Chlieh, M., Avouac, J., Sieh, K., Natawidjaja, D., Galetzka, J., (2007) **Heterogeneous coupling on the Sumatra megathrust constrained from geodetic and paleogeodetic measurements**, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abstract#U54A-01

Geodetic and paleogeodetic measurements of strain above the Sumatran portion of the Sunda subduction zone reveal a heterogeneous pattern of coupling along the subduction megathrust. Annual banding in coral heads provides vertical rates of deformation spanning the last half of the 20th century, and repeated GPS surveys between 1991 and 2001 and continuous measurements at GPS stations operated since 2002 provide horizontal velocities. The area of the plate interface within which the coupling is high is only a few tens of kilometers wide near the Equator but increases to a width of about 175 km farther south. The widest sections of this locked fault zone coincide with the rupture areas of four major historical Mw>8.5 interplate earthquakes. The section that ruptured during the Mw 8.7 Nias-Simeulue earthquake of 2005 released half of the moment deficit that had accumulated since its previous rupture in 1861. Farther south, beneath the Mentawai islands, overlapping ruptures of the locked fault zone produced giant earthquakes in 1797 and 1833. The accumulated slip deficit since these events is slowly reaching the amount of slip that occurred during the 1833 earthquake but already exceeds the slip that occurred during the 1797 earthquake. Thus, re-rupture of at least part of the Mentawai patch in the near future seems quite likely. In contrast, coupling is low in the Batu islands near the Equator and around Enggano island at about 5°S, where only moderate earthquakes (Mw<8.0) have occurred in the past two centuries. Temperature might influence the mode of slip along the plate interface, through its effect on the rheology of sediments at the plate interface. Other influences, such as structures on the subducting plate, may also play a role. In particular, subduction of the Investigator Fracture Zone near the Equator coincides with the relatively low coupling there.