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Coseismic rupture to the up-dip end of plate subduction zone, the result of IODP NanTro-SEIZE Exp316

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Seismic faulting along subduction-type plate boundaries plays a fundamental role in tsunami genesis. During the Integrated Ocean Drilling Program (IODP) Nankai Trough Seismogenic Zone Experiment (NanTro SEIZE) Stage 1, the updip ends of plate boundary subduction faults were drilled and cored in the Nankai Trough (offshore Japan), where repeated large earthquakes and tsunamis have occurred, including the 1944 Tonankai (Mw = 8.1) earthquake. Samples were obtained from the frontal thrust, which connects the deep plate boundary to the seafloor at the toe of the accretionary wedge, and from a megasplay fault that branches from the plate boundary decollement. The toe of the accretionary wedge has classically been considered aseismic. Non-destructive X-ray fluorescence core-imaging scanner, X-ray diffraction and the vitrinite reflectance geothermometry reveal that the two examined fault zones underwent localized temperatures. This suggests that frictional heating occurred along these two fault zones, and implies that coseismic slip must have propagated at least one time to the up-dip end of the megasplay fault and to the toe of the accretionary wedge.

Keywords: Plate subduction, Seismogenic zone, Tsunami, Vitrinite, XRD, XRF