Enhancement of Pressure Observation on board Hong Kong Voluntary Observing Ships

Dickson Lau

Accurate atmospheric pressure readings are crucial for mariners to appreciate the general weather conditions at high seas. In the old days, pressure and pressure tendency were among the most important weather observations for the ship captains to predict the weather en route during a voyage.

Aneroid barometer consisting of an evacuated capsule with some mechanical components inside (Figure 1a and 1b) is most commonly used on ships as it is small in size, relatively cheap in cost and easy to install. However, the aging of the mechanical parts may in time inhibit the movement of hairspring and lever inside. This will affect the accuracy of the readings, and frequent manual calibration and maintenance are required.

In recent years, digital barometer using pressure sensing transducers (Figure 2a and 2b), with higher sensitivity and durability than aneroid barometer, is becoming increasingly popular, particularly for measurement requiring highly accurate pressure readings.

Fig 1a. An aneroid barometer.

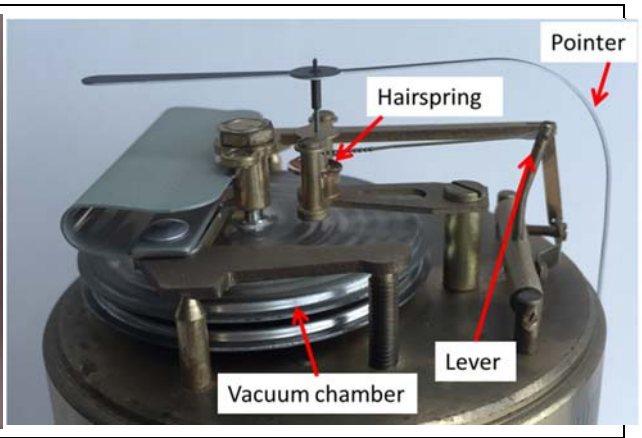

Fig 1b. Internal structure of an aneroid barometer.

	
Fig 2a. A digital barometer.	Fig 2b. A pressure sensing transducer (for illustration purpose only, and may not be the exact component used in the digital barometer in Fig 2a).

To enhance the accuracy of pressure observations and reduce the effort for calibration and maintenance, the Hong Kong Observatory commenced a programme to replace in phase the aneroid barometers on board Hong Kong Voluntary Observing Ships (VOSs) in 2016, with the first one installed on board Dapeng Moon in June 2016. As at 31 March 2017, ten Hong Kong VOSs have already been installed with digital barometers.

Pressure observations taken at seas by VOSs are closely monitored by E-SURFMAR[1], the surface marine observations programme of the European Meteorological Services Network (EUMETNET) managed by Meteo France. Figures 3 and 4 show respectively the time series plots of the deviation of pressure (red cross) reported by two Hong Kong VOSs, one equipped with digital barometer and the other with aneroid barometer, from the corresponding reference pressure values as deduced from the re-analysis of atmospheric pressure patterns using numerical models. It can be seen that the deviation for the digital barometer is much less and more stable than that for the aneroid barometer.

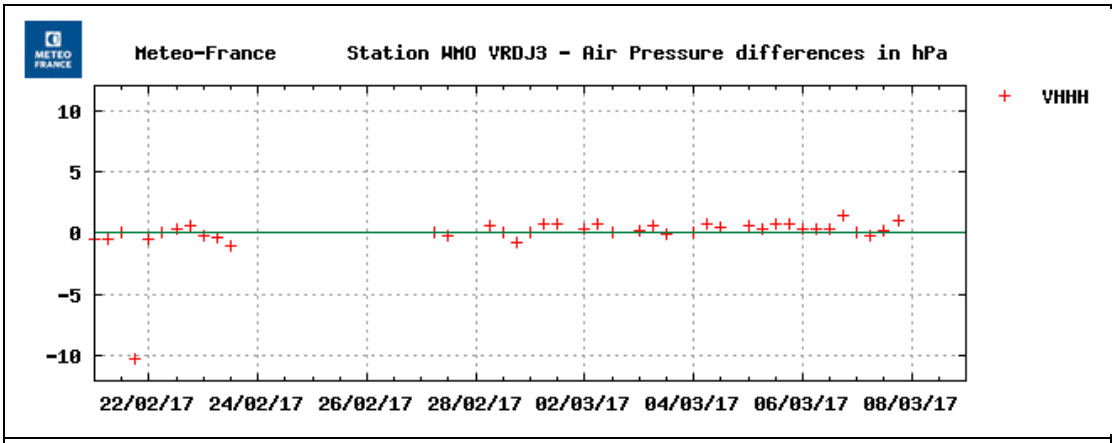

Fig 3. Deviation of pressure observations of a Hong Kong VOS equipped with digital barometer from the reference pressure values as analysed by numerical models.
(Source: E-Surfmar quality monitoring website of Meteo France)

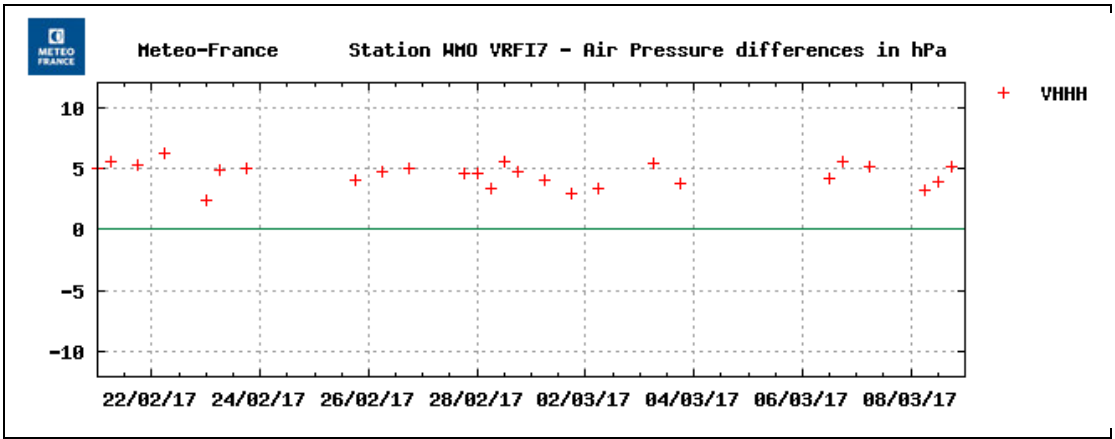

Fig 4. Deviation of pressure observations of a Hong Kong VOS equipped with aneroid barometer from the reference pressure values as analysed by numerical models.
(Source: E-Surfmar quality monitoring website of Meteo France)

[1] E-SURFMAR also contributes to the Ship Observations Team and Data Buoy Cooperation Panel of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) for quality control of observations collected by ships and buoys at seas.

Reference: Issue No 27 of HKO e-bulletin for the Marine Community – Digital Barometer – a New Equipment for Hong Kong Voluntary Observing Ships