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SHIP OBSERVATIONS TEAM

ITEM III-4.1

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REPORT ON THE VOS CLIMATE PROJECT, STATUS, RESULTS, AND IMPLICATIONS FOR THE WIDER VOS

(Submitted by Sarah North, Chairperson of the SOT Task Team on VOSClim)

Summary and purpose of the document

This document provides information on the status of the VOS Climate Project (VOSClim) as compared to the project's target (250 ships, recording of the additional elements). It is also assessing the results and lessons learned and address implications for the wider VOS. This document should be read in conjunction with the report of the Task Team on the VOSClim Project, which recommends that the project status should be discontinued, and that VOS Climate ships should be fully integrated within the existing VOS Scheme. It proposes criteria that should apply for ships to be upgraded from selected VOS standards to VOS Climate standards.

ACTION PROPOSED

The Team will review the information contained in this report, and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

Appendices: A. Proposed Criteria for Upgrading Selected VOS to VOS Climate ships

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

III.4.1.1 Taking into account the report of the Task Team on the VOSClim Project is the VOS Panel agreed that the 'project' phase of VOSClim should now be ended, and that the benefits learned from the project should be applied to the wider VOS.

III.4.1.2 Noting that the Task Team on WMO Pub 47 metadata had proposed the addition, of a new category of 'VOSClim (VOS Climate Reference Ship)' and 'VOSClim (AWS)' into WMO Pub 47, table 2202, the panel considered the development of an appropriate criteria for use by VOS Operators and Port Met Officers when determining whether, currently Selected VOS are suitable for upgrading to performing climate standard observations.

III.4.1.3 The Panel considered the level at which the criteria should be set, recognising that imposing too prescriptive standards would unnecessarily risk reducing the volume of additional VOSClim elements available for climate analysis. Following detailed consideration, the Panel agreed with the criteria shown at Appendix A.

III.4.1.4 Accordingly the Panel agreed that VOS Operators should be encouraged to apply this criteria and that, whenever possible, they should be requested to make determined efforts to upgrade their existing VOS to VOSClim standards in order to help ensure the future availability of climate quality marine data (***Action; VOS Operators and PMOs; ASAP & ongoing***). The Panel also requested that VOS operators and Port Met Officers should start applying the criteria at Appendix A to determine which manually reporting ships or AWS ships are suitable for upgrading to VOSClim standards (***action, VOS operators and PMOs, ASAP & ongoing***).

III.4.1.5 Since the number of ships complying with VOSClim standards was now likely to increase, it was recognised that this could impact, on the ability of the VOSClim RTMC and DAC to handle the increased volume of data. It was therefore necessary to ensure the continued flow of the necessary VOSClim data streams including, in particular, the ongoing availability of the associated forecast model values.

III.4.1.7 The Panel asked the UK Met Office and US NCDC to confirm that, in the light of the expected increase in VOSClim data volume, they would remain committed to continue to support the functions of the VOSClim RTMC and the VOSClim DAC respectively, and to provide the necessary associated data (e.g. monitoring statistics, co-located model values etc.) (***Action; Met Office RTMC and NCDC DAC; ASAP***).

III.4.1.8 With respect to the end of the VOSClim project, the panel agreed that there is still a role for the Task Team during the transition of VOSClim from project status to a 'class' within VOS. The Task Team should be re-established, with membership reviewed, for the next inter-sessional period, and then reviewed at SOT-VI. The Team agreed with the new Terms of Reference provided in Annex IV *[ToR to be discussed at the meeting, and this annex will be included at a later stage in the final report of the Session].*

- B - BACKGROUND INFORMATION

1. In Annex F to the report of the Task Team on the VOSClim Project, it is recommended that the 'project' phase of VOSClim should now end, and that the benefits learned from the project should be applied to the wider VOS. Accordingly the Task Team has proposed that VOS Operators should be encouraged, whenever possible, to upgrade their existing VOS to VOSClim standards in order to help ensure the future availability of climate quality marine data.

2. To this end, the Task Team has also proposed that VOSClim ships should now be fully

integrated within the existing VOS Scheme as separate category of VOS, and that this should be achieved by adding them as a new type of meteorological ship within WMO Pub. 47, i.e. by introducing VOS Climate Ships as a new type of observing ship in field vsslM, and in the associated table 2202. Similarly, 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.

3. The proposals by the Task Team were subsequently considered, and generally accepted, by the Task Team on WMO Pub 47 metadata. The latter Task Team suggested that in addition to adding a new category of *'VOSClim (VOS Climate Reference Ship)'* in table 2202, additional sub categories be introduced to recognise observing ships that are fitted with Automatic Weather Stations (AWS). Since a significant proportion of the VOSClim ships are now equipped with AWS, it has been proposed that a further sub category of *'VOSClim (AWS)'* should be included in WMO Pub 47.

4. Hence, in order for VOS Operators and Port Met Officers to be able to determine whether a currently Selected VOS is suitable for upgrading to performing climate standard observations it is necessary to establish suitable criteria that will distinguish a *'VOSClim (VOS Climate Reference Ship)'.*

5. The primary difference between a VOSClim ship and a standard selected VOS is the requirement for VOSClim ships to collect the following additional IMMT-3 code groups:

HDG	Ship's heading; the direction to which the bow is pointing referenced to true North
COG	Ship's ground course; the direction the vessel actually moves over the fixed earth and referenced to True North
SOG	Ship's ground speed; the speed the vessel actually moves over the fixed earth.
SLL	Maximum height in meters of deck cargo above summer maximum load line.
sLhh	Departure of reference level (summer maximum load line) from actual sea level.
RWD	Relative wind direction in degrees off the bow
RWS	Relative wind speed reported in Reported in either whole knots or whole units indicated by iW (knots or m/s)

5.1 These code groups are currently collected in delayed mode due to restrictions that were imposed on making changes to the WMO Ship Code at the outset of the project. However, with the current migration from alphanumeric codes, such as the SHIP code, to binary codes, such as BUFR, it is envisaged that it will be increasingly possible to collect these code groups in real time in the coming years.

6. The reporting of these additional VOSClim code groups has been greatly simplified since the start of the project by the increased use of electronic logbooks, such as TurboWin, which have been upgraded to allow the additional code groups to be automatically coded on board, ready for subsequent download by visiting Port Met Officers. For this reason, it is recommended that any manually reporting ship wishing to be considered for the VOSClim category must be equipped with an electronic logbook capable of logging the additional code groups. Moreover, it is suggested that the developers of such electronic logbook software should be invited to consider adding a capability to allow the transmission of the code groups in real time e.g. by introducing a BUFR module that will permit transmission of the VOSClim code groups in accordance with the latest BUFR template (which includes the VOSClim parameters).

7. Similarly, it is recommended that VOSClim ships equipped with AWS systems should also have the capability either to log the additional VOSClim parameters in delayed mode, or to transmit them in real time.

8. In addition to the requirement to collect the additional VOSClim parameters, ships which wish to be considered for the *'VOSClim (VOS Climate Reference Ship)'* or a *'VOSClim (AWS)'* category should also be proven to have a good observing record, both in terms of the number of

observations provided and the quality of such observations, and should also be equipped with instruments and sensors of suitable quality. However, the same could, be said, of course for standard 'Selected' VOS – so a level of judgment will need to be exercised on a case-by-case basis by individual VOS operators when deciding if one of their ships is suitable for upgrading to VOS Climate Standard.

9. Criteria could be prescribed for the quality for observations required from a VOSClim ship. For instance, this could be based on whether their observations have been flagged as being of suspect quality, of being of poor timeliness, by real time data monitoring (http://www.metoffice.gov.uk/research/nwp/observations/monitoring/marine/).

9.1 However, it was considered by the Scientific Advisers to the VOSClim project that imposing such criteria could prove to be too exclusive and, as a consequence, reduce the volume of additional VOSClim elements that would otherwise be available for climate analysis. Moreover, it was recognised that the timeliness of the data was not so critical for climate researchers. By defining such criteria that are too restrictive there was also the risk that ships would need to be continually upgraded, or downgraded, from the higher standards, resulting in the additional VOSClim code groups not being available on a consistent basis.

10. The VOSClim Project clearly identified the importance of the Port Met Officer role in ensuring the ongoing quality of observed data and ensuring; that the instruments and sensors are of adequate standard and maintained within calibration; that metadata is routinely updated; and that any monitoring problems are resolved promptly. For this reason, the project initially targeted ships that returned to a homeport and that could be inspected on a regular basis. However, with improved email communication with ships, and increased cooperation between international Port Met Officers, it should be increasingly possible to monitor ship performance remotely and for delayed mode electronic logbook data to be returned by the observers themselves. The aspiration should therefore be to ensure regular inspections of VOSClim ships, but again this should not be at the expense of losing data.

11. Ultimately, the VOSClim concept is dependant upon ensuring, and maintaining, the availability of the various datasets i.e. real time data and associated model output data, delayed mode data, metadata, and monitoring statistics. These data can then be unified into a single the IMMA format compatible with the International Comprehensive Ocean-Atmosphere Data Set.

11.1 As the proposals in this paper will hopefully result in a step increase in the volume of available VOSClim data it is therefore necessary to confirm that the various organisations involved in the VOSClim data flows continue to be willing to continue to handle this data. For instance, it will need to be confirmed that the Met Office, as the Real Time Monitoring Centre for VOSClim data will be willing to continue to make the associated model values available to climate users, and continue to provide the monitoring statistics. Similarly it is essential that the Secretariat maintain the metadata on the WMO website up to date, and that the NCDC who currently act as the Data Assembly Center for VOSClim data will continue to make the data sets available (bearing in mind any potential call sign masking issues that may impact on the availability of VOSClim data).

12. Based upon the above considerations the proposed criteria for upgrading observing ships to VOS Climate ships are attached at **Appendix A** for consideration, and agreement, by the VOS Panel. In particular, the Panel is invited to consider whether the criteria are set at the correct level, or whether criteria that are more prescriptive are needed, and to advise regarding text indicated in square brackets.

13. Following agreement of the criteria the Panel is invited to recommend that VOS operators should review their fleets to see which ships meet the criteria and instruct their PMOs to upgrade ships which meet the criteria at the first available opportunity to VOSClim standard (e.g. by ticking the relevant box on TurboWin and advising the officers accordingly). Ships fitted with AWS systems

that meet the criteria should similarly be upgraded to VOSClim standards, and the Pub 47 metadata amended accordingly.

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Appendix: 1

APPENDIX A

PROPOSED CRITERIA FOR UPGRADING SELECTED VOS TO VOS CLIMATE SHIPS

- Observations should be [proven to be] of good [high] quality;
- Observations should be submitted on a regular basis – [ideally] [at least 300 observations per year];
- The additional VOSClim elements [must] be available in the delayed mode observation, [and if possible should also be available in the real time message];
- [Real time observations should be submitted in a timely fashion and within forecast model cut off times];
- Meteorological Instruments should be in compliance with WMO Pub 8 standards etc and be routinely checked, replaced or re-calibrated to maintain data quality;
- Instruments and sensors should be well exposed and supported by digital images or basic drawings of the arrangements. Exposure should not adversely impact on the quality of the observations;
- Metadata records should be maintained up to date in accordance with the latest version of WMO Pub 47, and should be submitted by National Met Services to WMO at quarterly intervals [together with the associated digital images required for VOSClim ships];
- Delayed mode IMMT log files containing the additional VOSClim elements should be downloaded from manually reporting ships, and from AWS systems, at routine intervals [Ideally not exceeding every [6] months];
- Manually reporting ships [should] [must] be equipped with a suitable electronic logbook capable of coding and logging the delayed mode VOSClim elements;
- VOSClim ships fitted with AWS systems [should] [must] be capable of logging [or, If possible, transmitting] the additional delayed mode VOSClim elements;
- All visual and measured elements currently prescribed in the ship code message (FM-13) should be included, whenever possible;
- National Met Services that recruit VOS Climate ships, or upgrade existing VOS to VOSClim standards, [shall] ensure that delayed mode IMMT data containing the additional VOSClim elements is quality controlled and submitted to the GCC's on a quarterly basis;
- PMO Inspections of VOSClim ships should be undertaken on a regular basis [whenever possible] [ideally at [3] [6] monthly intervals].

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