



# ÉCOLE DOCTORALE SCIENCES DE LA TERRE



Subject offered for a contract starting in October 2014

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## **SUBJECT TITLE: 3D wide-angle seismic data using seismic interferometry: marine cases**

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Host lab/ Team : **IPGP- Seismology - UMR7154**

Financing: GPX or École doctorale IPGP

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Seismic interferometry is revealing its capacity to explore the Earth's interior just using the data from active and passive experiments records. The main idea is that we can reconstruct Green's functions between two stations by cross-correlating a random wavefield excited by reasonably distributed sources when averaged over long time series. In this way, seismic receivers can be converted into virtual sources (Bakulin and Calvert, 2006) that, in turn, can be used for seismic imaging and monitoring. Emerging applications of this principle in exploration geophysics might be based on both passive and active records. Surface waves extracted from correlations of ambient seismic noise can be used for imaging and monitoring of reservoir overburdens (e.g., Mordret et al., 2013). Extraction of body waves from passive noise correlations is also possible (e.g., Boué et al., 2013; Draganov et al., 2013). Based on reciprocity, it is also possible to reconstruct the media response between a pair of sources by correlating and stacking records from these sources at different receivers. Shiraishi et al. (2011) recently tested this idea to wide-spaced ocean bottom seismometer (OBS) and reconstructed finely spaced pseudo-seismic reflection data and showed that this technique can produce seismic reflection image similar to conventional seismic image.

In this PhD project we propose to explore further applications of seismic interferometry in the context of exploration geophysics. The starting points are expertise of IPGP seismologists in passive seismic interferometry, in numerical modeling of seismic wave propagation and in analyzing seismic reflection and refraction data. We propose to work with both passive and active datasets as well as with synthetic seismic experiments to develop methods required for extraction of body and surface waves from interferometric waveforms and for their analysis.

Students with strong background in mathematics, physics and interest in numerical methods are invited to apply. The students will work closely with our academic and industry partners in GPX program. S/he will receive training in seismic wave propagation, modeling, inversion and analysis of seismic data.

## References:

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- Shiraishi, K., Asakawa, E., Abe, S., Okamoto, T., Fujie, G., Sato, S., Kodaira, S. (2011), Abstract in national meeting of physical exploration (in Japanese) 110-113.