Subject offered for a contract starting October 2018

SUBJECT TITTLE: ***Link between earthquakes and tsunamis from 3D seismic reflection study in the 2006 Java Tsunami earthquake region***

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Financing: IPGP (Earth Observatory of Singapore)

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The 2004 Andaman-Sumatra (Mw=9.1) and 2011 Tohoku earthquakes (Mw=9.0) produced devastating tsunamis whereas Nias 2005 (Mw=8.5) and Bengkulu 2007 (Mw=8.4) did not produce any tsunamis. On the other hand, small earthquakes such as Java 1994 (Mw=7.6), Java 2006 (Mw=7.7) and Pagai 2010 (Mw=7.8) caused large tsunamis. These latter class of earthquakes is also referred as tsunami earthquakes, which produce exceptionally large tsunamis from relatively moderate-magnitude earthquakes, rupturing the updip portion of the subduction thrust interface, with low rupture velocities. However, co-seismic rupture on shallow dipping megathrusts is not able to induce such large tsunamis, as usually acknowledged by modelling studies. In turn, sediment effects, overshoot processes or coseismic splay faulting are often invoked to compensate for too low megathrust-induced seafloor uplift.

In order to address this fundamental problem, we plan to acquire three-dimensional seismic reflection data in May 2018 in the 2006 Java earthquake rupture area using an industry vessel capable of towing twelve 8-km long streamers over 16 km x 40 km surface area covering a part of the subducting plate, subduction front and the landward limit of the 2006 earthquake. These data will be processed by an industry up to pre-stack depth migration, allowing to image faults, plate interface down to 15 km depth on tens of metre resolution. In this project, propose to interpret this unique data set and understand the link between faulting, earthquakes and tsunami. We also propose to perform advance processing, such as seismic full waveform inversion to quantify the fluids and the rock properties of the faults and megathrust.

Students with a background in geophysics and interested in earthquake and deformation processes are encouraged to apply. The Ph.D. student will receive training in the analysis and interpretation of seismic reflection data, using the state of the art technique such as seafloor datuming, tomography and full waveform inversion. He/she will be working in the Marine Geosciences team at IPGP and may also spend some time working with the active tectonics group at the Earth Observatory of Singapore.