

(U-Th)/He thermochronologic analysis of the Median Tectonic Line and associated pseudotachylyte.

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Fault-generated pseudotachylytes (PST) were firstly reported along the Median Tectonic Line, Mie Pref., Japan (Shimada et al., 2001). The PST was formed after mylonitization of the Hatai Tonalite under amphibolite to greenschist facies conditions, and had been post-dated by cataclasis. We succeeded to date zircons separated from one of the PST and the mylonited Hatai Tonalite ~10 cm distant from this PST using the (U-Th)/He method. The measured ages, 60 ± 3 (1 sigma standard error) and 54 ± 2 Ma (1SE), respectively, are approximately concordant with the previously-reported zircon fission-track (ZFT) age of this PST, 60.0 ± 3.5 Ma (1SE; Takagi et al. in submission). On the other hand, the ZFT age of the same tonalite as for our (U-Th)/He dating is 70.2 ± 2.7 Ma (1SE; Takagi et al. in submission). This age is older than both of our zircon (U-Th)/He (ZHe) ages and the ZFT age of the PST.

The geological implication deduced from these thermochronologic constraints is that the ambient temperature for generating the PST, at least 10 cm scale, was higher than the closure temperature of ZHe ($\sim 180^\circ\text{C}$; Reiners and Farley, 2002; Reiners et al. 2004) and lower than the higher temperature limit of the ZFT partial annealing zone ($\sim 330^\circ\text{C}$ for 10 m.y. heating; Yamada et al., 2007). Shimada et al. (2001) estimated the ambient temperature for generating the PST as $200\text{-}300^\circ\text{C}$ from the existence of the Type-III deformation twin of calcite and the cataclastic-plastic transition of quartz. Our new age constraints are consistent with their estimate.

References

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