Initiation time of the Yanagase fault, central Japan, as constrained by apatite fission-track dating on porphyry dyke

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Although Quaternary activity of major active faults has been intensively studied in Japan, few have been reported on their initiation time based on radiometric dating. Clarifying initiation time of the Yanagase fault, one of major active faults in Japan, which trends ~30 km NNW and occupies a large segment of a fault system extending from the Japan Sea (back-arc side) to the Pacific Ocean (fore-arc side), is especially important because it has been correlated with the opening episode of the Japan Sea at ~15 Ma [1]. Fission-track dating using apatite and zircon on various rocks (granite, sandstone, green rock, porphyry dyke) around Yanagase fault were performed to better understand its entire tectonic history. Of particular note is that an apatite fission-track age of 21.4±3.2 Ma was obtained from porphyry dyke that intruded into the Yanagase fault. The porphyry dyke experienced only minor brittle deformation whereas the fault itself has much severely deformed fracture zone. This clearly demonstrates that the Yanagase fault initiated long before the opening of the Japan Sea. Moreover, a zircon fission-track age of ~20 Ma together with previously reported K-Ar ages of small granitic bodies near the fault indicate that granitic magma activity occurred at ~20 Ma. Therefore the porphyry dyke should have intruded along the Yanagase fault in relation with this granitic activity. No thermal overprinting on apatite fission-track system in the dated dyke indicates that only minor thermal disturbance occurred along the fault since ~20 Ma. These lines of evidence suggests that the opening of the Japan Sea episode had little thermal and tectonic effects on the Yanagase fault and after a long period of quiescence since ~20 Ma, the Quaternary fault activity should have occurred along the pre-existing Yanagase fault.

References

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