Subject offered for a contract starting in October 2014

SUBJECT TITTLE: ***Anatomy of ultra-slow spreading South West Indian Ridge***

Advisor: Satish Singh
Second Advisor/ Supervisor: Mathilde Cannat and Sylvie Leroy (P6)
Host lab/ Team : **Marine Geoscience at IPG Paris**

Financing: IPGP

For more information go to http://ed109.ipgp.fr, section: Offres de these (PhD offer), You must apply on the Doctoral School website

Ultra-slow spreading ridges with spreading rates less than 2 cm/yr are a novel clause of spreading centres where a significant part of the oceanic crust is formed by purely tectonic process exposing the mantle peridotite on the seafloor with little or no volcanism and where the extension is mainly controlled by long lived detachment faults leading to a complex seafloor morphology. However, the crustal structure of ultra-slow ridges is very poorly understood because of lack of good quality seismic reflection and refraction data. In order to characterise the nature of oceanic crust formed at ultra-slow spreading ridge, we shall be acquiring 3D seismic reflection and refraction data across South West Indian Ridge in September-October 2014 using a 4.5 km long streamer and 40 ocean bottom seismometers.

In this project, we propose analyse the data acquired during this experiment using advanced analysis techniques, such as downward continuation of seismic reflection data to the seafloor, tomography and elastic full waveform inversion (Arnulf et al., 2014a, 2014b). The full waveform inversion will provide information about the sub-surface on tens of meter scale allowing to relate the seafloor observations (e.g. serpentinite, lava, gabbro) with seismic results and allowing to quantify amount of serpentinisation along fault zones etc.

A student with strong background in geophysics with interest in seismic imaging is welcome to apply. The student will receive training in seismic data acquisition, advanced seismic analysis techniques, and interpretation of seismic data in terms of crustal accretion process. The student will work within the GPX Team, which is involved in the development of advanced modelling and inversion techniques, and interact with the GPX industry partners. He/she will also interact with colleagues at the University of Paris 6 and University of Halifax (Canada), and will be receive training in a broad range of marine geophysics, particularly related to ridge processes.

References:

Arnulf, A., Harding, A., Kent, G, Singh, S.C., Crawford, W. (2014a). Constraints on the shallow velocity structure of the Lucky-Strike volcano, Mid-Atlantic Ridge from downward continued multi-channel streamer data, *JGR*, doi:10.1002/2013JB010500.

Arnulf, A., Harding, A., Singh, S.C., Kent, G., Crawford, W. (2014b). Nature of upper crust beneath the Lucky Strike volcano using elastic full waveform inversion of streamer data, *G.J.I.*, doi: 10.1093/gji/ggt461.