

Stratigraphic Evidence of the 2004 Sumatra-Andaman subduction zone Seismoturbidite

Jason R. Patton¹, Chris Goldfinger¹, Yusuf Djadjadihardja², and Udrek²

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¹Oregon State University, College of Oceanic and Atmospheric Sciences, 104 Ocean Admin. Bldg., Corvallis, Oregon 97331, USA. patton@coas.oregonstate.edu, gold@coas.oregonstate.edu, 1+ 5417379622

²Bandan Penghajian Dan Penerapan Teknologi (BPPT) BPPT 2nd Building, 19th Floor Jl.MH.Thamrin 8 Jakarta, 10340, Indonesia, iyung24@yahoo.com

The paleoseismic history of earthquakes along subduction zones is an important tool to evaluate the cyclic hazards that millions of coastal residents are exposed to globally. From the R/V Roger Revelle, we sampled the sea floor with 109 gravity, Kasten, piston and trigger pair, and multi-cores offshore of Sumatra. We use litho- and chrono-stratigraphic methods to correlate turbidites between cores in sedimentologically isolated accretionary prism slope basins and trench settings. In 12 cores we interpret the uppermost turbidite to have been deposited as a result of seismic shaking related to the 2004 earthquake. Measures of relative age (lack of hemipelagic sediment of oxidation in the core tops) and radiometric ages (²¹⁰Pb and ¹⁴C) support our interpretation of the uppermost turbidite. P_Sequence (OxCal software) age modelling results in an age of -60 ± 10 cal yrs BP. The 2004 deposit is imaged in reflection data including the resolution of repeated coarse Bouma Tb-Tc subunits within the 2004 bed. There is evidence that there may be cycles of large turbidites similar in size to the 2004 seismoturbidite below our cores. Triggering distances at core sites outside the 2004 rupture zone are quite short (< 50 km), which we attribute to high attenuation, rupture directivity and low or no slip at the southern segment boundary. Using our correlations for the stratigraphic history spanning the last 6.5 ka, we estimate recurrence of earthquakes in the region of the 2004 earthquake to be 260 ± 160 years. Down-core variations of interseismic intervals show similar trends between cores, supporting our correlations. Recurrence of trans-oceanic paleotsunami records in the northern Indian Ocean is between 280 and 320 years, consistent with our estimate. Records of earthquakes in the submarine environment, found in sediment cores and seismic reflection data, are a useful tool to evaluate the cycling of strain along subduction zones.

Rob harris' abstract writing guide:

The first sentence describes the motivation and significance of the project. The next two or three sentences describe the type of data obtained, its location and its range of values. The next few sentences describe the techniques, field methods and mathematical models used in the analysis. Next the results from the analysis are presented numerically with error estimates. One sentence should summarize your preferred interpretation of the analysis. And finally summarize the conclusions of the experiment with regard to the first sentence; presented with a numerical value or estimation.