2.3 Float Gauges in Stilling Wells

Float gauges were described extensively in Volume 1 and additional information was provided in Volume 2, particularly with regard to the use of 'switches' in the well to provide a form of continuous calibration. The information contained in those volumes contains important advice which operators of float systems, which still comprise the majority of gauges in use around the world, would do well to read.

In fact, float gauges in a well can be thought of as another type of 'pressure' gauge as the level of a float in the well reflects the pressure at the orifice which in turn reflects the sea level outside the well. If the densities inside and outside the well are the same, then the same sea levels will be obtained.

Float systems may not be new, but for a site with a long historical sea level record from a float gauge, it would be irresponsible to recommend a change to a new technique without detailed consideration. The main object of our research is the production of good long **time series** of sea level changes. If the time series contains an overall bias because of a limitation of a particular technique (e.g. due to systematic bias of a stilling well due to ambient current or hydrographic conditions), then this should not affect the analysis of its temporal characteristics. However, if a new method with a different set of biases is introduced in the middle of a record, the different set of systematic errors introduced may well affect the correct representation of the sea level time series.

Another reason for an operator to chose a float system is the advantage of its being 'low tech' and, therefore, relatively low cost. However, there are major improvements which any present-day float gauge operator must implement to bring his equipment up to modern standards. These stem from the requirement to provide data in electronic form as rapidly as possible. This can be achieved by means of adding potentiometer or shaft encoder devices to the float arrangement, in addition to the use of electronic datum probes (Volume 2). By that means, data can be stored on a local data logger in electronic form, or can be transmitted immediately to a data centre via a modem. This enables gauge malfunctions to be detected as soon as possible and data to be used for near-real time applications. The slow, labour-intensive digitisation of paper charts must be consigned to history for GLOSS purposes, although it may be found that paper charts might be of interest as a source of ancillary information (e.g. of higher frequency seiche or tsunami activity). Of course, all historical charts from GLOSS sites must be preserved in a good archive.

Advice on upgrading float gauges to modern standards can be obtained from several agencies which have had experience of this process in recent years. For example, Japan and Norway now operate float gauges with shaft encoders and electronic data transmissions. Italian float gauges have recently been upgraded, with acoustic gauges operated inside the stilling wells as backup systems.

Some manufacturers (e.g. Ott) now offer simple shaft encoder float systems at relatively low prices which can record either by sampling (e.g. every minute) or by integration. Experience in the GLOSS community has been confined so far to the former (the Ott Thalimedes sampling system) which has been tested in South Africa, Spain and the UK. It is clear that these systems suffer from the range of problems float gauges always exhibit, such as long term drift (possibly due to 'tidal hysteresis') and jumps when float and counterweight collide if disturbed. However, if such systems could be combined with a simple chart recorder and with regular electronic datum probe ('dipping') checks as described in Volumes 1 and 2, we believe that an affordable float system could be provided to many countries. At the very least, this

could serve to demonstrate the utility of sea level data in local applications and to make the case for more advanced systems in future.