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Mountain buiding in Taiwan : new constraints on the thermal structure and exhumation processes

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Taiwan has played a key role in the development and/or testing of some of the most popular models of mountain building, in particular for the critical wedge model. The central range (CR) of Taiwan is composed of a Cenozoic slate belt and the pre-Tertiary Tananao complex (TC). Ongoing crustal shortening has resulted from the collision between the Chinese continental margin and the Luzon volcanic arc, which started $\sim$6.5 Ma ago. Due to the obliquity of the Luzon arc relatively to the continental margin, the collision initiated in the north and propagated southward. Key to understand mountain building processes is the knowledge of metamorphism, in terms of intensity and chronology. Because the CR is mostly composed of accreted sediments lacking metamorphic index and datable minerals, quantitative constraints on metamorphism are sparse. By contrast, these rocks are rich in carbonaceous material (CM) and therefore particularly appropriate for RSCM thermometry (Raman Spectroscopy of CM). We have therefore applied this technique in addition to (U-Th)/He thermochronology on detrital zircons to investigate the peak metamorphic temperature (T) and the low-T cooling history along different transects in southern and central Taiwan.

We found evidence for surprisingly high metamorphic T in the frontal Hsuehshan Range (HR) (western slate belt) where T reached at least 340-350 $^{\circ}$C and locally as much as 475 $^{\circ}$C. Thermochonologic data also indicate relative rapid exhumation with (U-Th)/He ages on zircons in the range of 1.5 to 2 Ma. Farther east, the slates of the Backbone Range (BR) were only slightly metamorphosed (T$<$250 $^{\circ}$C) and zircons were not reset for (U-Th)/He. From easternmost BR to the inner TC, T gradually in-

creases from ∼350 ˚C up to ∼500 ˚C following an inverted metamorphic gradient. Zircons yielded (U-Th)/He ages of about 0.5-1.2 Ma in both the TC and the eastern slate belt. This indicates that the HR experienced greater tectonic uplift than the BR. These data show significant departures from the predictions of the critical wedge model and appeal for a reappraisal of mountain building processes in Taiwan (see Simoes et al., session TS7.1, this meeting).