Geophysical Research Abstracts
Vol. 15, EGU2013-9718-1, 2013
EGU General Assembly 2013

Detailed history of slip along the Sunda mega-thrust

Nuno Simão, Anthony Lindsay, Shane Murphy, John McCloskey, Mairead Nic Bhloscaidh, and Suleyman Nalbant
Environmental Sciences Research Institute, University of Ulster, Coleraine, United Kingdom (n.simao@ulster.ac.uk)

We undertook a reconstruction of more than 200 years of deformation on the Sunda mega-thrust using the history of vertical displacement recorded in the stratigraphy of coral micro-atolls. This reconstruction gave an unprecedented opportunity to understand the distributions of slip on the recent series of great earthquakes and its relationship with coupling. We have seen with the recent earthquakes that, whilst the slip-coupling relationship may be complex and certainly depends on the pre-stress, the greatest slip generally occurs in areas of high coupling. We have also seen that the spatial distributions of the greatest slip reveals tessellation between earthquakes.
Using Monte Carlo techniques, we compare ground deformation produced by different fractal slip distributions with micro-atoll coral data to estimate slip distributions for the 1797 and 1833 historical earthquakes. The resulting slip estimations have a more realistic spatial distribution and provide a better fit to the micro-atoll data than previously published solutions. Preliminary results seem to imply that the 1797 and 1833 ruptures reveal a level of complementarity, where the greatest values of slip tessellate with the greatest slip values observed in the two great earthquakes of 2007 and the earthquake of 2010.
In addition, the spatial stacking of all slips from all available earthquake slip distributions reveals a strong correlation with the spatial distribution of the coupling. Discrepancies in the spatial slip-coupling correlation, although strongly influenced by the uncertainties of the slip distributions, and with the 1797 and 1833 earthquakes playing a stronger role, can still be used as a way to pin-point possible areas of slip deficit when compared with the spatial distribution of coupling. This seems to imply that correspondence between the slip probability in 1797 and 1833 and present-day earthquakes slip and coupling appears to show the same basic relationship indicating that the broad geometry of this coupling has survived for more than one seismic cycle. It does not however imply that the slip on these earthquakes is predictable; it means simply that there is a low probability that high slip will occur in areas of weak coupling or where high levels of slip already occurred during these shocks.