



Subject offered for a contract starting October 2019

SUBJECT TITLE: OBSERVATION, ANALYSIS AND INTERPRETATION OF THE ABNORMALLY LONG EARTHQUAKES

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Second Advisor/ Supervisor:

Host lab/ Team : **IPGP- Seismology Team – UMR7154**

Financing: Doctoral contract with or without teaching assignment

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Presentation of the subject: (1 or 2 pages)

Earthquakes follow on average well-established scaling laws, which relate in particular their source durations to their magnitudes. Some earthquakes are however known to depart from this general behavior, with a longer duration than what their magnitudes would predict. One of the known examples are the so-called "tsunami earthquakes" whose very long duration is a strong indicator of their tsunami potential. Other cases include the events occurring in volcanic contexts, while the long duration may also be due to the complexity of the rupture process, involving the successive breaking of several seismogenic areas of the fault.

The initial goal of this PhD thesis is to detect and to classify these long duration events in an exhaustive way, in order to locate in which contexts they occur and to finely characterize them in terms of source complexity and frequency content. To do so, the main observational tool is expected to be the analysis of earthquakes source time functions (STF), both by using and extending the SCARDEC STF catalog (<http://scardec.projects.sismo.ipgp.fr/>). The SCARDEC method relies on the analysis of the body waves recorded by the global seismic network, and this part of the PhD requires that the candidate previously manipulated seismological data, and has a strong interest in observational seismology and wave modeling.

We then plan to focus on several key active areas in order to better interpret how and why these abnormal earthquakes occur, and to integrate them in a more global perspective with all the deformation processes at play. Typical interesting areas are subduction zones where seismic coupling varies laterally and/or with depth (for example

Central America, Ecuador-Peru margin). Known long duration events took place in the past in these areas, but the development of both the local geodetic and seismic networks now allows to better document the diversity of the deformation processes, ranging from interseismic deformation to “classical” earthquakes, and including transient phenomena (slow slip events). The role of the long duration earthquakes in such areas, and the reasons why they appear to occur at specific places, will be explored during this PhD. This part of the project requires interdisciplinary interactions between seismology and geodesy.