A new discovery on spatial variation in metamorphic conditions of metasediments across the Yuli belt, eastern Taiwan: RSCM constraints and tectonic implications

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The Yuli belt is considered a high-pressure (HP) metamorphic belt because glaucophane and omphacite have been discovered in some unusual rocks associated with metabasite-serpentinite-dominated tectonic blocks embedded in metasediments. Peak pressure-temperature (P-T) conditions of the HP rocks imply a type of subduction metamorphism. However, P-T conditions of the host metasediments are still unclear owing to lack of HP minerals or assemblages. We applied Raman spectrum of carbonaceous material (RSCM) geothermometer to estimate peak metamorphic temperatures of samples from three of the four metasedimentary units in the Juisui area. On the regional geologic map, the units are elongated in a generally NE-SW trending and dipping NW. The analyzed samples are metasediments, which mainly consist of phengitic mica, quartz, chlorite, and albite, with accessory carbonaceous material (CM) and tourmaline. In meta-pelitic samples from the core unit (Juisui Schist), garnet, ilmenite, and paragonite may occur and albite tends to be porphyroblastic. Serpentinite and metabasite pods or blocks occur in this core unit, whereas the margin units lack such mafic-ultramafic blocks and porphyroblastic phases. Calculated temperature data in each sample surprisingly show a wide variation, implying some inherited peak temperatures from detrital CM grains. Moreover, temperatures constrained by RSCM also reveal a systematic variation in the spatial distribution across the three units. From west (structurally upper) to east (lower), temperature data of the three units are in the range of 360-410 ˚C, 480-530 ˚C and 370-420 ˚C, respectively. Apparently, estimated peak temperatures of the core unit are higher than those of the margin ones, although boundaries among the units are not exposed or poorly mapped. Such a variation in metamorphic grade is also consistent with petrographic features, such as grain size and mineral assemblage. We consider two possible explanations for the discontinuity in peak temperature distribution among the three metasedimentary units. One is that rocks in the core and margin units were subjected to different extent of retrogression. Thus the core unit still preserves higher grade assemblages whereas the margin units are strongly overprinted by lower-grade modification. The other possibility is that the core might have been exhumed faster than the margin, probably caused by extensional tectonics in the Yuli belt.

Keywords: carbonaceous material, geothermometer, temperature distribution, subduction metamorphism, exhumation

