



ÉCOLE DOCTORALE SCIENCES DE LA TERRE



Subject offered for a contract starting in September 2012

SUBJECT TITLE: Timing and implication of volcano flank-collapses in the history of Martinique volcanoes

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Second Advisor/ Supervisor:

Host lab/ Team : **Equipe de Géologie des Systèmes Volcaniques– IPGP - 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 (1 or 2 pages)

Flank collapse with emplacement of voluminous and potentially tsunamigenic debris avalanches is the key recurrent process controlling the evolution of Lesser Antilles volcanoes. In the context of island arcs where small size edifices are built, most debris avalanche material is deposited offshore such that on land studies provide only a very limited part of the information necessary to study these major volcanic events of considerable potential hazard. The expedition IODP 340 is taking place (3 March- 17 April 2012) offshore the Lesser Antilles volcanoes to obtain a complete record of eruptive activity and volcanoclastic sedimentation of the most active complexes of the Lesser Antilles arc, over, at least the last Ma.

The PhD is dedicated to the post-cruise research plans of this expedition. The aim of the PhD is to understand much better the timing and emplacement processes of debris avalanches produced by flank-collapses on Martinique volcanoes. This PhD will gain unprecedented information necessary for understanding the behavior of volcanic debris avalanche and the actual role of flank collapses in the evolution of arc volcanoes with a remarkable frequency of flank collapses (15 in the last 12 ka) higher than in other regions (e.g. Hawaii: 1/ 350 ka).

1- History of Martinique volcanoes and Timing of flank-collapse events

An important objective is to place each flank failure examined within the local volcanic history, and to provide accurate ages of events. The ages of events will improve quantification of the return periods, which is important for hazards assessment. Marine sediments preserve tephra layers and consequently provide a good record of the eruptions. Analysis of the cores through sediments offshore Montagne Pelée volcano combined with onshore record will provide the most complete history of the volcano, as a reference. The study of the sediments which cover the debris avalanche deposits will be used to date deposits around Martinique and to replace them into the long-term (2 Ma) eruptive histories of these islands. We will particularly focus on the influence of flank-collapse events on the evolution and eruptive processes of volcanoes.

2- Processes of debris avalanche emplacements

Understanding whether significant substrate erosion occurs during the emplacement of debris avalanches is crucial for understanding what controls the exceptional mobility of debris avalanche and for including realistic parameters in numerical simulations of flow processes. Logging data collected during the expedition will allow us to document the internal facies architecture and stratigraphy of debris avalanche deposits, evaluate the overburden removal of the underlying substrate and test the degree to which a given debris avalanche deposit volume results from erosion and entrainment during emplacement. We will compare debris avalanche from Martinique and other volcanoes given the recognition of different morphologies and deposit geometries that likely relate to the contrasted lithologies of the source products.

The CARIB PhD student will have strong collaborations with the Post-doctoral researcher on physical properties, with international researchers from the Expedition 340 and in particular with our UK colleagues. Cutting-edge results from this PhD research will significantly improve our understanding of the eruptive history of some of the Caribbean volcanoes which show an exceptional number of edifice collapses as well as impulse tsunamigenic debris avalanche hazards modelling beyond the current state of the art in.

Academic training and specific skills

Academic training in the area of geology and/or geophysics with a knowledge of techniques used in marine domain will be appreciated.