[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

[S-IT24]Probing the Earth's interior with geophysical observation on seafloor

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Most important sites for plate tectonics and mantle dynamics studies (e.g., subduction zones, spreading ridges, and hot spots) are located in oceanic regions. The coverage of seismic stations is concentrated in land areas, which cover only one-third of Earth's surface. Since 1990s, technology for seafloor geophysical instruments to explore deep earth structure have been advanced, such as broadband ocean bottom seismographs (BBOBSs), ocean bottom electro-magnetometers (OBEMs), and pressure gauge, because observation network in oceanic regions is essential for major breakthroughs in Earth sciences. Technical advance in the instruments including cabled realtime seafloor networks have made the seafloor observation more common and reliable, which promotes a number of seafloor observations, both temporary and permanent networks, in the last decade. We call for papers on recent scientific results from such observation projects, including those on crust and mantle structure beneath subduction zones, hot spots, Large Igneous Provinces, and spreading ridges. Technical advances for observation in oceanic regions, including seafloor instruments and drifting float, proposals and plans for innovative observations are also welcome.

[SIT24-P06]OBS Orientation from Ship Noise Polarization

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In the frame of the RHUM-RUM experiment (Réunion Hotspot and Upper Mantle – Réunions Unterer Mantel, www.rhum-rum.net) 57 three-components, broad-band Ocean Bottom Seismometers (OBS) were deployed on the ocean floor around La Réunion from Nov. 2012 to Dec. 2013. The OBS, provided by the German DEPAS and the French INSU OBS national pools, were equipped with wide-band or broad-band three-components seismic and hydro-acoustic sensors.
We present a new approach for orienting the OBS horizontal components based on ship noise polarization analysis. Part of the RHUM-RUM network in the SW Indian Ocean was indeed located beneath a route of heavy marine traffic connecting SE-Asia and the South-Atlantic region, providing a unique opportunity to exploit these anthropogenic signals for geophysical purposes. Both hydro-acoustic and seismic spectra exhibit clear signals associated to vessels in the [1-50 Hz] frequency range, that can be detected several hours before and after their closest point of approach and showing clear Doppler effects.

In this study, we show that combining a ship known position provided by its AIS (Automatic Identification system) data and an OBS known location, it is possible to retrieve the OBS actual orientation on the ocean floor by using the ship noise polarization. We applied time-frequency polarization techniques on the three seismic components to automatically extract the frequency bands

containing information relevant to the ship noise from the ambient, unpolarised noise. This allows estimating the accuracy of the horizontal orientation of the seismic components from a single ship measurement, that can be improved by using multiple ships passing in the vicinity of the OBS during its recording period. Based on the analysed data, this ship noise time-frequency polarization analysis provides a good precision in the OBS orientation, in agreement with our estimation determined independently from teleseismic body and surface wave polarization measurements (Scholz et al., GJI, 2017).