Dissolution-reprecipitation of zircon in metacarbonate rocks in response to fluid infiltration

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Zircons in metasedimentary rocks are extensively studied to understand the provenance and tectonic evolution of orogenic belts, since it is believed that zircon can preserve isotopic composition of different stages of orogenesis. In this study we report SHRIMP ages and geochemical characteristics of zircons in impure metacarbonate rocks from the Sør Rondane Mountians (SRMs), East Antarctica. The SRMs, located in the Neoproterozoic to Early Cambrian East African-Antarctic collisional orogen, is composed of medium- to high-grade metasedimentary, metaigneous and intrusive rocks of diverse composition. Multidisciplinary geological studies have revealed that this region can be separated into two distinct terranes, a metasedimentary and metaigneous dominated Northeastern (NE) and a meta-tonalitic and meta-sedimentary dominated Southwestern terrane (SW), that collided at around 650-660 Ma along the Main Tectonic Boundary [1] [2]. Strontium isotope chemostratigraphy of pure metacarbonate rocks suggested late-Tonian (880-850 Ma) apparent depositional ages in the SW terrane, whereas those in the NE terrane recorded early Cryogenian ages (820-790 Ma) [3].

In contrast to the typical sedimentary O and C isotopic composition, low concentrations for mobile trace elements and flat REE patterns for pure metacarbonates, the impure metacarbonates have lower O and C isotopic composition, high concentrations of mobile elements and LREE enriched patterns. These together with the presence of hydrous minerals in impure metacarbonates suggest that they have been affected extensively by fluid infiltration events. Petrographic observations revealed that zircon is abundant and textural features resemble those of detrital origin. However, SHRIMP ages of zircons in three impure metacarbonate rocks gave well-defined tight concordia U-Pb zircon ages of 545 +/- 1 Ma (n=55), 546+/- 2 Ma (n=33) and 549 +/- 2 Ma (n=58). These ages are neither detrital, nor they represent peak metamorphism of the SRMs. We present evidence from textural and geochemical data that the ages recorded in the zircons are related to the latest phase of fluid infiltration coeval to the granitic activity. We also discuss the possible role of alkaline Ca-bearing fluids might have been instrumental recrystallization processes.

[1] Osanai et al. (2013) *Precambrian Research*, **234** 8-29. [2] Hokada et al. (2013) *Precambrian Research* **234**, 183-209. [3] Otsuji et al. (2013) *Precambrian Research* **234**, 257-278.