The OBS experience at INGV
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It was the 2005 when management of the Centro Nazionale Terremoti, department of the Istituto Nazionale di Geofisica e Vulcanologia, thanks to funds of the Italian Civil Protection national service, decided to build its own first group of OBS’s. On July 2006, technicians of the Gibilmanna Observatory, seat of the “OBS Lab”, deployed the first prototype of OBS/H on the flat top of the Marsili submarine volcano. The nine days test, allow to record more than 1000 volcano-tectonic and regional events, among them, only nine were also recorded by the on-land seismic network, the others were related to the volcano activity.

The successful test led to the construction of seven OBS’s equipped with: i) Nanometrics Trillium 120p seismic sensors (120s-175Hz), installed on a passive levelling system inside a 17” pressure glass sphere; ii) Cox-Webb Differential Pressure Gauge (500s – 2Hz) or HTI-04-PCA/ULF hydrophone (100s – 8kHz); iii) four channels, 21 bits, Send Geolon MLS digitizer.

The ballast “burn-wire” release system is based on two different acoustic releasers, one backup of the other: i) Ixsea AR816S-MR, ii) Ore Offshore C980102. This solution, with two different releasers, installed in two different canisters, showed itself to be very reliable, allowing the recovery of the instrument also when one of the two releasers didn’t reply to the commands sent from the ship.

At the end of the experiment, owing to the release of the ballast, the OBS’s come up to the surface thanks to the buoyancy of McLane and Vitrovex glass spheres and they are recovered with the help of Novatech radio beacons and xenon flashers.

In case of unwished ballast release, a GPS based tracking system will supply, through a web platform, data for recovering of the instrument. This system allowed to recover one of the OBS’s deployed in the Aeolian islands area on July 2008: because of an electronic issue, the Ore Offshore releaser board gave voltage to the burn wire system and the instrument came up to the surface few hours after the deployment; the OBS was recovered three days after nearby the Straits of Messina.

Trillium 120p seismometers, installed until the end of the 2008 on our OBS’s, have a very narrow operational tilt range: ±0.2°. Out of the range of ±0.1°, power consumption increases to 2.5W from the nominal 600mW. This high power consumption in the presence of tiny mechanical problems on the leveling system, leaded us to replace the Nanometrics sensors with Guralp CMG40T-OBS (60s – 100Hz), a low power sensor (about 150 mW) gimbaled and housed in a glass sphere with a diameter of 16 cm.

First months of 2010 will see the birth of a new prototype of OBS. This new project provides the capability to communicate from the sea bottom to the surface: the instrument will be equipped with an embedded system, based on ARM processor, which will store and process seismic data coming from the seismometers and the DPG/hydrophone; a full depth acoustic modem will allow to transfer to the surface portion of seismic data (e. g. triggered earthquakes traces) or tsunami alarm. A new frame with syntactic foam instead of glass spheres was drawn to obtain the necessary buoyancy for the modem and its batteries pack.