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Unravelling metamorphic-fluid events in Gondwana collision: U-Pb-REE constraints from Sor Rondane Mountains, Antarctica

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Assembly of Gondwana supercontinent has been argued in numerous studies. Generally the reported ages of Gondwana collision zones are in the range of 750-500 Ma, and two main age groups of 750-620 Ma and 570-530 Ma are estimated (e.g., Meert, 2003). The first episode (~620Ma) is mainly reported from eastern Africa to East Antarctica, and the second episode (~530Ma) is dominated in southern Africa through East Antarctica-Sri Lanka-southern India to eastern Australia. It is, however, not yet fully understood the superimposition of these two events in the crossing region.

Sor Rondane Mountains in East Antarctica is one such area where 640-630 Ma and 550-520 Ma metamorphic-fluid events are recorded (e.g., Shiraishi et al., 2008. Adachi, 2010). Greenschist-facies through amphibolite-facies to granulite-facies metamorphic rocks occupy the area, and the granulite-facies rocks are dominated in the northeastern-central part of the area (e.g., Shiraishi et al., 1992; Osanai et al., 1992). Multiple leucocratic veins and granitic intrusives are also developed. We present zircon and monazite U-Th-Pb and REE analyses by using ion microprobe and electron microprobe applying to garnet-biotite-sillimanite gneiss and associated leucoveins in the central part of Sor Rondane Mountains. Zircon in garnet-sillimanite-biotite gneiss yields c.640-630 Ma with minor >700 Ma and 550-520 Ma ages, and gives clear age-chemistry relation that HREE/MREE ratios drop in c.640-630 Ma zircon crystals compared with older and younger grains that are presumably controlled by REE partitioning with the coexisting garnet. Zircon and monazite in multiple generations of leucoveins also yield >700 Ma, 640-630 Ma and 550-520 Ma ages. Combined rare earth elements (REE) chemistry with the U-Th-Pb age domains in syn- and post-metamorphic leucoveins suggests contrasting isotopic and chemical signatures, and could provide constraints for decoding Neoproterozoic-Cambrian metamorphic-fluid regimes in the Gondwana collision zone.

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