Observational Constraints on the Fracture Energy of Subduction Zone Earthquakes

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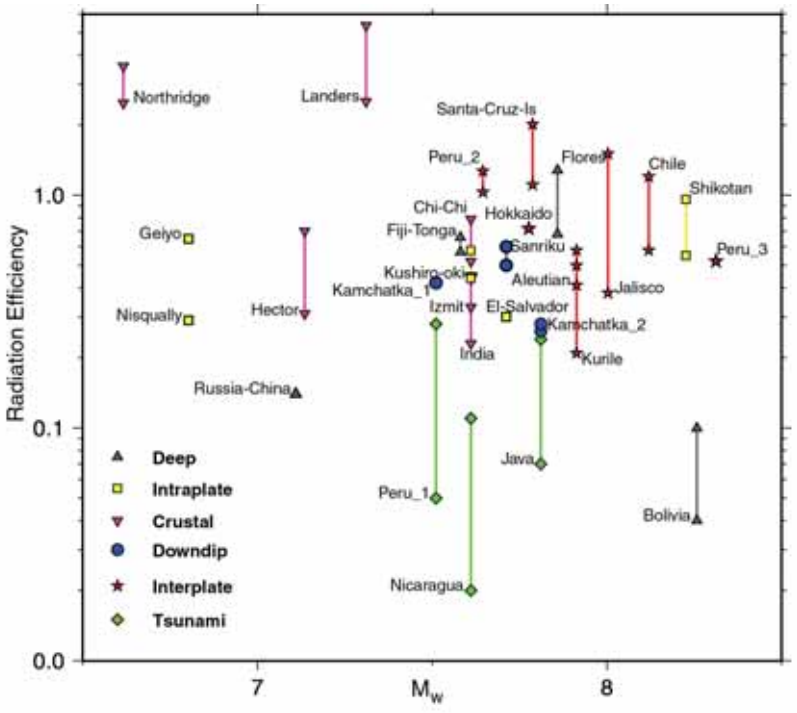

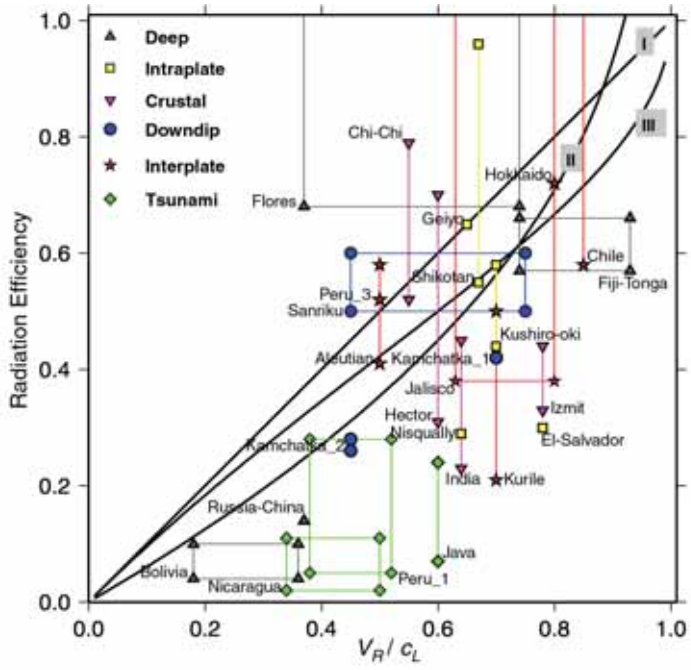

We computed the radiated energy for 23 large (mostly Mw 7.5) subduction zone earthquakes recorded between 1992 and 2002 and some smaller, well-studied subduction zone and crustal earthquakes. Using estimates of static stress drop and a slip-weakening model we determine the radiation efficiency of these earthquakes. The radiation efficiencies are consistent with the rupture speed estimated for these earthquakes. Most earthquakes have radiation efficiencies between 0.25 and 1 and are hence efficient in generating seismic waves, but tsunami earthquakes and two deep earthquakes, the 1994 Bolivia and the 1999 Russia-China border earthquakes, have very small radiation efficiencies (< 0.25) and hence dissipate a large amount of energy during faulting. We suggest that in these deep events, energy is probably dissipated in thermal processes in the fault zone, while it is possible that the morphology of the trench causes large energy dissipation during the rupture process of tsunami earthquakes.

Venkataraman, A., and H. Kanamori, Observational Constraints on the Fracture Energy of Subduction Zone Earthquakes, *J. Geophys. Res., 109*, No. B5, B05302, 10.1029/2003JB002549, 2004.