

**GLOSS Experts 9<sup>th</sup> Meeting  
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**Status Report of UK GLOSS Tide Gauges**

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**NTSLF Background**

The UK National Tidal and Sea Level Facility (NTSLF) is operated by the Proudman Oceanographic Laboratory (POL) and British Oceanographic Data Centre (BODC) in Liverpool with funding from the Environment Agency (EA) and Natural Environment Research Council (NERC). Details of its operations can be found via [www.pol.ac.uk/ntslf](http://www.pol.ac.uk/ntslf).

The main component of the NTSLF is the UK national network (or 'A Class' network) of 45 bubbler pressure gauges. The Tide Gauge Inspectorate of POL is responsible to the EA for the maintenance of the network to GLOSS standards. Data are made available in real-time to the Storm Tide Forecasting Service (STFS) at the Met Office, which is responsible for issuing flood warnings to the EA. Fully quality-controlled data are made available in delayed-mode through BODC and can be accessed via the above web page. Data are routinely made available to the European Sea Level Service (ESEAS), an association of tide gauge agencies in Europe.

A second UK network exists containing gauges in the South Atlantic, Gibraltar and Antarctica. These are operated by POL with funding from the NERC science budget. Their existence is not guaranteed as part of a global programme such as GLOSS, but depends on science arguments which have to be repeated every few years. Most were installed in the early 1990s as part of a science project called ACCLAIM (a part of WOCE) and several are now in need of major refurbishment.

Over the past two years there has been a considerable improvement in the infrastructure of both networks, especially in new data logging systems. A one year test of OTT radar tide gauges was conducted at Liverpool with favourable results, and it is likely that radar systems will be introduced into the networks in the near future. Meanwhile, a bubbler has been contributed to the international tide gauge test experiment at Villagarcia in Spain, enabling a comparison of relative merits of a number of different gauge technologies.

The NTSLF web site contains copies of a number of recent reports including annual reports. These are concerned with the NTSLF's numerical (tide-surge) modelling responsibilities, in addition to its tide gauge network operations. One particularly important report presents a forward look of the national network, containing recommendations for gauge technology, sampling strategy and data processing improvements. A further report concerned itself with network developments in Ireland, data from which could be of great interest to effective modelling of surges in the Irish Sea.

**UK Gauges**

All 45 gauges in the national network are operational including the three nominated GLOSS sites: Lerwick (236), Stornoway (238) and Newlyn (241). Lerwick completely refurbished in 2003. All 3 have CGPS. Newlyn and Lerwick have annual Absolute Gravity measurements.

DELAYED MODE data are available from the NTSLF web site as described above. FAST data are provided weekly by NTSLF to the GLOSS Fast Centre at UHSLC. REAL-TIME data were made available for a period during 2004, but were suspended for technical reasons. Discussions on alternative real-time data transfer methods are presently under discussion between NTSLF and UHSLC.

**Gibraltar**

A new OTT radar tide gauge was installed at Gibraltar (248) in early 2004 with funding from the Government of Gibraltar. The site chosen was north of the float gauge operated by the Hydrographic Office for many years but now no longer maintained to decent standards. CGPS will be added in the next

two months.

DELAYED MODE data are available from NTSLF web site. An imminent upgrade to data logger software will allow FAST data (possibly daily) to be provided which can be used for Mediterranean in/outflow studies. REAL-TIME data to GLOSS will hopefully follow; real-time data are already made available locally for harbour operations.

### **Ascension**

Ascension (263) typifies the present situation with regard to South Atlantic gauges. It is an accurate 'B' pressure gauge which has delivered a decade of good data. It is still working well, with data stored in a local logger. However, the logger can no longer routinely send data back to POL and needs replacing. In addition, the mid-tide pressure tube, which provides on-going calibration of the 'B gauge', needs replacing. A complete refurbishment of the gauge is planned in mid-2005, when an OTT radar gauge will be added in parallel to the B system. The radar gauge will transmit near real-time data through Orbcomm.

Consequently DELAYED MODE can be considered operational. FAST and REAL-TIME will be operational in mid-2005.

CGPS at Ascension is provided by the IGS core network station at Wideawake airfield, about 10 miles from the gauge. An additional CGPS at the gauge itself would be desirable if funding can be found.

### **St. Helena**

St. Helena (264) also has a 'B gauge'. DELAYED MODE can be considered operational. FAST data are sent to the UHSLC. REAL TIME needs further consideration. There are no plans to visit the gauge in 2005. St. Helena has no CGPS.

### **Port Stanley**

Port Stanley (305) also a 'B gauge'. DELAYED MODE can be considered operational. FAST data are sent to the UHSLC. REAL TIME from the B gauge needs further consideration. In mid-2005 the gauge will be completely refurbished and an OTT radar gauge will be added transmitting near real-time data via Orbcomm. CGPS is provided by a US (Prof. Mike Bevis) installation on Lookout Hill above the gauge site; an additional CGPS at the gauge itself would be desirable if funding can be found.

### **Tristan da Cunha**

Tristan da Cunha (266) has a long record of sub-surface pressure measurements from the 1980-1990s but, apart from a few short records, no real sea level data exist. It is a difficult site with infrequent access and almost always high wave conditions. There is mains power for only 12 hours a day. In the last year there has been increased interest in Tristan as its volcano is showing signs of eruption. The British Geological Survey (BGS) has asked POL to consider installation of a gauge there once again, and we will attempt installing a radar gauge in summer 2005/6.

### **Vernadsky (Faraday), Antarctica**

Vernadsky (188) has a float gauge together with an absolute pressure sensor, both of which were provided by POL when the base was owned by the British Antarctic Survey (BAS). Charts from the float gauge and data sets from the pressure gauge arrive at POL with a delay of typically 2 years as they are sent by ship to the Ukraine. BAS now no longer makes routine calls at Vernadsky which POL could make use of. The only possibility for upgrades there is for equipment to be provided to Ukraine colleagues who will make the installations themselves. Discussions are urgently needed on how best to do that.

Vernadsky is well worth persevering with. It has the longest record in Antarctica and several recent papers

have demonstrated the importance of its data for monitoring the ACC.

### **Rothera, Antarctica**

Rothera (not GLOSS core network) is a partial alternative to Vernadsky although considerably further south. Its advantage is relative ease of access by air from the Falklands or Chile and by BAS ship. It is connected by a permanent computer LAN to BAS in Cambridge.

Rothera has a 'B gauge' which presently provides DELAYED MODE data. The gauge is some distance from the nearest LAN connection in the base buildings, so FAST and REAL-TIME data are not presently available. We are investigating how such a connection might best be made. CGPS is also under discussion.

### **Signy, South Orkney Islands**

Signy (306) had a sub-surface pressure gauge for some years when BAS operated the base year-round. However, since BAS relegated the base to summer-only operations, it has been difficult to maintain our equipment there. We consider the Signy gauge to be lower priority than Vernadsky and Rothera upgrades.

### **South Georgia**

No gauge presently exists in South Georgia (187). There are two sites under consideration: King Edward Point which BAS operates for the South Georgia Administration but which it does not own. Discussions with the Administration have taken place. However an additional possibility is at a base at Bird Island which BAS does own and has permanent LAN connection. However, Bird Island presents more of a technical challenge for gauge installation with wide beaches occupied by angry seals. We have concluded that South Georgia, like Signy, remains on our list of intended sites but with a lower priority.

### **Cananeia, Brazil**

POL has had a cooperative agreement with the University of São Paulo for over 20 years. Its most recent development has been the provision of funds (jointly with IOC) to modernise the USP's gauge at Cananeia which has one of the longest records in Brazil. The USP is purchasing a radar gauge which we hope will be operational in the next 1-2 months. Cananeia already has CGPS equipment.

### **Mozambique Gauges**

As part of a collaborative project with IOC and the South African Hydrographic Office, POL has purchased two gauge systems for Pemba and Inhambane in Mozambique. Each system consists of an OTT radar gauge capable of reporting via Orcomm, together with a pressure gauge attached to an OTT logger which can be downloaded locally. These will be installed by the SAHO in April 2005.

IOC has also provided POL with funds for purchase of an additional 'Mozambique' system. Discussions have been made on where this can be best deployed: Pakistan or Yemen has been suggested.

### **Other Remarks**

See other reports for information on other UK-owned sites: Diego Garcia (26), South Caicos (296) and Bermuda (221).

The UK Foreign and Commonwealth Office has asked POL to install a gauge at Monserrat in the Caribbean where BGS has personnel as part of the Volcano Observatory. Hardware has still not been purchased, however, as it has not been confirmed who will pay for it. Once funds are confirmed it should be a relatively straightforward installation.

It is clear that after the Indonesia tsunami that all new gauges and many existing ones will have to be 'tsunami enabled'. POL and BGS have been studying how the UK can establish some kind of tsunami warning capability, perhaps in collaboration with neighbouring countries, and how at least a subset of the 'A Class' and South Atlantic networks can have an effective 'tsunami capability'.

Finally, IOC has asked the UK Government to fund a travelling team of technicians to support the developing tsunami networks in the Indian and Atlantic oceans and also the network being established through the ODINAFRICA proposal. We very much hope that this proposal will be well received as it will provide an important UK contribution to GLOSS, and will complement excellently the technical support provided by POL to the UK and South Atlantic networks.