Subject offered for a contract starting in October 2015

**SUBJECT TITLE:** ***Nature of Young Oceanic Lithosphere across the Mid-Atlantic Ridge***

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 lithosphere is the upper rigid and solid part of the Earth, which floats over the asthenosphere that flows slowly beneath, and it is the basic building block for plate tectonics. The lower side of the plate boundary, the Lithosphere-Asthenosphere Boundary (LAB), is an active plate boundary that accommodates differential motion between the upper lithosphere and the underlying asthenosphere. Beneath the ocean spreading centres, the thickness of the lithosphere is 2-6 km depth but as the plate cools, it increases to 100 km for a lithosphere of 100 Ma age. However, the precise nature of the LAB and the lithosphere is poorly defined.

In March-April 2015, a 2100 km of ultra-deep seismic reflection data were acquired starting from the Greenwich Meridian on the African Plate, crossing the Mid-Atlantic Ridge up to 25 Ma on the South American plate in the equatorial Atlantic Ocean. The data were acquired on board the Western Trident towing a 12 km long multi-component IsoMetrix streamer at 30 m water depth. The multi-component towed-streamer system 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 50 m to 75 m, and consequently the record length from 20 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 focus on 0-25 Ma of the oceanic lithosphere on both sides (African and South American plates) of the Mid-Atlantic Ridge, where the thickness of the lithosphere increases most rapidly from 5-6 km to 40-50 km. We also hope to image the presence melt lenses in the mantle beneath ridge axis and deep penetrating faults away from the ridge. We propose to use first a conventional processing technique, followed by downward continuation, tomography and full waveform inversion.

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

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