



Subject offered for a contract starting October 2018

SUBJECT TITLE: Seismotectonics of the Barbados wedge (Eastern Caribbean), implication for the seismogenic behavior of the Antilles subduction zone.

Advisor: **Nathalie FEUILLET, Phys, feuille@ipgp.fr**

Second Advisor/ Supervisor: **Hélène Carton, MCF, carton@ipgp.fr**

Host lab/ Team : *please fill in and leave out meaningless information*
IPGP- Team Tectonics and Marine Geosciences – UMR7154

Financing: Doctoral contract with or without teaching assignment

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Presentation of the subject: (1 or 2 pages)

The Barbados accretionary wedge is up to 15km-thick and more than 200km-wide. It is one of the most important one in the world. Its morphology is complex and reflects a long tectonic history that is not well understood today mainly because high-resolution data were missing. Between May 27 to July 5, 2016, during the CASEIS marine cruise (Feuillet et al., 2016), we acquired high resolution bathymetry and backscatter, several 24-trace seismic and chirp profiles as well as several sediment cores aboard of the R/V Pourquoi Pas?. These new data highlight active structures within the wedge and in the fore-arc that could produce significant earthquakes and tsunamis. The aim of the PhD thesis is to characterize (geometry, segmentation, kinematics) those active structures at all scales on a basis of a morphotectonic and seismotectonic study by using the new data we acquired combined with older available data. In more detail, the objective is to analyze the bathymetric data and the backscatter data to map the active structures at all scales and to identify markers of deformation. The seismic profiles will be processed and analyzed to highlight the 3D geometry of the fault systems at depth and to discuss their link with the lesser Antilles megathrust. Chirp data and information from marine cores (sedimentation rate, facies) will be used to estimate deformation rates and to obtain information on the history of fault systems. The long-term tectonic data will be combined with instrumental seismicity data recorded by the IPGP observatories to obtain information on the origin of earthquakes of magnitude greater than 6 in 1969 off Guadeloupe and 2014 off Barbados. .

The surface structures of the wedge may reflect the seismogenic behavior of the

subduction interface and reveal the seismogenic zones, capable to produce an earthquake in the future. Modeling using, for example, the critical taper theory may permit to understand the existence of these structures in relation with the mechanical behavior of the interface (Cubas et al 2013). Part of the PhD thesis will also be dedicated to the analysis of gravity anomaly over the Lesser Antilles subduction zone. Indeed, several studies have shown a correlation between the zones of important trench-parallel gravity variations and so-called coupled zones of the subduction interface capable of producing large earthquakes (e.g. Song and Simons, 2003).

This thesis will be conducted in collaboration with Christine Deplus (Geosciences Marines, IPGP, Gravimetry), Nadaya Cubas (Istep, Paris, Modeling) and Thibaud Pichot (Beicip, Franlab, seismic stratigraphy)

Feuillet et al., CASEIS cruise report, Juillet, 2016

Cubas, N., Avouac, J. P., Souloumiac, P., & Leroy, Y. (2013). Megathrust friction determined from mechanical analysis of the forearc in the Maule earthquake area. *Earth and Planetary Science Letters*, 381, 92-103.

Song, T. R. A., & Simons, M. (2003). Large trench-parallel gravity variations predict seismogenic behavior in subduction zones. *Science*, 301(5633), 630-633.

Collaborators : Christine Deplus (Geosciences Marines, IPGP, Gravimétrie), Nadaya Cubas (Istep, Paris, Modélisation), Pichot Thibaud (Beicip, Franlab, stratigraphie sismique)