

Integration of a permanent OBS offshore NE Iberian Peninsula to the Catalan Seismic Network

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Abstract

We summarize the results of more than 3 years of operation of a permanent Ocean Bottom Seismometer (OBS) deployed 40 km offshore Catalonia (northeastern Spain) in terms of the site ambient noise conditions and quality of the data acquired. As observed on most of the ocean-floor observatories, the noise level at the OBS site is quite large on all components. However, the integration of the OBS station into the Catalan seismic network has allowed to improve hypocenter locations.

Keywords: Ocean bottom seismometer, ambient noise, seismic network

INTRODUCTION

The first initiative for long-term sea-floor seismic monitoring observation in Spain became a success on August 2005, when a permanent Ocean Bottom Seismometer (OBS) and a differential pressure gauge (DPG) were deployed 40 km offshore Catalonia (northeastern Spain) within the framework of a joint project between the *Institut Cartogràfic de Catalunya* (ICC) and the *Observatori de l'Ebre*, in collaboration with the Spanish oil company *Repsol Investigaciones Petrolíferas*. The OBS is located on sedimented sea-floor in shallow water (150 m in depth) at about 400 m from the Casablanca oil platform. The OBS is completely buried into the sediments (Fig. 1) and the DPG is deployed 10 m away from the seismic sensor. The system is linked by a 750-m length, 26-mm-diameter cable with the Casablanca oil platform, which hosts the power supply, the GPS, and the 1.8-m-diameter antenna for satellite data transmission via VSAT. The ocean-floor station was completely integrated into the Catalan seismic network (CSN) in October 2007, when satellite transmission allowed to have continuous and real time data available at the network data center in Barcelona (<http://www.igc.cat>). COBS data is integrated into the monitoring center data management system of the CSN through Earthworm. The station, with geographical coordinates 40.71°N and 1.36°E, has the code COBS at the International Registry of Seismograph Stations of the International Seismological Centre.



Fig. 1. Image of the buried OBS

OBS CONTRIBUTION TO THE CATALAN SEISMIC NETWORK

The plan was initially designed with the main goal of improving the understanding of the seismicity of the region around, which is densely populated and is industrially very active. In this sense, singular infrastructures such as nuclear power plants, chemical and oil industries are present in the area, having these aspects great implications on the seismic risk assessment of the region. Moreover, the fact that some earthquakes occur offshore, leads to some difficulty in surveying seismic activity with the inland stations only. Thus, the installation of a broadband OBS for real-time data acquisition might improve the performance of the network. At present the implementation of the OBS to the seismic network has only been made partially. Despite the data provided by the sea floor sensor do not contribute to the automatic location system, they allow a whole waveform analysis and are used to perform the manual locations, which can be improved for local offshore epicentre events that would have a larger station gap without these data. Since COBS is operative, some local, regional and teleseismic events have been recorded

AMBIENT NOISE ANALYSIS

A seismic ambient noise study from the OBS and the DPG recordings has been performed, showing that, as observed on most of the ocean-floor observatories, the noise level is quite large on all components. It can be observed that the COBS noise shows large temporal changes, especially in the microseism band, that are linked to seasonal variations. On the other hand, both the wind speed and the significant wave height have a great influence in the calculated noise levels on all the 3 components. This indicates that wind driven gravity waves are important sources of seismic noise. Taking advantage of the high coherence between the OBS and DPG recordings, a low frequency noise correction has also been carried out, thus improving data fidelity.

FINAL CONSIDERATIONS

Although the implementation of ocean-floor seismic stations is a difficult task and such deployments require solving important technological and logistical issues, long-term ocean-floor seismic observatories can contribute to the investigation of global-scale geophysical processes and to better constrain regional tectonics. In this way, COBS station contributes with broadband seismic data in real time to the Catalan seismic network and to the scientific community.