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Ocean Bottom Seismometers: A short overview focusing on data processing

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Abstract

About 70 of the Earth is covered by water mainly distributed among in the five oceans. This creates a natural barrier to conventional seismological data acquisition. In this context, the ocean bottom seismometers (OBS) are helping scientists to recover information from the ocean floor for both local and global studies.

Despite the recent developments of new technologies, working with OBSs is still a challenge which includes a considerable budget necessary to install them on the ocean, the duration of the battery and the lack of direct communication with the device after the deployment, i.e., it is like a "blind" acquisition: it is almost impossible to check whether the equipment is working correctly. Even if the OBSs have been fully recovered the data needs heavy pre-processing steps before been apt to be used.

This work will give a short view of the processing required to use the OBSs data. The first step is to locate the OBS on the ocean floor. The OBS final location is not the as same as the deployment and the retrieval. The final location can be done by using the time difference between acoustic signal release from the ship towards the OBS and vice versa assuming the P-wave velocity and the bathymetry are known.

Because there is no communication with GPS, time drift correction is a must, in one year the difference can reach more than 10 s. There are also the compliance and tilt corrections due to the ocean tides and seafloor currents adding a new channel unfamiliar to land seismologists: pressure. Azimuthal correction is also needed and it can be retrieved from Rayleigh wave polarization (from natural events or from Ambiental cross-correlation noise). Some corrections that also may be needed are one more time correction because of leap seconds and the removal of electronic glitch in the data.

Summarizing, OBS data requires much more effort to be used, however, is a must for a better understanding of the Earth and sea process.

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