



How well do the Mentawai corals constrain great historical earthquakes?

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Vertical coseismic displacements recorded in corals on the Sumatran forearc offer a unique opportunity to reconstruct past earthquakes on the Sunda megathrust. These observations not only constrain the time and magnitude of historical earthquakes but also place some bounds on possible slip distributions for them. Here we explore the range of slip distributions which are consistent with the coral data. We choose a brute-force technique in which the displacements at the corals are computed for many possible slip distributions. The technique makes no assumptions about the earthquake other than the geometry of the fault and the autocorrelation function of the slip distribution which limits the post-seismic strain. We expose several internal inconsistencies in the data which may indicate that the displacements suggested by the corals may not have resulted from pure double couple displacement on the megathrust. Movement on splay faults, for example, may be required to reconcile the discrepancies. We also show that while the along-strike length of the rupture is reasonably well constrained, the location of high slip down dip is only poorly resolved. Numerical simulations of tsunamis that would have resulted from possible historical earthquakes may help to advise on possible hazard from a near future Mentawai earthquake.