ÉCOLE DOCTORALE
SCIENCES DE LA TERRE ET DE L'ENVIRONNEMENT
ET PHYSIQUE DE L'UNIVERS, PARIS

Subject offered for a contract starting october 2016

SUBJECT TITTLE:

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

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

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Presentation of the subject:

Magnetic anomalies are considered as an important tool to study seafloor spreading at mid-ocean ridges, but very few studies used this tool to study subduction zones. Whether the magnetic signature of structures created by subduction is diverse, complex, and interpreted in somewhat ad hoc or divergent ways, the magnetic signature of the subducting plate does not originally differs from that of oceanic basins, which magnetic structure and properties are now well constrained. This allows considering the magnetic anomalies observed on subducting plates to constrain the additional effects of subduction on these anomalies. We propose to address this problem using two complementary approaches.

The first approach consists in analyzing, on a set of favorable subduction zones (Sumatra, Japan…), the magnetic anomalies associated with subducted oceanic crust, which amplitude rapidly decreases and wavelength increases. These effects jointly mark the increasing distance to the magnetized sources and the removal of their remanent magnetization with increasing temperature. The first effect can be quantified and corrected, allowing to investigate the second and derive constraints on the thermal structure of subduction zones. This thermal structure is itself an essential parameter in the localization and the properties of the seismogenic zone. Possible lateral variations of the magnetic signature and the seafloor spreading-related parameters (age, spreading velocity, …) along the studied subduction zones will be crossed with their observed tectonics and seismicity.

The second approach aims to reconstitute the past geometry of the subduction zone by simulating the subducted oceanic lithosphere by the methods of plate kinematics. This type of approach is the only one allowing to determine the age and the spreading velocity of the subducted oceanic lithosphere and the presence of any singularities (oceanic plateaus resisting subduction, spreading center having entered subduction and opening an asthenospheric window in the subducting slab…). In the case of complex interaction between major plates involving the formation of back-arc basins and the development of intermediate plates (Philippine and Caroline plates, subduction transfer in the North Fiji and Manus Basins), the detailed shape (skewness related to the azimuth) and the amplitude of the magnetic anomalies will be used to constrain the trend of the magnetic lineations of these basins at the time of their creation and, as a consequence, the geometry of the associated subduction zones. Such constraints are deeply needed to reconstruct quantitatively the evolution of South-East Asia and the Western Pacific Ocean.