

## Origin of mega-splay fault in subduction zone - out-of-sequence thrust or evolution gap in subduction

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Mega-splay fault in subduction zone is a major seismogenic fault in subduction zone and separates outer and inner wedges of the forearc in many places. Origin of the mega-splay fault, however, is not so clear and is ambiguously considered to be out-of-sequence thrust in accretionary prism or accidental result of thrust branching from the plate boundary mega-thrust.

The out-of-sequence thrust model assumes that terrigenous sediments supply and relative plate convergence are constant, and the prism grows constantly. The prism grows by in-sequence thrusting at the deformation front, with out-of-sequence thrusting occurring in the inboard of the prism and maintaining the critical taper. The resulting accretionary prism can thus thicken until it obtains the thickness of continental crust of ~30 km and more with association of exhumation of high grade metamorphic rocks to keep the critical taper.

If we attempt to apply this out-of-sequence thrust model to the mega-splay fault in the Nankai margin and tectonic boundary faults in ancient accretionary prisms of southwest Japan, the model implies that the northern Shimanto Belt was continuously followed by the growth of the southern Shimanto Belt and modern Nankai accretionary prism without any serious break since Late Cretaceous time to present.

The tectonic history of southwest Japan, however, presents several complications of the events, such as global change in relative convergence with subduction of several different oceanic plates such as Farallon, Kula, Philippine Sea, Pacific and other anonymous plates, intermittent sediment supply to the trench in Late Cretaceous and Palaeogene times as suggested by many researchers.

Given that one or some combination of these tectonic scenarios may have controlled the onset and evolution of the main tectonic boundaries and setting of the mega-splay fault in the forearc. Present mega-splay fault in the Nankai Trough may be related to the onset of new tectonic framework at ~2Ma and present inner wedge appears to have related to the onset of new subduction in the Nankai Trough at ~6Ma. Thus, out-of-sequence thrust interpretation for the origin of the megasplay fault should be avoided.