Reinterpretation for melange as an ancient seismogenic zone; an example for the Mugi Melange, the Shimanto Belt

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An accretionary prism has been a focus of study to understand the subduction process for a long time. The interest of the accretionary prism has been revived from the viewpoint of seismogenic zone in recent years. A recent hypothesis suggests that thermal condition of subduction zone strongly controls the up-dip and down-dip limits of the seismogenic zone (Hyndman and Wang, 1993). Geophysical observation indicates that the depth range of the seismogenic zone is from about several to about 40 km (Savage, 1993). Such pressure-temperature condition ranges within the metamorphism from zeolite to greenschist facies through prehnite-pummpelyite facies (Ernst, 1970). Many ancient accretionary prisms exposed on land suffered from the metamorphism of this range. Therefore, seismicity-related phenomena should be recorded within the complexes although a little investigation has been conducted on such phenomena.

The Mugi Assemblages of the Shimanto Belt in SW Japan, is one of on-land accretionary prisms that were located under the thermal condition of the seismogenic zone in the past. The Mugi Assemblage consists mainly of melange of black shale matrix enclosing blocks of sandstones, siliceous mudstones, tuffs, basalts, and small amount of cherts. The Mugi Assemblage is divided into five thrust sheets (from unit 1 to unit 5) bounded by thrusts. In each sheet, basalt is situated in the lowest portion of the thrust sheet. Red shales cover the basalt, and melange, which is defined, to be composed only of sandstone blocks surrounded by scaly shale matrix (Cowan, 1985), overlays the basalt and red shales. This kind of sequence is called a ghost ocean floor stratigraphy (Byrne and Fisher, 1990). The result suggests that the Mugi Melange can be classified into upper (unit 4 and 5; 210C to 265C) and lower part (unit 1 to 3; 150C to 190C).