

REPORT BY THE TASK TEAM ON THE VOS CLIMATE PROJECT (VOSCLIM)

(report submitted by Sarah North, Chairperson of the VOSCLim Task Team)

Introduction

1. The VOSCLim project is now operationally mature with many of the obstacles identified at previous sessions of the SOT having been overcome. Levels of ship participation set by the SOT have been met and the data flow processes are now operating as required with the relevant datasets readily available to users via the project website

2. However, whilst the implementation phase of the project has now been completed, there has been limited progress with the evaluation stage, which is intended to demonstrate the added value of the VOSCLim datasets.

3. This report addresses the key issues assigned to the Team in its Terms of Reference and identifies the key areas where progress has been made since SOT IV. Taking into account work undertaken by the ETMC and the new cross-cutting (ETMC-SOT) Task Team on Delayed Mode VOS Data (TT-DMVOS), the report invites the SOT to consider carefully how the project should develop in the future, so that it can help to raise the climate quality of data from the wider VOS, and thereby contribute to the Global Climate Observing System (GCOS). In this respect, the Task Team believes that the time is now right to extend the good practice established for VOSCLim ships to the wider VOS community and invites the SOT to consider the most appropriate means of achieving this objective.

4. The following supporting documents are appended to this report

Annex 1 Task Team current Terms of Reference

Annex 2 VOSCLim Project Status Report

Annex 3 Report by Scientific Advisers to the Project

Annex 4 Overview of Current Project Status

Annex 5 Status of actions agreed at SOT III & SOT IV

Annex 6 The future of the VOSCLim project

ANNEX 1

Terms of Reference of the SOT Task Team on VOS Climate Project

Task Team on the VOS Climate Project

Tasks (in close cooperation with the ETMC):

1. Coordinate, maintain, promote and enhance the VOS Climate project, monitor its performance, and encourage increased participation.
2. Revise the VOS Climate project document to reflect the current procedures and to clarify and revise where necessary the responsibilities of the VOSClim data centres;
3. Review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;
4. Prepare a report to SOT-IV on, inter-alia, the following over-arching VOSClim issues
 - a. Should VOSClim be continued as a project, or developed into a separate long-term operational programme? If so, what form should this programme take?
 - b. Is the high-quality dataset a valuable resource? If so, how should it be updated? operationally?
 - c. How can the lessons learnt from the VOSClim be used to improve data quality in the wider VOS?

Members:

Sarah North (TT chairperson, United Kingdom)
Julie Fletcher (VOSP chairperson, New Zealand)
Representatives of participating countries (VOSClim focal points)
Representative of the Real Time Monitoring Centre (RTMC) —hosted by the UK Met Office
Representative of the Data Assembly Center (DAC) —hosted at the NOAA National Climatic Data Center (NCDC)
Representatives of the Global Collecting Centres (GCCs)
Scientific advisers

ANNEX 2

VOSCLIM PROJECT STATUS REPORT

1. VOSCLim Ship Participation & Recruitment

1.1 At SOT-IV (April 2007) it was noted that the initial target of 200 ships participating, which was set at the outset of the project, had been achieved and a new target of 250 ships set.

1.2 The Task Team is pleased to report that this revised target has now also been met and at the end of 2008, the number of ships reported as actively participating in the project stood at 255, representing ships recruited by ten participating countries. Table 1 below shows the growth in participation since SOT III (March 2005). An update on the current status will be given at the SOT-V meeting

Country	Number of VOSCLim ships at SOT III	Number of VOSCLim ships at SOT IV	Number of VOSCLim ships at SOT V <i>(at February 2009- to be updated at meeting)</i>
Australia	10	12	10
Canada	14	40	47
France	6	23	25
Germany	11	22	32
India	21	22	22
Japan	5	5	5
Netherlands	1	19	37
New Zealand	0	1	1
UK	33	62	59
USA	12	12	17
TOTALS	113	218	255

Table 1: Contribution of ships to VOSCLim by country

1.3 To ensure that the project data can be monitored by the RTMC, it is essential that recruitments, withdrawals and call sign/name changes be notified promptly to the DAC (and to the RTMC) so that the participating ship list can be kept up to date. The team is therefore pleased to report that previous problems with updating the ship list on the website, reported at SOT IV, have now been resolved. Furthermore, the format of the ship list has been revised since SOT IV to show additional information such as former ship names and call signs. Full details of participating ships are maintained on the project website at <http://www1.ncdc.noaa.gov/pub/data/vosclim/vosclimshiplist.xls>.

1.4 There has been a marked increase in the number of ships equipped with shipborne AWS systems participating in the project (notably those ships recruited by France and Canada) and approximately one third of the project ships now carry AWS. Although this has resulted in an increase in data volume it, perhaps means that the scope of participation is not as representative of the wider VOS as originally intended – although there is a wide variety of different ship types involved in the project, including research ships, container ships, bulk carriers, cruise ships and ferries.

1.5 The number of manually reporting VOSCLim ships has also grown gradually since SOT IV and

notably Germany, the US and the Netherlands have increased the size of their VOSClim fleets.

1.6 The need for Port Met Officers to routinely, inspect VOSClim ships has resulted in ships mostly being drawn from the regular liner trades, such as container ships, and relatively fewer ships operating on variable charter trades, such as oil tankers. However as the nature of shipping is highly dynamic there have been cases where ships routes have changed with little notice, making routine inspections impossible. Inspection details for VOSClim ships are only maintained on a national basis and are not available at a central location.

1.7 Resource pressures felt by national met services, and reported previously at SOT IV, appear to have had only a small impact on the availability of Port Met Officers to inspect VOSClim ships. However, the growing migration to using Automatic Weather Stations is inevitably having an impact on the range of observed parameters available in the VOSClim datasets. Such problems are also a pressing issue for the wider VOS community and will need to be addressed by SOT in the coming years

2. Electronic Logbooks and AWS software

2.1 As identified in the 2008 GCC report there continues to be a significant number of ships that are effectively 'self recruiting' and submitting observations with the additional delayed mode VOSClim IMMT elements. This is typically due to the use of electronic logbooks such as TurboWin, which is used on the majority of manually reporting project ships, and which easily permits officers to upgrade their reports to VOSClim standards (i.e. by ticking the VOSClim check box). Whilst a warning message was added to TurboWin Version 4 to try to prevent this practice the Task Team maintains the view that such self recruited ships do not impact on the value of the VOSClim datasets - provided that it is recognised that the only ships officially recruited to the project are those which have been formally notified to the DAC and are listed on the project website. Indeed the additional data provided by self-recruited ships should not be discouraged given the proposed extension of VOSClim standards to all VOS [see separate discussion at *Annex 6*].

2.2 The need to compare the algorithms associated with these different electronic logbook software systems (OBSJMA, TurboWin, SEAS) was identified at the outset of the project and the Team is pleased to note that the intercomparison of electronic logbook software will have resolved many of these potential inconsistencies. However, given the increased use of proprietary AWS software (AVOS, BATOS, and MILOS etc) it is considered that a similar intercomparison study should be undertaken for these systems to ensure consistency of data

2.3 The latest version of the TurboWin software, due to be released in early 2009, will include password protection for its metadata module - as changes to metadata should preferably be made by the Port Meteorological Officer rather than by the observers themselves. Some flexibility may however need to be exercised for ships that do not routinely return to a homeport and where inspections can be years apart. In all cases, however, it is the responsibility of the recruiting country to vet all metadata before making submissions to WMO Pub. 47.

3. Real Time Data

3.1 The transmission of VOSClim ship observations from the RTMC to the project DAC continues to operate in accordance with the project requirements. Reports from manually reporting VOSClim ships are typically transmitted in WMO Ship GTS Code (FM 13) via Inmarsat C, whilst an increasing number of automatically reporting ships send their reports via national centres using data compression to reduce transmission costs.

3.2 The RTMC appends the six prime model parameters from the forecast model – pressure, relative humidity, air temperature, sea temperature, wind speed and wind direction – to the ship report and, since July 2002, has been routinely transferring this data in BUFR code to the project DAC,

forming what is referred to as the “BUFR” dataset. Furthermore, the RTMC has also been making back-up copies of the data available to the DAC via the Met Office’s external FTP server. A more detailed RTMC report will be included in the Met Office’s RSMC report submitted under agenda item SOT-V/III-3.

3.3 The DAC also makes available a second “GTS” dataset based on NCDC GTS data, which has not been transformed into the BUFR format and retains the original FM 13 message data.

4. Delayed Mode Data

4.1 The delayed mode observations from VOSclim ships (including the additional IMMT project code groups) recorded in electronic logbooks (from manually reporting ships) are typically downloaded by visiting Port Meteorological Officers on a recommended three monthly basis. Minimum quality control procedures are then applied to the collected delayed mode datasets before being sent to the two Global Collecting Centres (located in Hamburg and Edinburgh). Having checked the data quality flags, and clarified any problems bilaterally, the GCCs have been sending the delayed mode data to the DAC on a quarterly basis since March 2003. Problems reported at the previous sessions have now been overcome and this “GCC” dataset is now available to users via the DAC website.

4.2 Further details of the delayed mode VOSclim data contributions will be included in the 2008 GCC report submitted under agenda item SOT-V/III-3.4. The number of VOSclim observations being submitted to the GCCs remains generally good although submissions were only received from nine of the ten participating countries. In total 48583 observations were received from VOSclim ships in 2008 amounting to 6% of the total submissions received by the GCCs (the same proportion as in 2007)

4.3 Although the IMMT-3 format (which permits QC flags to be applied to the additional project elements) formally came into use in 2006 it is understood that some VOSclim contributing members are still having problems with sending their data in the newer format and one member has been unable to submit any data. In addition the IMMT element for SLL (maximum deck cargo height) reported by new generation container ships has created problems for application of MQCS. Consequently, the current limiting height of 32 m has had to be increased to 40m, following agreement by the ETMC.

4.4 In accordance with discussion in the TT-DMVOS, the way in which the VOSclim data is distributed was changed in July 2008 so that the complete quarterly dataset containing VOSclim data is now despatched by the GCCs to the Responsible Members and to the Project DAC. Accordingly the DAC now takes ownership for calculating the quarterly statistics for the number of VOSclim observations with and without the additional elements, and the number of observations from unlisted ships (refer to SOT-V/III-3.4 for further details).

5. Metadata Collection & Recruitment/Update forms

5.1 Although, the majority of project participants are now collecting metadata in accordance with the latest format prescribed for WMO Publication No. 47 (i.e. Version 03 introduced in July 2007), it is regretted that the availability of updated metadata to users on the WMO website continues to be extremely poor, with the WMO website not having been updated since the 2nd Quarter of 2008 (at time of writing this report). However, in the case of E-SURFMAR recruited project ships this metadata is now also maintained on the new E-SURFMAR metadata database, with monthly updates provided by contributing project members. (Metadata from other project countries is also made available on this database.)

5.2 VOSclim metadata is now collected in exactly the same Pub. 47 format as used for normal VOS, although PMO’s are requested to take additional digital images showing the location and exposure of instruments and to make schematic drawings of the ships arrangements. At SOT III it was agreed that these could be submitted to the DAC for archive only, (as it was considered that inclusion of such digital imagery on the website could require considerable manual intervention) while

at SOT IV the WMO Secretariat was requested to investigate whether such photographs could be stored together with Pub. 47 Metadata on the WMO website. The outcome of this action is awaited.

5.3 As a consequence of the introduction of Metadata Format Version 03 in July 2007, it was decided to recommend that a new Form VOSP002 should in future be used for the recruitment and collection of metadata for VOSClim ships. To ensure accurate completion of this form it was further recommended that Port Met Officers take a copy of the latest Metadata Format Version 03 with them when inspecting VOSClim ships. Copies of Form VOSP002 and Metadata Format Version 03 are available for download [from the project website](#) (via a link to the form on the VOS website).

5.4 However, the availability of a separate metadata module within TurboWin has greatly simplified the collection of metadata for several VOSClim ship operators, as it automatically encodes the metadata into Pub. 47 format (XML or delimited). Because it is maintained in electronic format at source it can be easily verified and maintained by, visiting Port Met Officers while on board and then downloaded for subsequent ingestion into national databases and submission to WMO. This therefore brings into question the need to additionally fill in hard copy VOSClim recruitment/update forms, as it represents a duplication of effort for some project members (especially as VOS operators may require national inspection forms to be completed as well). This could explain why some Port Met Officers appear reluctant to recruit new project ships. It is suggested, therefore, that the requirement to additionally fill in a hardcopy of form VOSP002 should rest with the individual VOSClim ship operators concerned - however, the Task Team would not wish to appear to be preventing use of this excellent hardcopy form by both VOS and VOSClim members who find it advantageous. The important points to remember are that it is essential that the required metadata is collected and updated at regular intervals and that records of the inspections and visits made by Port Meteorological Officers are maintained and archived.

5.5 The use of the TurboWin module also affords the opportunity for downloaded metadata to be routinely transmitted back to VOS and PMO focal points, which could be particularly useful for ships that are trading on a worldwide basis and are out of the reach of the Port Met Officers. In this respect, consideration is currently being given to, whether TurboWin should include a timed facility, linked to the computer time, to remind observing officers to download all their TurboWin log files at routine intervals (e.g. quarterly or six monthly) and return them to their recruiting VOS focal points. (This would be particularly helpful to keep abreast of changes to ship's call signs.)

6. Monitoring Statistics

6.1 Monitoring statistics for the real time observed data continue to be produced by the RTMC on a monthly basis together with monthly listings of ships whose observations have been flagged as 'suspect'. These statistics are made available to the DAC via the Met Office external FTP server.

6.2 Problems reported at SOT IV concerning the availability of the monitoring statistics on the project website have now been overcome, and they are now readily available to VOSClim focal points and PMO's, who are encouraged to take early remedial action to resolve any monitoring problems.

7. Project Website

7.1 The project website [<http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html>] is maintained by the DAC, and acts as the main focal point for the project, providing users with easy access to the necessary data.

7.2 The website design and layout was improved in 2006 and further minor improvements have been made since SOT IV. Previous metadata information on the website has now been removed and a direct link to the Pub. 47 website has been added. A link has also been made to the new inspection Form VOSP002 which is now recommended for use by VOSClim ship operators, and which replaces the previous project recruitment/update form. The ship list on the website has been amended to

include former ship names and call signs, and details of when masked call signs were adopted. A large number of digital images for ships recruited by the UK, US and Australia are included on the website and a link is made to the images of project ships recruited by the Netherlands available on the KNMI website at <http://www.knmi.nl/vos/vosclim/>.

7.3 The Team is pleased to report that previous problems with maintaining the information on the project website up to date have now been overcome due to the addition of additional staff resource at NCDC (i.e. with particular thanks to the efforts of Eric Freeman who has been promptly updating the website when requested).

7.4 A separate report by the DAC will be made under agenda item SOT-V/III-3.6.

8. Project promotion – Project Brochure & Project Newsletter

8.1 It was recognised at the last session that the revision of the project brochure was not an urgent task, but agreed that it would eventually need to be revised to reflect changes such as the increased target for participating ships

8.2 In view of the need for SOT to agree the future form and direction of the project at the current session, and the possibility of extending the project to wider VOS programme, the Task Team has taken no action on this item since the last session

8.3 Copies of the project brochure are now in short supply, although pdf copies are downloadable for printing from the project website and from the TurboWin electronic logbook

8.4 The first issue of the VOSClm project newsletter was issued in October 2003 and was made available for download via the project website. The newsletter was originally intended as a means for exchanging information and for keeping all those involved in the project – both ashore and at sea – aware of the latest developments. Unfortunately, resource limitations have prevented further copies of the newsletter from being issued, although articles on the progress of the project have been included in publications such as NOAA's Mariners Weather Log, the Ocean Views newsletter issued by the Australian Bureau of Meteorology, and the KMNI Marine Information Bulletin.

9. Project Certification

9.1 Following discussion at the last session it was decided to discontinue the VOSClm Certificate of Appreciation (intended for presentation, unsigned, to ships observers) and concentrate solely on the VOSClm Certificate of Participation (for presentation, signed, to participating ships). This would help reduce the proliferation of certificates being issued to observing ships. Copies of the VOSClm Certificate of Participation are available for pdf download from the project website.

10. Masked Call signs

10.1 The masking of ship call signs in response to security concerns, and its implications for data monitoring, is being addressed separately by the Task Team on Call Sign Masking and Encoding. However, this issue continues to have implications for the success of the VOSClm Project, especially if national met services adopt non-unique masked 'SHIP' solutions with data release time restrictions.

10.2 Notwithstanding, the masking issue does not appear, so far, to have had a major impact on the availability of project data or on its ability to be monitored in real time. Although the E-SURFMAR AWS systems that are contributing to the project are uniquely masked this has not been done for security purposes, but to assist efficient operation of the E-SURFMAR programme. However, it should be noted that these AWS ships are listed on the VOSClm website under their real call signs, and not under the masked call signs that are used for their real time transmissions. In the case of the Japanese ships that contribute to the project it is understood that because they are government

research ships they are not subject to the non-unique SHIP masking system being used for merchant Japanese (and a few US) ships that send their observations via Yamaguchi LES.

10.3 The planned introduction of a lookup database of Mask Vs Real call signs on the JCOMMOPS website (WMO Letter to Permanent Representatives dated 26 January 2009 refers) will greatly assist the real time monitoring centre to ensure ongoing monitoring of project observations. However, the non-unique SHIP call sign system in use for Japanese ships and a lesser number of US ships continue to present problems for the RTMC as highlighted in the Met Office RSMC/RTMC report submitted under agenda item SOT-V/Doc. III-3

ANNEX 3

Report by Scientific Advisers to the Project

1. The three overlapping VOSCLim datasets (BUFR, GTS, and GCC, as discussed in *Annex 2*) are now readily available from the project website, all conveniently unified into the International Maritime Meteorological Archive (IMMA) format (Woodruff 2007), but unfortunately, no analysis has been possible using them in the period since SOT-IV. This highlights the need to make the VOSCLim datasets an integral part of the scientific DataStream to improve accessibility to scientists, and initial efforts along these lines linked to ICOADS (Worley et al. 2005, <http://icoads.noaa.gov>) are discussed below.

2. An important study using the observation/model comparison methodology of VOSCLim has been carried out recently at the Met Office, but using the full marine dataset for 2007-8 which is available internally at the Met Office (Ingleby 2009). This study showed, for example, that differences between the Met Office NWP model winds and ship visual winds showed a strong country-to-country variation and clearly shows the effect of bias in air temperatures caused by solar heating of the ship (e.g. Berry and Kent 2005). Ingleby (2009) demonstrated that ships in VOSCLim without AWS reported air temperatures with smaller RMS differences than those of the remainder of VOS reports. VOSCLim humidity observations were also better than average, but little difference was seen for pressure observations. The Ingleby study was carried out on over 2500 ships and clearly shows the advantage of making the associated model parameters routinely available with all ship reports, and of extending this to other observation types such as moored buoys, rigs and drifters. The delayed mode information available as part of the VOSCLim dataset, which includes relative wind speed and direction, would have helped in diagnosing whether or not the true wind speed had been calculated correctly. It seemed likely that in some cases, this was not done properly, but no definite conclusions could be drawn.

3. The full availability of the VOSCLim datasets now needs to be advertised to the scientific community, and mechanisms for doing this will be investigated and implemented. It is clear from the Ingleby study that the extension of the VOSCLim model data and additional parameters to all VOS would be advantageous. Meanwhile, to ensure the widest take-up by the scientific community, the existing VOSCLim datasets should be made readily available together with ICOADS, which is widely used for climate research. Data from the three VOSCLim datastreams are now starting to flow regularly to ICOADS (which also uses the IMMA format), and the possibility of merging these with ICOADS in the most effective manner will be investigated. With the support of UK NOCS, selected Pub. 47 metadata are already periodically merged with ICOADS for the entire VOS (currently back to 1973) utilizing an extensible “attachment” feature of the IMMA format. Additional IMMA attachments could potentially be defined, for example, to store unique data from the three VOSCLim datastreams and, as appropriate, combine them via report compositing. In the longer-term, it is also hoped that additional and timelier integration can be achieved within the modernisation of the delayed mode and real time dataflow, including linkages with ICOADS, as proposed by TT-DMVOS (see *Annex 6* and SOT-V/III-3.5).

References

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ANNEX 4

OVERVIEW OF CURRENT VOSCLIM PROJECT STATUS

Element of VOSCLim Project	Implemented?	Status
Recruitment	Yes	Initial target of 250 ships met. (expansion of project to be considered at SOT V)
Real time data exchange	Yes	Data transfer to DAC working with backup FTP transfer now implemented (BUFR template not ideal for data exchange).
Metadata availability	Partly	Metadata often only available with significant delay. Availability of digital imagery not fully resolved
Delayed mode data exchange	Mostly	IMMT data available on DAC website- but some countries not making quarterly submissions MQCS-V being implemented by [most] contributing members.
Monitoring	Yes	Monthly statistics for full range of variables being produced by RTMC and sent to DAC. (Mechanisms for logging monitoring follow up actions not fully resolved though)
Project Promotion	Partly	Brochure available but may need updating. Project document needs updating Newsletter and articles issued Certification being issued
VOSCLim website	Yes	Website updated in 2006 and now being routinely kept up to date
VOSCLim Datasets	Mostly	Real time and delayed mode data streams now working and data added to website Metadata still not promptly available
Scientific Analysis	Partly	Data sets not being fully exploited despite data now being available on the website (despite interest expressed by scientific community). Scientific journal papers have been published using VOSCLim dataset. Some comparison of VOS and VOSCLim reports made at SOT-IV Scientific and Technical Workshop.

ANNEX 5

STATUS OF VOSCLIM ACTIONS AGREED AT SOT III & SOT IV

1. Status of action items from SOT IV relating to VOSClim

II-4.5	To provide VOSClim uncertainty maps and time series of uncertainty	TT/VOSClim	For presentation at Technical Workshop
I-4.4.2	To check the VOSClim project website (recently updated) to verify ships and call sign changes to make sure that none are missing	VOSClim operators	Done/Ongoing
IV-3.2.5	To use a slightly higher limit of 12% for the bias limit criteria for the real time monitoring for relative humidity VOSClim	RTMC	Done
IV-3.2.6	To provide details of remedial actions taken to the DAC by email	PMOs	Ongoing?
IV-3.4.4	To consider the following recommendations by the meeting regarding the display and availability of VOSClim project data on the website: (i) there is a need for maintaining the list of VOSClim ships up to date, (ii) the notification of the recruitment to the DAC must be the date of notification, (iii) a link to VOS web site should be added on the VOSClim web site, (iv) the DAC should keep track of call sign changes (e.g. beginning/ending dates for call signs)	VOSClim DAC	Done/Ongoing (i) Done (ii) Done? (iii) Done (iv) Done
IV-3.7.1	To consider how many observations are needed from the VOSClim yearly	TT/VOSClim	For presentation at Technical Workshop
IV-3.7.1	To investigate whether the VOSClim photographs could be stored with Pub47 Metadata	Secretariat (WMO)	Not done - To be confirmed
IV-3.7.1	To revise the VOSClim brochure	TT/VOSClim	Not Done
IV-3.7.1	To consider a way to discriminate between VOSClim and non-VOSClim ships for ships not listed in the VOSClim in case of extending the Principle of all VOSClim data going to one central repository (DAC) to be used for all VOS data.	VOSClim DAC	Done (Project ships are those notified to the DAC and included in the ship list)
IV-4.1.2.7	To negotiate with some of the web sites making ship positions and identification available on their web sites to delay the availability of the data in certain regions to be defined	VOSClim USA	Part Done (time delay now on sailwx.info)
I-6.3.7	To consider adopting VOSClim best practices more generally under the VOS scheme	TT/VOSClim	For further consideration at SOT V

2. Status of action items from SOT III relating to VOSClim

III-B/1.3.2	DAC to link to the latest version of Pub. 47 on the WMO web site and the JCOMM VOS web site, and the tools for metadata display and interrogation on the JCOMMOPS website.	DAC	Done
III-B/1.3.2	Scientific Advisers to be responsible for the association of metadata with individual VOSClim reports. A mechanism for the provision and storage of VOSClim digital images to be investigated.	Scientific Advisers and DAC	Part done Storage of images not resolved yet
III-B/1.3.3	Increased recruitment of VOSClim ships.	VOSClim operators, VOS operators who have yet to contribute	Ongoing/Done (targets achieved)
III-B/2.1.2	RTMC to take appropriate actions so that only reports received in ocean areas (model surface type 'ocean') would be included in the monitoring statistics.	RTMC	Done
III-B/2.1.2	Operators who had responded to the monitoring statistics to provide feedback on remedial actions.	VOSClim operators	Ongoing/Partly done
III-B/2.1.2	Once the VOS monitoring feedback system is established, using JCOMMOPS facility, mechanism to be extended to VOSClim project.	RTMC, JCOMMOPS Coordinator, VOSClim operators	Not done?
III-B/2.1.2	An up-to-date list of the project focal points to be maintained on the web site.	VOSClim operators	Done (needs updating again)
III-B/2.1.2	Modifications to the list of participating ships to be sent to the RTMC and VOSClim Data Assembly Centre	VOSClim operators	Ongoing
III-B/2.2.1	DAC and RTMC to take actions to recover data from the Met Office to fill the gap in the BUFR data stream between the end of April and the end of August 2003 due to the transition from e-mail to GTS transmission of the BUFR data stream.	DAC and RTMC	Done
III-B/2.2.2	DAC and the RTMC to agree on improved mechanisms, which will be put in place to avoid RTMC BUFR data loss.	DAC and RTMC	Done
III-B/2.2.2	Mechanisms for simplifying data delivery between RTMC and the DAC, such as ftp, to be considered	DAC and RTMC	Done
III-B/2.2.2	DAC to simplify data delivery to users using ftp site.	DAC	Done
III-B/2.2.2	RTMC to investigate whether the monthly statistics and suspect lists can be transferred to the DAC by ftp rather than e-mail.	RTMC	Done
III-B/2.3	VOSClim operators to ensure implementation of the latest version of IMMT.	VOSClim operators	Ongoing/ Part done
III-B/2.3.2	All contributing members of the VOSClim project to review their delayed mode data submission processes to the GCCs in IMMT-2 or IMMT-3, and ensure or work toward their processes and submissions being up-to-date	VOSClim operators	Ongoing/ Part done
III-B/2.3.3	France to attempt to revise the BATOS system.	France	Done (BATOS now reports IMMT3)
III-B/3.1.1	Since the lack of delayed mode, data for the VOSClim project is a problem, as interim measure VOSClim operators are to provide raw data from the data entry software direct to the Scientific Advisers.	VOSClim operators	Done (delayed mode data flow now working)
III-B/3.1.2	Scientific Advisers to convene an informal 'Scientific Users Group' to widen expertise inform the development	Scientific Advisers	Part done (i.e. at

	of the high-quality dataset and guide the assessment and exploitation of the value of VOSClim datasets.		MARCDAT-II in 2005 when a number of scientists agreed to contribute to analysis of the VOSClim dataset)
III-B/3.1.2	A strategy for the future production and maintenance of a high-quality dataset to be developed and agreed based on results of assessment of value of VOSClim datasets. The strategy to include a determination of how many ships and observations will be needed to ensure the quality of the dataset.	Scientific Advisers	Part Done
III-B/3.1.3	JCOMMOPS to set up and maintain a VOSClim Task Team mailing list.	JCOMMOPS	Done
III-B/3.1.4	New Task Team on VOSClim to prepare a report to SOT-IV on, inter-alia, overarching VOSClim issues.	Task Team on VOSClim	Done
III-B/3.1.5	Scientific Advisers to produce a VOSClim dataset for presentation at SOT-IV. Mechanisms for the maintenance of the dataset to be developed.	Scientific Advisers	Mechanism for dataset maintenance considered in Appendix F
III-B/3.1.5	VOSClim operators who are currently not providing delayed mode data in IMMT-2 and IMMT-3 formats to the GCC to contact the Scientific Advisers (eck@noc.soton.ac.uk) to arrange delivery of delayed mode data as a temporary measure to allow scientific assessment to proceed.	VOSClim ship operators	Done (delayed mode data flow to DAC now working)
III-B/3.2.2	As an alternative to issuing a VOSClim Newsletter, Robert Luke (USA) to include an updated VOSClim article in a coming edition of the US Mariner Weather Log. NMS encouraged taking similar actions.	Robert Luke, NMS	Done
III-B/3.2.3	DAC to review the front page of the VOSClim web site and make revisions as appropriate. The Task Team on VOSClim to advise the DAC regarding any web site enhancement.	DAC and Task Team on VOSClim	Done

ANNEX 6

THE FUTURE OF THE VOSCLIM PROJECT

(Note - the VOS Panel under SOT agenda item III-4.1 will also consider this aspect of the Task Team report separately)

1. The following discussion paper outlines the general views of the Task Team for the future of VOS Climate Observations taking into account the three overarching issues assigned to the Team, as follows (but with item b updated from *Annex 1* to reflect the current situation with three distinct datasets available from the DAC)

- (a) ***Should VOSClim be continued as a project, or developed into a separate long-term operational programme? If so, what form should this programme take?***
- (b) ***Are the high-quality datasets a valuable resource? If so, how should they be updated operationally, including possibilities for integration of overlapping data receipts?***
- (c) ***How can the lessons of VOSClim be used to improve data quality in the wider VOS?***

DISCUSSION

2. In considering the future need for the VOSClim Project and its implications for the wider VOS, the Task Team has taken into account the following key factors, which will impact on its future evolution -

- (a) Although the number of ships has now achieved the target levels set by SOT, the volume of project data being collected is far less than had originally been hoped for, and is insufficient to permit the required level of scientific scrutiny
- (b) From 2012 all GTS international data exchange between National Met Services will be required to use either BUFR or CREX table driven formats. The latest VOS BUFR templates include all the current VOSClim elements and should permit additional elements to be included with less difficulty. Previous CBS restrictions on making amendments to the WMO Ship code will no longer apply once the alphanumeric codes have been superseded, although any code amendments will still need to be approved formally through CBS in what can be a lengthy process.
- (c) Recruitment of project ships has been made a far simpler process with the increased use of electronic logbooks such as TurboWin, which include a Pub. 47 metadata module. This therefore offers the opportunity to widen the current participation to all manual VOS with minimal effort.
- (d) The expected rapid growth in the use of shipborne AWS systems is likely to give rise to a variety of different transmission mediums and formats for sending coded observations e.g. hexadecimal, compressed binary, and other proprietary codes. While the volume and quality of observations is likely to increase, the range of parameters will be limited to those that can be measured without manual input. The future focus is therefore likely to be targeted at NWP forecast requirements, and often at the expense of providing the full range of observed elements traditionally provided by VOS.
- (e) PMO resources to inspect and maintain the traditional manually reporting VOS are under significant pressure, and with the introduction of AWS systems it is anticipated that there is likely to be an increased requirement for technical skills

- (f) The work of the TT-DMVOS is expected to have an impact on the future VOSClim data flow. In particular, their proposals for a revised GCC data flow involving both real time and delayed mode Global Collecting Centres feeding the data into a WIS data server and thence on to the ICOADS will need to be considered.

3. Having considered these factors the Task Team and its scientific advisers, have come to the conclusion that there is a need for the additional IMMT code groups reported by VOSClim ships to be requested (as soon as feasible) from all VOS ships. Moreover, as these parameters are currently only reported in delayed mode, it is considered that work should begin on ensuring that these parameters can increasingly be made available in real time.

4. Accordingly, the Task Team considers that it is now time to end the 'project' status of VOSClim and to start applying the benefits learned to the wider VOS. Upgrading, whenever possible, existing VOS to VOSClim standards will help to ensure the future availability of climate quality marine data.

5. Consequently, rather than developing the project into a separate long-term operational programme as was originally suggested at its outset, it is recommended that VOSClim should be fully integrated within the existing VOS Scheme as separate category of VOS. In liaison with the Task Team on WMO Pub, 47 metadata, the Task Team considered that that this could be achieved, at least in part, by introducing a new type of meteorological ship into WMO Pub. 47 (e.g. by adding 'Selected VOS Climate Ship' as a new type for the field vssIM and in associated table 2202). Detailed proposals in this respect, including proposals on how to distinguish VOSClim ships fitted with AWS systems will be included in the report of the Task Team on Metadata for WMO Pub No 47. In addition, it was suggested that a flag could be added to the delayed-mode IMMT format to indicate whether a given ship is officially part of the VOSClim project. Having made these changes VOS operators could then be strongly encouraged to upgrade their existing Selected VOS to the VOSClim standard.

6. One of the key achievements of the VOSClim project is the process whereby all relevant datasets (i.e. real time data and associated model output data, delayed mode data, and metadata) are made available at a single location, and unified into the IMMA format (see *Annex 3*) to be compatible with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS; <http://icoads.noaa.gov/>). Although it took longer than originally anticipated to establish this data flow, it is now in place and climate researchers can easily gain ftp access to the data from the VOSClim website. It is proposed that the aim now should be to apply the principle of this data flow to the whole VOS, but with modifications to also eventually align it with long-term data management proposals currently under consideration by TT-DMVOS (see *Annex 3* and SOT-V/III-3.5). The resultant VOSClim datasets are already starting to flow regularly to ICOADS with an IMMA flag indicating ships identified as members of the VOSClim project. It is suggested that ICOADS, with support from UK NOCS (and contingent on agreement with the Met Office RTMC, NCDC DAC, and other involved organizations) should also investigate populating the model and VOSClim attachments historically (back to 2000). Model parameters are already associated with all GTS reports by the RTMC, but only the VOSClim subset is currently forwarded to the DAC, and extending this to all ships (including the model information historically, as feasible, and possibly extended to buoys and other non-ship data types) could be highly beneficial scientifically.

7. One of the additional tasks assigned to the Task Team at SOT IV was to review all relevant JCOMM Publications to make sure they are kept up to date. Consequently, SOT is invited to note that the proposal to start upgrading all VOS to encompass VOSClim standards is likely to require amendments to the following publications

- WMO No 471, WMO Guide on Marine Meteorological Services (Chapter 6 - The WMO Voluntary Observing Ships' Scheme)
- WMO No. 544, WMO Manual on the Global Observing System (GOS) (section 2.3.3 Sea Stations which makes references to selected, supplementary, and auxiliary)

- WMO No. 488, WMO Guide to the Global Observing System (GOS) (section 3.2.1.3.3 Mobile sea stations which defines selected, supplementary, and auxiliary, and criteria for recruiting VOS; there is also section 3.7 dealing with climatological stations although these are basically land stations but a note could be added to refer to VOSClim)
- JCOMM TD No.4, The Voluntary Observing Ships Scheme – A Framework Document

8. Upgrading existing VOS to VOSClim standards will provide an impetus for VOS operators to ensure that they collect the full suite of metadata for all VOS in accordance with WMO Pub. 47, together with the supporting digital images and ship profile plans that are currently collected for VOSClim ships. In addition, it will help to ensure that VOS are equipped with the calibrated instruments needed to collect high quality observations.

9. Subject to acceptance of the above proposals the SOT is invited to revise the Task Teams Terms of Reference, in particular by deleting para 4 and by introducing a new task to ensure that the data management aspects are addressed and aligned with the long-term proposals currently under consideration by TT-DMVOS.

10. As the project can now be considered as being operationally mature it is recommended that the leadership of the project should now be revisited, noting that the current project leader intends to step down at SOT-V.
