Syn-metamorphic magmatic and fluid events at Austkampane, Sør Rondane Mountains, Antarctica

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South Rondane Mountains is located within Dronning Maud Land where Neoproterozoic to Cambrian age magmatic and high-temperature metamorphic terranes comprise the area more than 1000 km along the coast or the inland of Antarctica. Among those, the Sør Rondane Mountains consists of greenschist-facies through amphibolite-facies to granulite-facies metamorphic rocks with multiple leucocratic or granitic intrusions. The Mountains can be subdivided into at least two areas - the NE and the SW Terranes based on the lithological and metamorphic signatures (e.g., Asami et al., 1992; Osanai et al., 1992). The NE Terrane is characterized by the granulite-facies peak metamorphism followed by the extensive hydration at amphibolite-facies or lower grade conditions. Shiraishi et al. (2008) and Adachi et al. (2010) suggested the peak granulite-facies metamorphism at c.650-600 Ma and the subsequent thermal events at ~560-515 Ma based mainly on the SHRIMP zircon U-Pb ages.

In this study, we report the mode of occurrence of the sequences of magmatic/fluid intrusions especially focusing on the syn-metamorphic intrusions in Austkampane area, where is located within the NE Terrane and preserves the evidences of multiple magmatic and fluid events including syn-metamorphic and post-metamorphic as follows:

1) Garnet-sillimanite gneiss is cut by three sets of leucocratic veins. The earliest vein, constituted mainly of Qtz+Pl+Kfs+Sil, apparently cross cut but is partly intermingled with the host garnet-sillimanite gneiss. The second leucovene, consists of Qtz+Pl+Kfs+Ms, is layer parallel or slightly oblique to the host gneiss. The third vein, pegmatitic composed mainly of quartz and feldspars, discordantly cross cut the host gneiss and the former two veins. The first and the second veins along with the host garnet-sillimanite gneiss yielded c.650~600 Ma EMP monazite U-Th-Pb ages accompanied locally with >700 Ma and <560 Ma monazite grains, whereas the final discordant vein gave c.550~500 Ma monazite ages.

2) Garnet-biotite gneiss in the nearby locality is cut its foliation by garnet-bearing quartzo-feldspathic biotite gneiss which includes some magmatic textures such as non-deformed or slightly-deformed magmatic mafic enclaves (MME) and K-feldspar phenocrysts along with poikiloblastic garnet and biotite interpreted as metamorphic recrystallized grains. This garnet-bearing quartzo-feldspathic biotite gneiss is, therefore, assumed to be syn-metamorphic magmatic intrusion that was metamorphosed under with the host garnet-biotite gneiss. Magmatic zoned zircons in this garnet-bearing quartzo-feldspathic biotite gneiss gave 637+/−5 Ma U-Pb ages by SHRIMP interpreted as magmatic intrusion age (Adachi et al., 2010).

Base on these lines of evidences, we will discuss the signatures of magmatic and fluid events with their temporal relations with the peak granulite-facies and the later relatively lower-grade hydration/retrograde events in the area. The data presented in this study could be keys to understand the thermal history of the Sør Rondane Mountains, and further on to the deep crustal magmatic and fluid processes.

References