The origin of syntectonic veins in accretionary complex and its implication for fluid behavior of seismogenic zone

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The ancient underplating-related fault is well developed in the Mugi Melange, Shimanto accretionary complex, southwest Japan. To better understand how fluid affects the faulting near the up-dip limit of the seismogenic zone (i.e. 5-7 km depth, 130-200 degrees C) in the subduction zone, we examined four occurrences of veins developed in the melange: intra-basalt, boudin-neck, network, and fault-fill veins. Intra-basalt veins are developed broadly in the basaltic rocks. Boudin-neck veins are observed in the pinched part of sandstone blocks in the melange. Network veins are developed in the fault damage zones. Fault-fill veins are marked by implosion breccia, which occur along the dilational jogs. The characteristics of faulting-related fluid flow reconstructed by lines of structural and isotopic evidence are as follows: (1) Crack opening and fluid flow repeatedly occurred because the fault-fill and network veins crosscut to each other; (2) The faulting was progressed under low shear stress probably associated with high fluid pressure because orientations of network veins are sub-perpendicular to the fault plane; (3) Intra-basalt veins were derived from geothermal system at spreading ridge because of delta-13C values of 0 permil; (4) Other veins represent dehydration of hydrous mineral (e.g. clay minerals) due to metamorphic and/or diagenetic reaction in subduction zone because the calculated oxygen isotopic composition of vein-forming fluid is +5 to +10 permil (SMOW); (5) Fluid composition might have been temporarily changed because carbon and oxygen isotopic values of vein calcite are obviously different between fault-fill and network veins. These features suggest large variation in fluid pressure and fluid source during the faulting near the updip limit of the seismogenic zone, and possibly represent the earthquake cycle in subduction plate boundary.