Geophysical Research Abstracts
Vol. 19, EGU2017-8042, 2017
EGU General Assembly 2017

Structural profile reconstructions and thermal metamorphic evolution in the slate belt of southern Hsuehshan Range in the active Taiwan mountain belt

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The fate of passive continental margin in collisional orogens is crucial in understanding tectonic evolution of mountain belts. The active arc-continent collision of Taiwan is considered as a model case in studying mountain building processes, and largely consists of deformed margin basement and cover series. Among the whole orogeny belt, the slate belt of the Hsuehshan Range (HR) is a prominent large-scale pop-up structural on the prowedge part of the orogen, and is composed of metamorphosed Eocene to Miocene sediments which experienced only the Neogene Taiwan orogeny after diagenesis in margin graben. Characterizing the metamorphic history of the HR is essential for reconstructing its geological evolution during the mountain building processes. However, previous studies were mostly focused on northern and central HR, structural investigation coupled with metamorphic documentation in the southern part of HR, which is the most active part of the orogeny belt, is therefore targeted in this work. Since carbonaceous material is common in pelitic protolith of HR slates, the Raman spectrum of carbonaceous material (RSCM) measuring the rock peak temperature is chosen for quantitative thermal metamorphic documentation.

In this study, we reconstruct a geological structural profile in western central Taiwan across the prowedge part of the mountain belt containing the southern HR by combining the surface geological data, well log records and published seismic reflection profiles. Although most of the existing data are concentrated in the fold-and-thrust belt, they are now reinforced by new field structural measurements and RSCM samples in the southern HR. In total 27 RSCM samples were collected along 2 transects perpendicular to the average strike with a dense interval about 2 km. The results allow us to map peak temperature distribution across southern HR, and provide new constraints for structural profile reconstruction and reappraisal of the structural evolution of the HR and neighboring fold-and-thrust belt. As shown in the previous thermal metamorphic investigation, we expected that southern HR strata acquired highest temperature during its burial stage than the orogenic stage like their central HR counterparts, thus experiencing mostly retrograde metamorphism in the entire mountain building processes.