Coseismic fluid reduction in seismogenic out-of-sequence thrust in ancient subduction complex

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The Nobeoka thrust in the Shimanto accretionary complex, Kyushu, Japan is a large ancient fossilized out-of-sequence thrust (OOST) exhumed from seismogenic depth of accretionary prism and thought to be an on-land analogue of mega-splay fault seen in many subduction zones. Recent studies have been revealed general features of the thrust: 1) Widely-distributed shear zone was formed due to repeated shear and extensional cracking, 2) Large amount of syn-deformational fluid influx was suggested by numerous mineral veins along the thrust (Kondo et al., 2005), 3) Existence of pseudotachylyte-bearing subsidiary faults in hanging wall damage zone shows that the Nobeoka thrust system had been act as a seismic fault (Okamoto et al., 2006).

In this study, I have investigated microchemical analyses of syn-tectonic veins (Fault vein and Extension vein) along the Nobeoka thrust. Fault vein fills shear fractures, while Extension vein occurs in tensile fractures. They are mutually crosscutting. EPMA and LA-ICP-MS analyses revealed that Fault vein is composed of ankerite (Ca(Fe,Mg)(CO3)2) with positive Europium anomaly, on the other hand Extension vein is composed of quartz and calcite with no Europium anomaly. Positive Europium anomaly and compositional zoning of Fe in vein ankerite strongly suggest that fault plane was temporary in reductive environment when Fault vein was precipitated and then gradually oxidized before precipitation of Extension vein. This reductive environment on the fault plane might be explained by coseismic mechanochemical reactions like H2 generation (Kita et al., 1982; Kameda et al., 2003) during comminution, or postseismic fluid discharge from wedge mantle. Ankerite precipitation on the fault plane would enhance sealing, fluid pressure rise just below the existent fault plane, and might cause downward propagation of shear zone.