NEW EVIDENCE FOR A SECONDARY TECTONIC SOURCE FOR THE CATACLYSMIC TSUNAMI OF 12/26/2004 ON NW SUMATRA

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The near field tsunami generated by the great M9.1 Sumatra-Andaman earthquake of 12/26/2004 devastated about 200 km of the NW Sumatra coast and caused 169,000 of the 232,000 tsunami deaths; far-field waves resulted in the remaining 63,000 deaths. On Sumatra, flow depths (7 to 32 m) and maximum run up heights (to 38 m) exceed by a factor of 2–3, tsunamis generated by historical megathrust quakes of comparable or larger magnitude such as Chile (1960) and Alaska (1964).

This paper addresses the question: "Why was the Sumatra tsunami so large and destructive compared to all previous tsunamis that accompanied great megathrust earthquakes?" To answer this question we collected, in May 2005, 110 eyewitness accounts along the NW Sumatra coast to determine tsunami arrival times and characteristics. We also re-surveyed some pre-quake echo sounder lines offshore from NW Sumatra, in October 2006, to ascertain whether there were any large depth changes that could have generated the local tsunami.

Based on these data, our working hypothesis is that large slip on one or more steeply dipping intraplate thrusts or backthrusts that splay off the Sunda megathrust caused the local tsunami that struck NW Sumatra, whereas slip on the gently-dipping Sunda megathrust was the probable source of the far-field tsunami. Our hypothesis is compatible with: 1. Data on arrival times and characteristics of the near field tsunami; and 2. A numerical tsunami source model consisting primarily of coseismic uplift along a splay fault about 80 km long, 60 degree dip, and ~20 m slip that is superimposed on minor uplift (<3 m) due to up-dip slip on the megathrust.

Biography: Dr. George Plafker is a geologic hazard consultant and volunteer scientist emeritus for the U. S. Geological Survey in Menlo Park. George received his B.S. from Brooklyn College, followed by an M.S. from UC Berkeley. He received his Ph.D. from Stanford University, in Geology and Geophysics. George has a wide range of experience, the foremost of which includes 37 years doing geologic mapping, engineering geology of dam sites, neotectonic studies, and onshore-offshore petroleum basin evaluation with the USGS, primarily in Alaska. These activities focused on the geologic effects of earthquakes, tsunamis, seismic hazards, and regional tectonics in Alaska, the western conterminous U.S., and nine foreign countries. His other experience includes 11 years of consulting on hazards from subaerial and submarine landslides in Alaska and on faulting, tectonic tsunamis, and earthquake-related ground shaking in California; 5½ years petroleum exploration in Guatemala and Bolivia with Chevron Oil Company; and 1½ years engineering geology of dam sites in California with U.S. Army Corps of Engineers.

George's primary professional interests include active faults, paleoseismology, regional tectonics, and earthquake hazards; coseismic deformation and tsunamis related to subduction zone and backarc thrust fault earthquakes; mechanisms of submarine slides and slide-generated waves and subaerial high-speed rock avalanches; and onshore & offshore regional geology, tectonics, and petroleum potential of the Gulf of Alaska margin. George is the author or co-author of 200+ published papers and geologic maps and 100+ abstracts on geology, tectonics, and the geologic aspects of earthquakes, primarily in Alaska. He was senior editor for, and a major contributor to, *The Geology of Alaska*, published in 1994 by the Geological Society of America (1,055 pages, 13 map plates).