The Mw 8.1 rupture occurred on the Solomon Islands subduction zone (above) where the Woodlark and Australian plates converge with the Pacific plate at ~10 cm/year. We used coral measurements, geomorphic indicators, satellite imagery, and cultural features to quantify uplift and subsidence along the rupture area (right).

Main findings

1. We observed maximum uplift of 2.46 meters near the trench and a subsidence trough of -0.6 meters farther arcward (right). A well-defined hinge line (line of zero change) separates the regions of uplift and subsidence. On the downgoing slab, the island of Simbo subsided up to 0.7 m -- this represents the first set of coseismic uplift and subsidence observations straddling a subduction plate boundary. The total rupture length is over 250 km.

2. Slip was confined to the shallowest portion (<15 km) of the subduction zone, which was previously assumed to be aseismic based on seismicity studies and prevailing notions regarding the seismogenic potential of the shallow portions of megathrusts (below left). In this region of extremely young (<5 Ma) seafloor and thin sediment, the megathrust appears to support velocity-weakening behavior nearly to, or all the way to, the seafloor.

3. Slip reached the deformation front (trench) beneath the island of Ranongga, where the Simbo Ridge transform subducts. Significant slip here is consistent with the idea that subducted topographic highs can function as asperities. Curiously, slip inversions based on teleseismic data (below right) show nearly no slip beneath Ranongga. This may highlight the non-uniqueness of purely teleseismic slip inversions and the utility of geodetic data for mapping slip.

4. Along-strike controls on slip are complex. Rupture began near the edge of Rendova Island, then propagated through the triple junction at the subducting Simbo Ridge transform before ending near the Woodlark Rise. Thus it appears that structural features in the upper and lower plates are sufficient, but not necessary, to arrest rupture.