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Deformation processes at the down-dip limit of the seismogenic zone: the example of Shimanto belt

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The metamorphic terranes of Shimanto belt (southwestern Japan) have been recognized as a fossil accretionary prism and offer a good opportunity to study the deep part of the seismogenic zone in subduction contexts. The Hyuga and Makimine units have been strongly deformed for temperature conditions of ∼250-280 and 300°C (Mukoyoshi et al., Island Arc 2009), respectively, providing a lower limit in temperature to the seismogenic portion of the plate interface. In both units, the ductile fabrics consist principally in the formation of a phyllosilicate-rich foliation and the deformation of pre-existing quartz veins. The deformation mechanisms in the quartz from the two units are nevertheless very contrasted: in the lower temperature Hyuga unit, quartz deformation results principally from micro-fracturing and dissolution precipitation, with very limited plastic deformation and dynamic recrystallization. In the higher temperature Makimine unit, most of the quartz domains are dynamically recrystallized. Both deformation processes are associated with a strong crystallographic preferred orientation: the lower-temperature processes result in c-axes being parallel to the elongation direction, while the higher-temperature processes result in c-axes being perpendicular to foliation plane. Dissolution-precipitation of quartz constitutes therefore a transitional process, for a temperature between 250 and 300°C, between the low-temperature, brittle portion and the high-temperature, plastic portion of the plate interface. We finally derive estimates of the shear stresses associated with this transitional domain of the plate interface.