三波川帯の低変成度領域における温度構造と変形構造，およびテクトニックな意義

Thermal structure and deformation history of the low-grade Sanbagawa belt in the central of Kii Peninsula and tectonic implications

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The Sanbagawa belt in SW Japan is one of the best-documented regions of relatively warm subduction-type metamorphism and information from such regions are important to clarify our understanding of convergent plate margins. Much of the present knowledge is based on petrological studies in the higher grade parts of this belt. However, most of the Sanbagawa belt belongs to the lowest grade domain, the chlorite zone. The lack of reliable methods to determine the thermal structure in this low-grade zone has meant that information from the majority of the belt has been underrepresented. Development of the Raman carbonaceous material thermometer (RCMT) has opened up possibilities of determining the temperature structure of low-grade metamorphic domains such as the chlorite zone of the Sanbagawa metamorphism. Application of RCMT to pelitic rocks of the central Kii peninsula shows a progressive decrease in T from ~390 °C close to the northern boundary marked by the Median Tectonic Line (MTL) to ~270 °C ~7 km to the south and roughly constant thereafter. The thermal structure is not significantly affected by fault boundaries between different geological units. Meso and microstructural observations combined with strain analysis based on deformed shapes of detrital grains in metamudstone indicate a similar deformation history throughout the area and no correlation between strain and temperature gradients. These features can be used to asses possible models for the observed temperature rise. On this basis, we suggest the rise in T was not due to return flow of high T material in a subduction channel. We also conclude that the rise in T takes place over too narrow a distance to be explained as part of the expected thermal warping in a warm subduction zone. We find no evidence for heating related to the rise of magma or hot fluids. Shear heating along the MTL does provide a plausible explanation for the observed thermal structure compatible with all observations. One-dimensional thermal modeling shows that to account for the observed thermal structure requires slip rates of several mm/yr and relatively high coefficients of friction (μ=??). A similar result was reported from an area to the east but with a much more limited domain of elevated temperatures, probably due to late-stage thinning related to normal faulting. Our results imply that long-lived major crustal faults such as the MTL are at least locally associated with high stresses and are relatively strong. Evidence for the faults being weak at shallow depth implies there is a rapid decrease in strength over the upper few km of the MTL fault zone.

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