Subject offered for a contract starting October 2018

SUBJECT TITTLE: : ***Nature Oceanic Lithosphere across the Equatorial Fracture Zones in the Atlantic Ocean using seismic tomography***

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Second Advisor/ Supervisor:

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For more information go to http://ed560.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.

A 600 km long ultra-deep seismic reflection data using a 12 km long multi-component streamer were acquired, allowing image the lithosphere-asthenosphere boundary down to 100 km depth (Mehouachi and Singh, 2018). In 2018 we plant to acquire refraction data using ocean bottom seismometers. In this project, we propose to analyses the OBS data to determine velocity structure of the oceanic lithosphere and of the fracture zones down 30-40 km depth and interpret these results along with deep seismic reflection data. To analyse these unique data, we propose to use state of the art analyses techniques, such as 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.
More information about the project could be found on: http://erc.europa.eu/projects-and-results/erc-

fundedprojects?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

Reference

Mehouachi, F. and Singh, S. C. (2018). Water-rich sublithospheric melt channel in the equatorial Atlantic Ocean, *Nature Geoscience* **11**, 65-69 (https://doi.org/10.1038/s41561-017-0034-z)