ÉCOLE DOCTORALE SCIENCES DE LA TERRE

Subject offered for a contract starting in September 2012

SUBJECT TITTLE: Seafloor seismic monitoring of Lucky Strike volcano and hydrothermal vent site, Mid-Atlantic Ridge

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Host lab/ Team: **IPGP- Marine Geosciences – UMR7154**

Financing: **Doctoral contract with or without assignment**

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

Presentation of the subject:

Lucky Strike volcano sits 1600 meters beneath sea level on the Mid-Atlantic Ridge between the North American and European plates. High-temperature (>350°C) hydrothermal vents surround a frozen lava lake at the volcano's summit, and a 3-4 km wide, 6-7 km long and 3 km deep magma chamber sits beneath the volcano summit. Lucky Strike has been heavily studied over the past two decades, using marine bathymetry, gravity, magnetic and active seismic methods, resulting in one of the best images of the structure of a mid-ocean ridge volcano.

Lucky Strike is now one of the sites of a pioneering seafloor observatory initiative, as part of the European EMSO (European Sub-Sea Observatory) project. The monitoring experiment at Lucky Strike includes autonomous and connected seismological, geodetic, fluid temperature, chemical and ecological sensors, As part of this monitoring project, seismometers have been deployed on Lucky Strike volcano for the past 5 years: the longest seismology experiment ever performed on a mid-ocean ridge volcano. Several thousand seismic events have been located and preliminary studies show events associated with hydrothermal circulation and tectonism at the volcano summit, as well as tectonic events along the spreading segment, mostly to the south of the volcano. The fifth year of data will be recovered in the summer of 2012.

We propose a doctoral thesis project to study tectonism, magmatism and hydrothermal activity on the Lucky Strike volcano and segment using these seismological data. The student will use earthquake locations and magnitudes to determine the present tectonic, magmatic and hydrothermal conditions within the volcano, based on long-term (background) activity and on discrete active spreading events. A clear understanding of plate tectonics and seismic wave propagation as well as a familiarity with numerical methods are highly recommended.

Depending on the student's interests, this project could be complemented, in collaboration with the University of Brest (Dr Julie Perrot) by a methodological study of how ground motion associated to seismic events at the ridge axis creates acoustic signals that propagate to great distances in the water column. For this, the student would use the Lucky Strike seismic monitoring dataset and a coincident set of water column hydrophone recordings, also acquired as part of the EMSO project.