

Automated and high quality meteorological observations from ships

By H Y Mok September 2012

The World Meteorological Organization (WMO) Voluntary Observing Ships (VOS) Scheme is the international programme by which ships plying the oceans and seas of the world are recruited by national meteorological services for taking and reporting meteorological observations. At present, there are around 5,000 ships joining the VOS Scheme worldwide.

Despite the advancement in remote sensing technology by satellites and radars in the past few decades, the observations taken by the VOSs over the vast oceans are still regarded as essential and irreplaceable for the provision of safety-related meteorological services for the marine community, as well as for climatological purposes. Timely and high quality meteorological observations from the VOSs are vital for numerical weather prediction systems in terms of model initialization, development and verification. Furthermore, with the increasing recognition of the role of the oceans in the global climate systems, high quality marine meteorological observations has become more important for the study of the climate change. To meet these needs, national meteorological services have commenced to recruit VOSclim (VOS which can provide high quality meteorological observations) and install Automatic Weather Station (AWS) on board VOSs since the early 2000's for the acquisition of timely and high quality meteorological observations over the oceans. The number of VOS with AWS increased by 3 folds from 81 in 2002 to 241 in 2010 (Figure 1) while the observations taken by VOSclim increased significantly from around 13,000 in 2003 to around 140,000 in 2011 (Figure 2).

The AWS installed on board a VOS comprises certified meteorological instruments to measure at least air pressure, pressure change, temperature and humidity. Optional sensors would include wind speed and direction and sea temperature measurement. The AWS may or may not have the facility for manual input of the visual elements, and can transmit reports at least every three hours or more frequently. At present, the popular means of transmitting the meteorological observations recorded by AWS

on board in real-time is the sophisticated 66-satellite Iridium constellation. With more popular use of VSAT system for continuous internet, email and phone services on board, there is a potential for making use of the VSAT system for high frequency real-time transmission of AWS data from VOSs. On the other hand, a VOSClim is a mobile ship station equipped with sufficient certified meteorological instruments for making observations, transmitting regular and timely weather reports, entering the observations in a standardized electronic logbook, and has a proven record of providing high quality observations. A VOSClim should have at least a barometer, a thermometer to measure sea surface temperature, a psychrometer for measuring air temperature and humidity, a barograph and possibly an anemometer, with the full range of metadata maintained. It is highly desirable for a VOSClim ship to be visited and inspected by Port Meteorological Officer at less than six-monthly intervals.

Under the VOS Scheme, the Hong Kong Observatory (HKO) started in 1949 to recruit a fleet of locally based VOSs. Presently a fleet of around 60 merchant ships which ply between Hong Kong and various ports of the world is maintained but none of them are yet VOSClim or VOSs with AWS on board. HKO is working with the VOSs berthing at Hong Kong at least once every six months to upgrade to VOSClim and recruit VOSs which can operate AWS on board and have telecommunication systems for real-time transmission of AWS data to provide higher quality and timely marine meteorological observations for contributing further to global climate monitoring and safety operation of the marine community worldwide.

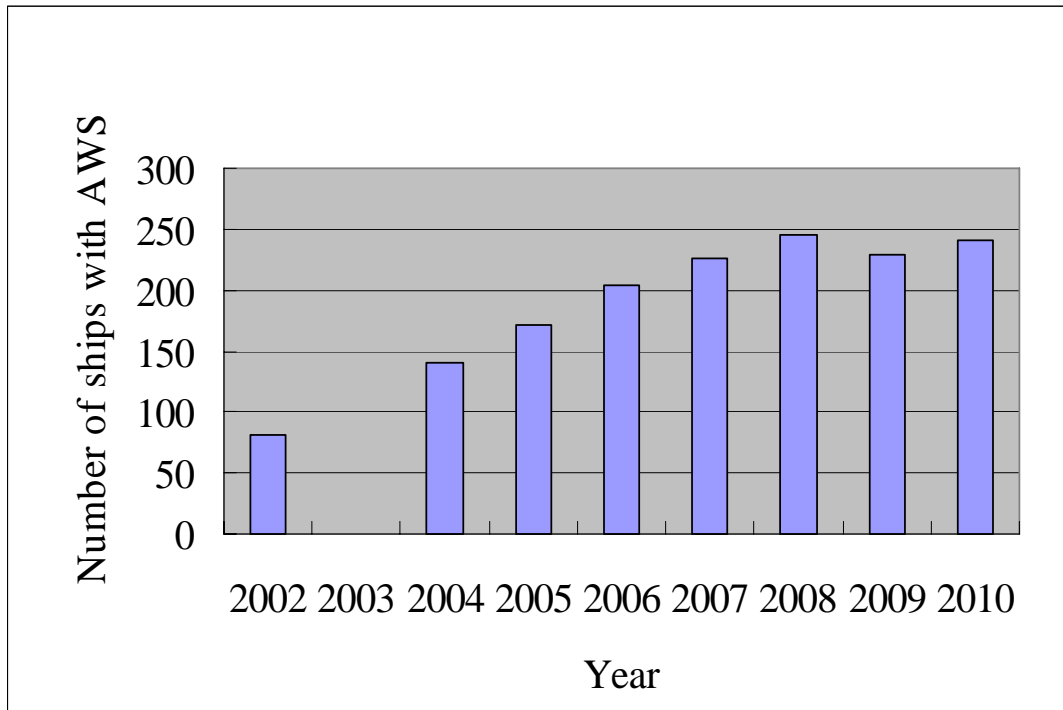


Figure 1. Number of VOS with AWS from 2002 to 2010
(Source: JCOMM Ship Observing Team 2010 Annual Report)

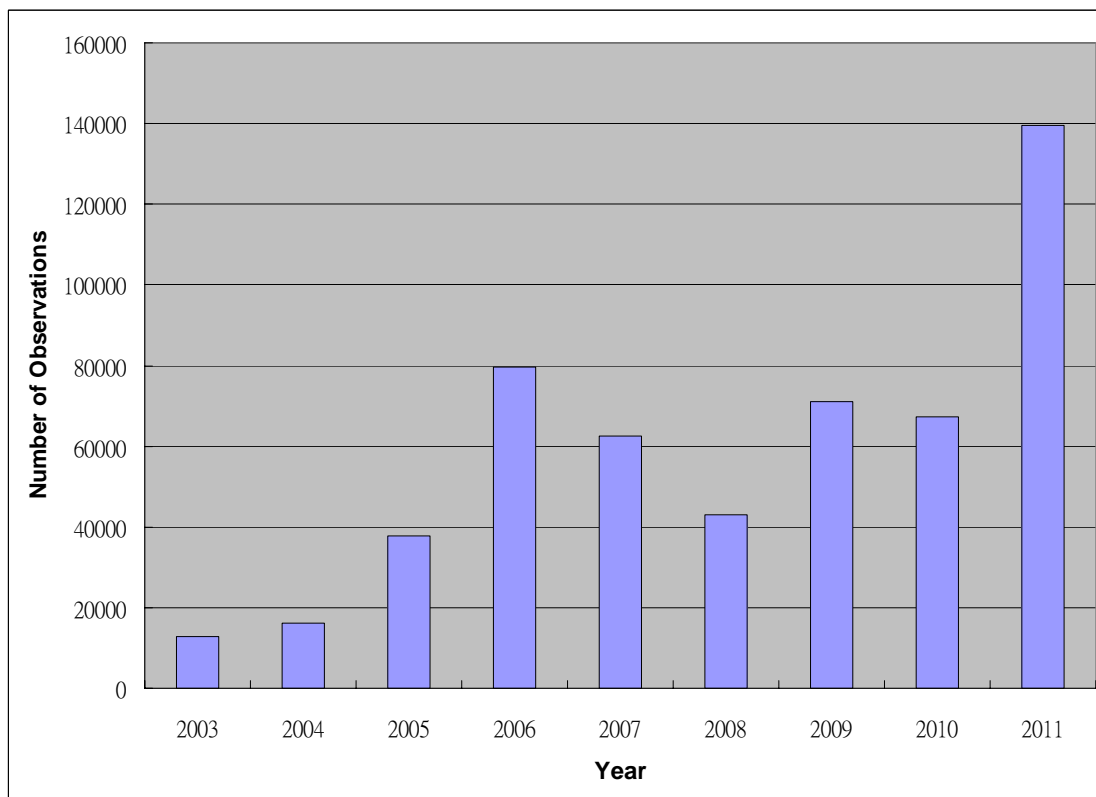


Figure 2. Number of Observations taken by VOSclim from 2003 to 2011
(Source: Global Collecting Centre 2010 & 2011 Annual Report)