Fault segmentation for crustal and subduction earthquakes based on dynamic rupture simulations

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It is important to consider what kind of features control the fault segmentation of earthquakes. Since it is quite difficult to see the detailed structure of the fault system for subduction earthquakes, the analogy to inland shallow crustal earthquakes becomes important, where we can see fault segmentations from the geological and geographical survey as well as the hypocentral distribution of aftershocks. Therefore it is expected that inspecting the detailed features of fault segmentation of inland earthquakes would be useful for the examination of those for subduction earthquakes.

However, it should be noted that the predominant fracture mode is different between the inland earthquakes and subduction ones; in-plane rupture is dominant for inland earthquake and anti-plane for subduction earthquakes. There is mass transportation at the corner of the fault kink for the in-plane case but not for the anti-plane rupture; The rupture tends to curve when rupture accelerates for the in-plane rupture but not for the anti-plane rupture; the rupture velocity may exceed the S-wave velocity for the in-plane case but not for the anti-plane case. Therefore, the fault segmentation problem for subduction earthquake might be simpler than those for the inland shallow intra-plate earthquake.

From the point of numerical simulation analysis, whether the rupture propagates across the fault segment boundary or not depends on the detailed geometry of segments at the boundary, tectonic stress applied to the fault segments, constitutive relation for the rupture, and the rupture velocity when it approaches the boundary of fault segments. In this talk I will investigate these effects on the fault segmentation based on the dynamic rupture propagation modeling.