Subject offered for a contract starting in October 2015

SUBJECT TITLE: ***Nature of Oceanic Lithosphere across the Equatorial Fracture Zones in the Atlantic Ocean***

Advisor: GPX Team
Second Advisor/ Supervisor: Satish Singh
Host lab/ Team : **Marine Geoscience**

Financing: IPGP (European Research Council)

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

The Equatorial Fracture zones in Atlantic Ocean have played fundamental role in the break-up of Africa and Brazil, and define the 2,000 km E-W coastline along the Equatorial Africa. The age contrast across the Chain Facture Zone is about 15 Ma, i.e. an offset 300 km; across the Romanche Transform Fault the age contrast is 45 Ma, with an offset of 900 km, and across St. Paul it is 35 Ma with an offset of 700 km. The Romanche transform fault is the largest transform fault on Earth and has hosted a series of large earthquakes, including the 1994 Mw=7.1 earthquake. It has been suggested that the lithosphere beneath these fracture zones is cold. These fracture zones have also been responsible for the un-mixing of the water between the southern and northern oceans, and hindering the migration of ecosystem from south to north across the Equator. However, the nature of these fracture zones remains unknown.

In March-April 2015, a 600 km long ultra-deep seismic reflection profile was shot across the above fracture zones on board Western Trident. A 12 km long multi-component IsoMetrix streamer was deployed at 30 m water depth, which recorded both total pressure and particle acceleration vectors using densely sampled micro-electrical mechanical system (MEMS) accelerometers at every 3.125 m, the most advanced technology available in seismic industry. The energy source was a 10,170 cubic inch air-gun array comprised of 6 sub-arrays with 8 guns each, deployed at 15 m depth, targeting very low frequency output. The shot interval varied from 62.5 m to 75 m, and consequently the record length from 25 s to 30 s, depending upon the target depth along the profile. The multi-component data have been combined to obtain a broadband seismic energy down to 1.5 Hz, lowest frequency ever recorded.

In this project, we propose to analyses this unique dataset to characterise the nature of these fracture zones using first a conventional processing technique, followed by downward continuation, tomography and full waveform inversion. The question we wish to address are, but not limited to: (1) How deep the fracture zone faults penetrate in the lithosphere, (2) how deep fluid penetrates within these fracture zones, (3) how the thickness of lithosphere changes across the facture zones?

A student with background geophysics, physics with interest in understanding fundamental geophysical processes is encouraged to apply. The student will be a member of the Paris Exploration Geophysics Group (GPX) and will benefit from its wide-ranging projects and interaction with industry partners.

More information about the project could be found on: http://erc.europa.eu/projects-and-results/erc-funded-projects?f[0]=sm_field_cordis_project_funding%3AAdvanced%20Grant%20%28AdG%29&f[1]=sm_field_cordis_project_subpanel%3APE10&f[2]=sm_field_cordis_project_hi_count%3AFrance&page=1

Ecole Doctorale des Sciences de la Terre ✉ IPGP – 1, rue Jussieu – Bureau P27 – 75005 Paris
Directrice : Laure Meynadier - 💻 dir-Ed@ipgp.fr
Secrétariat : Prisca Rasolofomanana ☎ +33(0)1.83.95.75.10 - 💻 scol-Ed@ipgp.fr