11,5m **->** hh_{max} = 11,5 m (23 x 0,6 = 13,8 m -> hh_{max} = 9,2) (see *); Criterium proposal**: hh>= 13 m** to allow for more flexibility
	hh < - 01	Correct manually and Q_{27} = 5, otherwise Q_{27} = 4	Difference Tropical Freshwater load line minus summer load line is far beyond 1 m (usually max 50 - 60 cm)

MQCS for VOSClim (Proposal) (cont.)

Element	Condition	Action	Remarks
92	RWD ≠ 000 – 360, **999**	Correct manually and Q_{28} = 5, otherwise Q_{28} = 4	analogous to El. 13 (dd=99) the case "variable wind" has to be reported. As RWD allows for 99 as a regular value, a new quantity has to be introduced. Proposal is 999 which is not yet existent in any WMO code table and which has to be considered as an IMMT speciality. (999 appears better than e.g. the German national use of "VRB")
	RWD = ΔΔΔ, ///	Q_{28} = 9	
93	RWS ≠ 000 – 999	Correct manually and Q_{29} = 5, otherwise Q_{29} =4	
	RWS = ΔΔΔ, ///	Q_{29} = 9	
	RWS > 110 kts	Correct manually and Q_{29} = 5, otherwise Q_{29} = 3	analogous to El 15 (ff > 80 kts) here: 80 kts + 30 kts max ships velocity -> max value RWS = 110 kts
RWD versus RWS			
	RWD = 000, RWS ≠ 000	Correct manually and Q_{28} or Q_{29} = 5, otherwise Q_{28} = Q_{29} = 2	analogous to El 13
	RWD ≠ 000, RWS=000	Correct manually and Q_{28} or Q_{29} = 5, otherwise Q_{28} = Q_{29} = 2	analogous to El 13

(*) The max value of hh probably appears, when tankers, bulkers or refrigerator ships are going in ballast. As the minimum or ballast draft (MD) is often very poorly known, the "Germanischer Lloyd" gave a thumb rule (personal communication) to estimate this quantity from the ship's draft (S) (summer max load line). It is: MD = ca. 0,5 to 0,6 x S.
Thus the max values for hh = S - MD are derived, when taking the factor 0,5. (**Fig. 3**); the biggest draft of German tankers presently is at 22,9 m.

Annex VII

STATUS OF VOSCLIM PROJECT ACTION PLAN – THIRD YEAR

ACTION	WHOM	WHEN	STATUS
1. Prepare and distribute a test data set for algorithm analysis	SOC	March 2002	Ongoing
2. Run test data set through automated system algorithms and return results to SOC	Participants	June 2002	Ongoing
3. Prepare VOSClim certificates of participation and distribute electronically to participants	WMO	End March 2002	Done
4. Print and issue certificates to participating ships	Participants	Continuous	Ongoing
5. Finalize paper recruitment/inspection form and instructions and distribute to participants and DAC	Australia	End Feb 2002	Done
6. Finalize electronic recruitment/inspection form and distribute to participants and DAC	Australia	April 2002	In progress
7. Prepare paper and electronic recruitment/inspection forms in F, R, S and distribute to participants and DAC	WMO	Late 2002	No
8. Submit paper recruitment/inspection form to SOT-I for review and possible recommendation concerning use with all VOS	WMO	Feb. 2002	Done (Reported to the SOT-1)
9. Prepare updated list of ship types for review by JCOMM ETMC	E. Kent	March 2002	Done (Document will be submitted to ETMC)
10. Finalize revised Project Document and publish on DAC and WMO web sites	WMO	July 2002	Done

ACTION	WHOM	WHEN	STATUS
11. Submit final meeting report of VOSClim-III to SOT-I	WMO	Feb. 2002	Done
12. Review real time monitoring limits	Met Office and SOC	Ongoing	Ongoing
13. Prepare first newsletter and transmit to DAC	WMO and participants	Sept 2002	In progress
14. Populate web site and initiate operations	DAC	Ongoing	Done
15. Update consolidated list of potential ships, plus line map and circulate to participants, DAC, RTMC	E. Kent	End Feb 2002	Done
16. Begin ship recruitment and submit names and call signs to DAC (D. Manns, with copy to: Alan.Hall@noaa.gov) DAC to place list of call signs on the web	Participants, DAC	Immediate	Ongoing
17. Begin metadata submission to DAC – immediately using U.K. template, and using electronic recruitment/inspection form as soon as available	Participants	Immediate	Done
18. Begin production of monitoring reports for participating ships and forward to DAC	RTMC	End March 2002	Done
19. Send monthly reports of suspect ships to participants	RTMC	Continuous, beginning March 2002	On going
20. Begin submission of IMMT-2 data reports to GCCs	Participants	First quarter of 2002 and at least quarterly thereafter	Done
21. Arrange fourth project meeting, perhaps in conjunction with an international PMO workshop	Project Leader, WMO, participants	First quarter of 2003	Done

Annex VIII

VOSCLIM PROJECT ACTION PLAN –AFTER VOSCLIM-IV

Para.	Action	By whom	timing
2.2.3	Ensue that all basic surface meteorological variables, including SST are included in each report	Participants	Ongoing
3.2.2	Recruit as many suitable ships as possible	Participants	Start immediately and ongoing
3.2.3	Notify prospective ship names and call signs to the RTMC.	Participants	Start immediately and ongoing
3.2.6	Make every effort to ensure that all metadata are collected and reported and that all observation variables are reported.	Participants, PMOs Natioanl focal points	Ongoing
4.1.2	Send monthly report of suspect ships to national focal points and DAC.	RTMC	Ongoing
4.1.3	Send update of national focal points and ship call signs to DAC	Participants	Ongoing
4.1.3	Maintain and update details of national focal points and call signs of ships participating in the project on the project web site	DAC	Ongoing
4.1.3	Send ship lists to the RTMC when they are sent to the DAC	Participants	Ongoing
4.1.4	Start using the new monitoring criteria	RTMC	August 2003
4.1.4	Review real time monitoring limits	RTMC	Ongoing
4.1.6	Submit national records of remedial actions to the DAC where appropriate.	Focal points	Ongoing
4.1.7	Start monitoring observations from prospective ships	RTMC	As soon as lists are sent to the RTMC
4.1.10	Produce monitoring reports for participating ships and forward to the DAC	RTMC	Ongoing
4.2.2	Archive the BUFR observation/model data	DAC	Start immediately and ongoing
4.2.3	Link the project web site to the VOS web site	DAC	Immediately
4.2.3	Send their comments on the web site to the DAC	Participants	Ongoing
4.2.5	Send lists of national VOSClim ships to the DAC (Excel files) in the same format as the current ship list available on the web site.	Participants	Ongoing
4.2.5	Up to date an assembled ship list of VOSClim ships.	DAC	Ongoing
4.2.6	Archive digital imagery of ships	DAC	Ongoing
4.2.6	Send digital images to the DAC in jpeg format (6-7 images per ship on average).	Focal points	Start immediately and ongoing
4.3.2	Distribute the revised MQCS to participating members for their use on a trial basis	Secretariat	Immediately

Para.	Action	By whom	timing
4.3.2	Submit the proposal on the revision of MQCS to the next session of the Expert Team on Marine Climatology for their consideration.	GCC Germany	By early 2004
5.2	Circulate the electronic form to VOSClim focal points for their comments	Australia	Soon
5.2	Make the electronic form available to VOS operators upon request	Australia	Ongoing
5.3	Investigate the possibility of producing a web based metadata input and archive system to possibly be hosted by the DAC.	Mr D. McShane	Start immediately
5.3	Propose a web-based metadata input and archive system to the SOT-II	Project Leader	SOT2
5.5	Ensure that metadata are sent to the WMO on a quarterly basis in the new format.	Participants	Ongoing
5.6	Send metadata for VOSClim ships to the DAC in the semicolon delimited form on a quarterly basis	Participants	Ongoing
5.6	Make the metadata available on the project web site	DAC	As soon as data are sent
5.7	Invite VOS panel to consider the need for further revisions to certain fields in Pub 47.	Project Leader	SOT2
5.7	Send details of any proposed amendments to Pub 47 to the VOSClim Project Leader.	Participants	As soon as possible and ongoing
5.8	Report the type and version of the electronic logbook in footnotes to Pub47	Participants	Start immediately and ongoing
5.9	Send copies of nationally used hand books/guidelines on marine observation practices to SOC	Participants	Immediately
6.1.2	Send additional contributions for the Newsletter , especially photographs to the Project Leader and the Secretariat	Participants	By the end of August 2003
6.1.2	Issue Newsletter via the project web site	Project Leader, Secretariat, DAC	September 2003
6.1.3	Provide scientific articles for the future issues of newsletter.	Scientific Advisors	Ongoing
6.1.4	Submit a proposal on a VOS newsletter	Project Leader	SOT2
6.2.1	Issue certificates of participation addressed to VOSClim ships (taking presentation photographs)	Participants	Ongoing

Annex IX

LIST OF ACRONYMS AND OTHER ABBREVIATIONS

ASAP	Automated Shipboard Aerological Programme
CLIVAR	Climate Variability and Predictability (WCRP)
CMM	Commission for Marine Meteorology (WMO)
DAC	Data Assembly Centre
ETMC	Expert Team on Marine Climatology
GCC	Global Collecting Centre
GCOS	Global Climate Observing System
GOOS	Global Ocean Observing System
GTS	Global Telecommunication System (WMO)
IMMA	International Maritime Meteorological Archive
IMMT	International Maritime Meteorological Tape
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
MQCS	Minimum Quality Control Standard
NCDC	National Climate Data Center
NOAA	National Oceanographic and Atmospheric Administration (USA)
PMO	Port Meteorological Officer
RTMC	Real Time Monitoring Center
SEAS	Shipboard Environmental Data Acquisition System (USA)
SHIP	Report of Surface Observation from Sea Station
SOC	Southampton Oceanographic Centre (U.K.)
SOOP	Ship-of-Opportunity Programme
SOT	Ship Observation Team
TD	Technical Document
TOR	Terms of Reference
VOS	Voluntary Observing Ship
VOSClim	VOS Climate (project)
VSOP-NA	Voluntary Observing Ships Special Observing Project for the North Atlantic
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment