



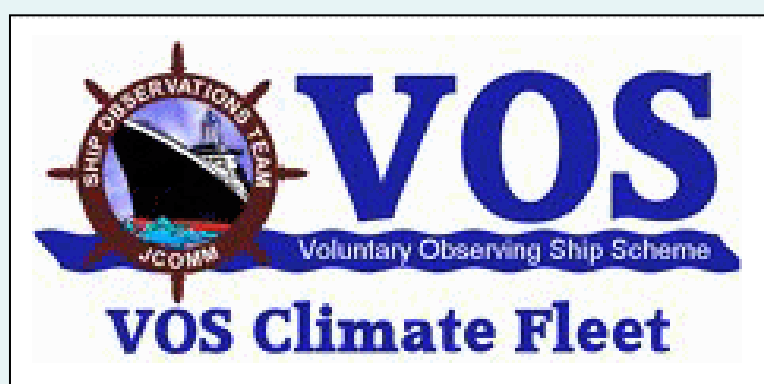
### Introduction

The International VOS Scheme comprises a fleet of more than 3000 Voluntary Observing Ships (VOS) operating on a worldwide basis. Participating National Meteorological Services recruit ships whose officers and staff are encouraged to record and transmit weather observations in support of the World Weather Watch (WWW), and the International Maritime Organization's Safety of Life At Sea (SOLAS) Convention.



### VOS Climate Ships

A subset of nearly 500 observing ships have additionally been recruited to the international VOS Climate (VOSCLIM) fleet. These ships report to higher standards and their data are used for climate studies and research

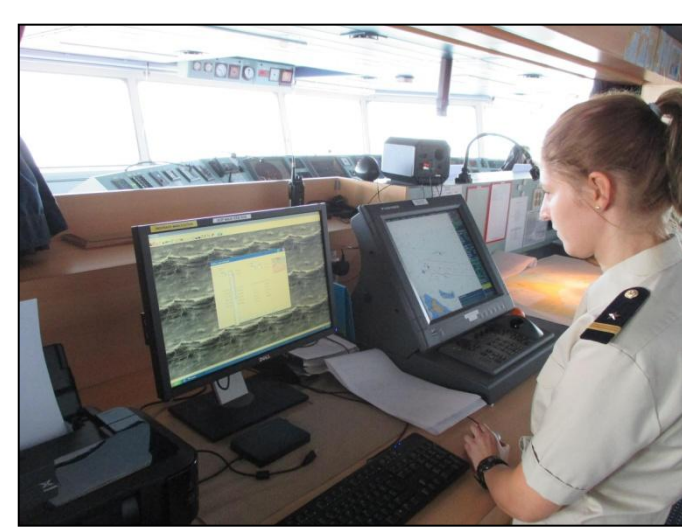


Comprehensive information and resources for VOS fleet operators is maintained on the VOS website at [www.bom.gov.au/jcomm/vos](http://www.bom.gov.au/jcomm/vos)

### Instrumentation

Suitable VOS are loaned instruments for manually taking meteorological measurements – notably an aneroid or digital barometer, a barograph and a marine screen or psychrometer containing dry-and wet-bulb thermometers. However, international restrictions on the use of mercury is expected to increase the use of digital hand held temperature and humidity sensors in the coming years.

Low free board ships may be equipped with a sea-water bucket and sea thermometer for recording sea temperatures, although for practical reasons larger ships more commonly report the seawater intake temperatures nowadays. A few ships, typically research ships, may also be fitted with a dedicated hull sensor. In addition to the instrument measured parameters, observers are also requested to submit visual observations of the sea state, weather conditions and cloud cover.



Courtesy - Hamburg Sud/JCOMMOPS

Observations are normally compiled using electronic logbook software (e.g. 'TurboWin', OBSJMA, etc) that is provided to each ship. This software automatically codes the observations before it is transmitted - typically using the ship's Inmarsat C or e-mail systems.

### Port Meteorological Officers

Port Meteorological Officers (PMO's) ensure the efficient operation of the VOS. They provide free training both in weather observing practices and the use of electronic logbook software, ensure instruments remain within calibration, and provide essential meteorological supplies.



Courtesy - Hamburg Sud/JCOMMOPS

VOS Observations are assimilated into Numerical Weather Prediction (NWP) and ocean forecast models, and are archived in climatological databases. They are also exchanged internationally via the Global Telecommunication System (GTS) so they can be used for a variety of purposes, including:

- preparation of forecasts and warnings
- ships weather routing
- marine consultancy
- monitoring the state of the oceans
- verifying satellite calibrations
- climate research and prediction



### Automation

The level of automation on observing ships has increased significantly in recent years and this trend is expected to continue in the future. Automatic Weather Stations (AWS) have now been installed on more than 300 VOS. AWS systems have the advantage of automatically measuring and transmitting basic meteorological parameters by satellite at hourly intervals without the need for human intervention.



There are two basic types of AWS in use:

- 'Autonomous' AWS systems that usually report only air pressure, air temperature and humidity
- 'Integrated' AWS systems that usually report air temperature, pressure, humidity, wind speed and direction, and sea temperature, and which also allow the observer to add visual observations



### International VOS Forums

The VOS Scheme is a core observing programme of the Ship Observations Team (SOT) established under the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM). Coordination of VOS activities at the international level is undertaken through the JCOMM in-situ Observing Programmes Support Centre (JCOMMOPS) - [www.jcommops.org](http://www.jcommops.org)



### European VOS Activities

Almost half of VOS observations are now received from ships recruited by European VOS fleet operators whose operations are coordinated through EUMETNET's Surface Marine Operational Service (E-SURFMAR). This programme aims to coordinate, optimise and progressively integrate European activities for surface marine observations in support of Numerical Weather Predictions.

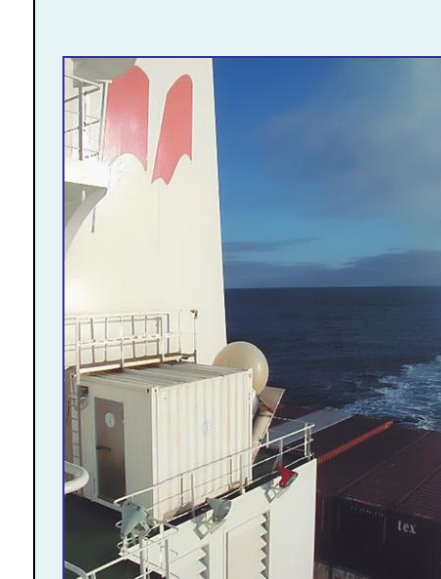
### Data Quality

Various tools have been developed to monitor the quantity, quality and timeliness of VOS observational data. As the WMO-designated lead monitoring centre for marine data the UK Met Office produce monthly statistics to help identify any ships whose data is of suspect quality, or should be excluded from NWP assimilations. Daily quality plots of VOS data relative to the model outputs are also maintained by E-SURFMAR. These tools assist PMO's to take early remedial action to address observing errors or instrument calibration problems.

Global Collecting Centres (GCC) located in the UK and Germany also have responsibility for the collection, quality control and exchange of delayed mode VOS data.

### Metadata

Comprehensive metadata on VOS, and the locations, types and exposure of their instruments is maintained by WMO, and is also operationally collected in an online E-SURFMAR metadata database.



### Upper air observations

A number of VOS ships are also recruited to perform radiosonde balloon ascents. Most of these ships participate in the EUMETNET Automated Shipboard Aerological Programme (E-ASAP) and are primarily trading in the North Atlantic.