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Zircon LA-ICP-MS U-Pb dating of metamorphic rocks from Sor Rondane Mountains, East Antarctica.

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Sor Rondane Mountains, East Antarctica, has been considered to locate inside of the collision zone between West Gondwana and East Gondwana (e.g., Meert, 2003; Jacobs and Thomas, 2004). This area is composed by greenschist- to granulite-facies metamorphic rocks and various plutonic rocks that intrude to metamorphic rocks (Osanai et al., 1992). The Sor Rondane Mountains has been divided into Northeastern (NE) terrane and Southwestern (SW) terrane, based on variety of the constituent rocks and metamorphic process (Osanai et al., in press). The NE terrane consists of unit A and unit B. Metamorphic rocks from the unit A are amphibolite-facies, and from the unit B are granulite-facies (unit B). Metamorphic rocks from unit B show the ages of magmatism at 1130-890 Ma and 800-790 Ma (partial melting), granulite-facies metamorphism at 750-700 Ma and 640-600 Ma, and amphibolite-facies metamorphism (retrograde) at 580-520 Ma (Osanai et al., in press). By contrast, the SW terrane has granulite-facies metamorphic rocks in unit C, greenschist- to amphibolite-facies metamorphic rocks in unit D, and metatonalite (unit D'). Metamorphic rocks of the unit C, D and D' show the ages of syn-magmatism and magmatism at 1190-950 Ma, magmatism at 770-750 Ma (e.g., Nakano et al., 2012), metamorphism at 700 Ma (Hokada et al, 2013), granulite-facies metamorphism at 640-600 Ma, amphibolite-facies metamorphism (retrograde) at 580-520 Ma (Osanai et al., in press). Amount of geochronological data has been reported from the Sor Rondane Mountains. However, their collected areas were limited mainly in central part and eastern part. In this study, we analyzed 25 samples (2 samples from unit A, 12 samples from unit B, 5 samples from unit C and 6 samples from unit D) mainly from the unknown areas to reveal more detailed tectonic evolution of the Sor Rondane Mountains.

In the unit A, zircon ages in metapelites (Grt-Bt gneiss) yield 1070-780 Ma from detrital zircon and 640-630 Ma from metamorphic rim. Those in metamorphosed felsic or intermediate rocks (Hbl-Bt gneiss) yield 1180-1030 Ma, which is interpreted as the ages of magmatism. In the unit B, range of zircon ages in metapelites (mainly Grt-Bt gneiss and Opx-Bt gneiss) is 610?2900 Ma. Especially, the age cluster of 660?610 Ma are interrupted as metamorphic age, and other age groups were analyzed from detrital zircon. Metamorphosed felsic or intermediate rocks (Bt gneiss) consists 1050-840 Ma igneous zircon age and 670-570 Ma metamorphic zircon age. In the unit C, zircon ages in metamorphosed felsic or intermediate rocks (Hbl-Bt gneiss and Bt gneiss) yield 1000-920 and 870-730 Ma with minor 730-710, 570 Ma. Zircon ages at 1000-920 and 870-730 Ma are interpreted as magmatic age, on the other hand, ages of minor 730-710, 570 Ma may be interpreted as metamorphic age. Zircon ages of metamorphosed mafic rocks (Grt-bg. Bt amphibolite) yield 810-760 Ma as magmatism age, and 640 and 610-570 Ma as metamorphic age. Those in calcsilicate metamorphic rock (Hbl-Cpx rock) yield ca. 760 Ma. In the unit D, detrital zircon ages in metapelites (Grt-Bt gneiss and Ep-Chl-Ms schist) are dated at 1120-930 Ma. The variety of zircon age clusters in metamorphosed felsic or intermediate rocks (St-bg. Grt-Bt gneiss and Bt-Hbl gneiss) is 1150, 1050-1010, 950-800 Ma and 720 Ma. Zircon ages, ranging 1150?800 Ma, are interpreted as magmatism age, in contrast, zircon age of 720 Ma may be interpreted as metamorphism. Range of detrital zircon ages in calcsilicate metamorphic rock (Bt-Ep-Hbl rock) is 980-780 Ma.

In comparison with geochronological data of the NE terrane and the SW terrane, the detrital age cluster of >1800 Ma is recognized in unit B, characteristically. Difference in detrital zircon ages suggests that these two terranes would be derived from different hinterlands. We also could recognize that both terranes have similar igneous ages from felsic, intermediate and mafic metamorphic rocks.