M4 OBS APPLICATION INALERTES PROJECT

Pazos, A.[92], Davila, J.M.[93], Buforn, E.[94], ROA seismic group.

Abstract

The main goal of the ALERTES project is the study of the feasibility of an Early Earthquake Warning System (EEWS) in the SW of the Iberian Peninsula, where the greatest earthquakes have occurred in the Western Eurasia-Africa plate boundary. One of the ALERTES project activities, leaded by the ROA, is the deployment of three long term OBS in selected sites in order to record earthquakes close to the sources, improving the locations and the scaling laws needed for a very quick estimation of the used parameters in the EEWS. Although the Alboran sea was not initially selected as a test zone for this project, the Alboran permanent Geophysical Observatory will be finally included in the ALERTES EEWS prototype.

Keywords: ALERTES project, Earthquake, warining System, long term OBS, scaling laws, Alboran OBS.

INTRODUCTION

The ALERTES project is aproject funded by the Spanish Ministerio de Economía y Competitividad coordinated among three groups: Universidad Complutense de Madrid (UCM, coordinator), Real Instituto y Observatorio de la Armada (ROA, San Fernando, Cádiz) and Instituto Geologic de Catalunya (IGC, Barcelona), which aims to study the feasibility of an EEWS in the SW of the Iberian Peninsula. This test site was chosen due to occurrence of the biggest earthquakes in Western Eurasia-Africa plate boundary, like the so called 1755 Lisbon tsunami and earthquake, although the area is characterized by a moderate seismicity and a convergence of a few centimeter per year in NNW-SSE direction [1].

The idea of an EEWS is to determine the earthquake parameters (hypocentre and magnitude) from the analysis of the initial portion of the P-waves and provide a very quick warning, before the arrival of S-waves, which produce the more severe shaking, to populated areas and large infrastructures, thus allowing a short-term mitigation. Some parameters have to be estimated from the analysis of previous seismic records and correalations with magnitude, ground displacement, etc. have to derived. To obtain a good a good earthquake-waveform database is needed, so in order to improve this database three long term OBS's were deployed close to the test zones.

DATA AND SCALING LAWS

The first step in the ALERT-ES project has been the creation of the data base of earthquakes occurred in the two test seismic zones: S. Vicente Cape - Gulf of Cadiz area. We have selected earthquakes occurred in the period 2006-2011 with magnitude larger than 3.8 and recorded at the available broad-band stations (24 stations) belong to different networks: Western Mediterranean (WM, a ROA/UCM net), Instituto Geográfico Nacional (IGN) and Instituto de Meteorología (Portugal, IM). In total, 67 events for San Vicente test zone and 38 events for the Gulf of Cádiz have been selected.

Scaling laws were estimated using, among others, the P-wave predominant period,[2] and the peak displacement (e.g. [3]) as input parameters, but a major refinement is needed using data from the OBS's.

LONG TERM OBS DEPLOYMENTS

One of the ALERTES project activities, leaded by ROA, was the three long-term OBS deployment. These OBS were manufactured in KUM Laboratories with a BB seismic sensor (Guralp CMG-40T), an Hydrophone (HTI-04-PCA/ULF) and a KUM compass for orientation, and the recorder is a GEOLON-MCS. All system is contained in titanium pressure tubes. ROA deployed these three OBS's, using the Navy patrol boats facilities, in November 2011 (locations, depths and dates are shown in table 1). Initially, a deployment of at least one year period was planned, with maintenances every 6 months, but finally a six-month deployment was carried out for two OBS and a year deployment for the third, due to a failure on the acoustic release system. After recovering the OBS, the seismic data showed a sensor leveling malfunction so only the hydrophone data could be used and only a few earthquakes were recordered. Now a days the three sensors are in the manufacturer labs for reparation.

ALBORAN PERMANENT GEOPHYSICAL OBSERVATORY

The ALBO project started on 2005 and was funded by the Ministry of Education and Science (MEC), IEO, UCM and Spanish Navy, to deploy a permanent broad band seismic OBS linked by a submarine fibber optic cable to the Alboran island where a Navy intranet link and power are available. It was deployed between the 30th September and the 3rd October 2009 in 46 meters depth water about 1700 meters away from the island. Additionally, a permanent geodetic GPS and a meteorological station were installed. The OBS is composed by a 7 channels CMG-DM24 digitizer, a CMG-3T seismometer, CMG-5T accelerometer and a differential pressure gauge. Morever, four RS-232 with power connectors are available for future additionally instruments.

The submarine part was uninstalled in June 2010 due to corrosion problems in the instruments and also due to a fault in the fibber optic . Now a days, the cable and the instrumentation has been repaired and we plan the reinstallation during the first week of June. Future data provided by this OBS will be included in the Alertes project data analysis.

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	Latitude	Longitude	Depth	Deployment	Recovery
OBS 1	35º 51'.3024 N	9º 19'.1898 W	4030 m	14/04/2011	18/11/2011
OBS 2	35º 54'.1403 N	7º 23'.1540 W	980 m	14/04/2011 17/11/2011	17/11/2011 13/06/2012
OBS 3	35º 54'.067 N	4º 22'.1500 W	1300 m	13/04/2011	19/10/2011

Table 1: Location of the OBS's depyments.