

The new « Hippocampe » OBS and the French OBS pool

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Abstract.

The study of continental margins, subduction zones and oceanic basins as well as the quantitative assessment of seismic hazard near densely populated coastal areas request the deployment of a large number of Ocean Bottom Seismometers (OBS) during period of several weeks for active tomography, up to several months for passive experiment.



Figure1. Deployment of an Hippocampe OBS from R/V Atalante. The sensor (on the right) will be deployed from the arm when the OBS lay on the sea bottom.

Geosciences Azur (joint IRD¹, CNRS², UPMC³ and UNSA⁴ laboratory) developed a new, easy-to-use, 4- components OBS named "Hippocampe". The Hippocampe OBS exists in a short period version based on 3 gimbaled, 4.5 Hz, geophones installed in their own, 150 mm diameter, glass sphere. The broadband sensor was designed in cooperation with Guralp System™ and on the basis of a CMG-40T seismometer gimbaled in a similar glass sphere, with a magnetometer and tiltmeter for position on the bottom (option).

The data logger developed at Geosciences Azur consists in a 24 bits analog/digital converter synchronized by a high accuracy Seascan clock

($2 \cdot 10^{-8}$). Data are buffered in a 128 Mb flash memory then stored on a 40 Gb hard disk. Power consumption is ~500 mW for continuous recording of 4 channels at 200 samples per seconds allowing 6 to 12 months recording autonomy on the sea bottom. The data logger and batteries fit in a 432-mm diameter glass sphere. A second sphere is used to increase the floatability during long-term deployment. For recovery a coded acoustic code trigger simultaneously a electro-mechanical release system, developed in cooperation with Guralp System™) and an electrolytic, burn-wire, release. At the surface flash lights and radio beacons allow an easy recovery of the instrument at sea.

During the Esmeraldas experiment to study the 3-D structure and seismic activity of Ecuador subduction zone, a network of 20 Hippocampe OBSs was deployed, together with 7 OBSs from the previous generation and 30 land-seismometers during more than 3 months. This network recorded successfully shot of the 128-liter airgun source towed by R/V Atalante and numerous earthquakes. For this first deployment the new Hippocampe OBS provide excellent results, with 100% recovery, and an excellent coupling with the sea bottom especially for horizontal components.

The 20 Hippocampe OBS, together with the 7 OBSs of the previous generation, operated by Geosciences Azur are part of the French OBS pool supported by IFREMER Institut Français de recherche pour l'exploitation de la mer, CNRS and IRD. In Brest, Laboratory « Géophysique et Géodynamique » of IFREMER and laboratory "Domaines Océaniques" deal with 35 OBSs, 20 of them are Micro-OBS, recently developed by IFREMER, mainly used for active experiment because their limited autonomy (~10 days). Laboratory Géosciences Marines in Paris manage 20 L-Cheapo (Scripps Institution of Oceanography), 2 components OBSs supported by CNRS. An agreement between CNRS, IRD and IFREMER allow to share these resources for an experiment each year in order to provide the French scientific community a pool of ~80 instruments and possibly up to 100 in the future.

1. Institut de Recherche pour le Développement
2. Centre National de la Recherche Scientifique
3. Université Pierre et Marie Curie (Paris)
4. Université de Nice Sophia Antipolis
5. Institut Français de recherche pour l'exploitation de la mer