

Natawidjaja, D., Sieh, K., Galetzka, J., Suwargadi, B. W., Edwards, R. L., Cheng, H., Shen, C., Mohamed, C., (2007) **A 700-year-long paleoseismic context for the Sumatran megathrust earthquakes of 2007**, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abstract#U53A-01 INVITED

The Mw8.4 Sumatran earthquake of 2007 resulted from a 275-km rupture within the 700-km-long Mentawai section of the Sunda megathrust. Paleoseismic and paleogeodetic patterns of the past 700 years show that it was the largest rupture within this section in nearly the last two centuries and imply that it is the beginning of a series of gap-filling ruptures. We have characterized previous great ruptures using the growth patterns of coral microatolls on the Mentawai island reefs above the megathrust. These natural instruments have allowed us to map ancient coseismic vertical deformations in enough detail to make useful comparisons to the recent event. The last two giant ruptures occurred in 1797 (Mw 8.5–8.7) and in 1833 (Mw 8.6–8.9). Rupture in 1797 produced uplift above a 350-km long section of the megathrust from 0.5 to 3.2°S. Rupture in 1833 produced uplift for about 275 km, from 2.2 to about 4.2°S. Uplift in 2007 extended from 2.5 to 4.5°S, nearly coincident with that of 1833. In all three events, the islands tilted toward the mainland, away from the trench. In the South Pagai Island (from 2.8° to 3.2°S) in both the 1797 and 2007 events, uplift ranged as high as 80 cm. Uplift in 1833 was about 4 times greater there. The close timing of the 1797 and 1833 ruptures and their partial overlap indicates that a single great megathrust rupture need not relieve all the strain that has accumulated across the megathrust. Comparison of strain accumulated in the past half-century with strain relieved during the 2007 event shows that, indeed, the 2007 break involved only the southern half of the Mentawai locked patch and that even along that section, strain relief was only partial. Coral microatolls also reveal two earlier rupture sequences, in the mid- to late 1300s and in the late 1500s to early 1600s. Since the 1300s, intervals between great-earthquake sequences have been about 200 years. Thus, it was not a surprise that the first in what is likely to be a sequence of great earthquakes occurred this year. We fear that the later great earthquake of the recent sequence is likely to be greater in magnitude than that of the first, as much more strain is still unreleased. Although some emergency preparations have been undertaken in communities at risk from the next great rupture of the Mentawai patch, it is not at all clear that enough will have been done to secure the lives, livelihoods and well-being of most of the million or so people who live along that part of the Sumatran coast.