Paleocontinent-oceanic interaction from Sr and Nd isotope systematics in the Sør Rondane Mountains, East Antarctica

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The rocks that remain on the surface of the earth, whether they are igneous, sedimentary and metamorphic, are certain to provide some geochemical information on the past geological events. For example, igneous rocks are key in understanding the tectonic scenario in which the magma has formed and so on, whereas sedimentary rocks gave us information of both continent and oceanic depositional environment. Additionally, in an extreme case, geochemistry of chemically deposited sedimentary rocks, like pure carbonate rocks, is often used as an indicator to understand paleo-oceans. Especially, the neodymium isotopic ratio is one of the important tools for recognizing the relationship between continents and seawater. Because of the infinitely low concentration of neodymium in sea water than that of continental material and a very short residence time in the seawater, the Nd budget of the ocean is dominated by continental source and sedimentary rocks record its local differences. In particular carbonate rocks are good indicator for understanding the relationship between continents and surrounding oceans, because it is commonly deposited in a platform environment surrounding a continent

The Sør Rondane Mountains, located in the Neoproterozoic to Early Cambrian East African-Antarctic collisional orogen, is a good test ground for understanding the Gondwana amalgamation. Recently lots of new information on these mountains have been generated in terms of its geology, lithological variations, tectonic evolution, geophysics and so on. These mountains are composed of medium- to high-grade metasedimentary, metaigneous and intrusive rocks of diverse composition (Osanai et al., 2013 and references therein).Within the metasedimentary rocks, the metacarbonate rocks are considered to have deposited chemically in the so-called the “Mozambique Ocean” that separated the continental blocks of East Antarctica and southern Africa during late Tonian to early Cryogenian that amalgamated to form Gondwana (Otsuji et al., 2013). We consider that the metacarbonate rocks record geochemical signatures of contemporaneous seawater. Metasedimentary rocks distribute in Northeastern area of the Sør Rondane Mountains, and the southwestern area is dominated by metaigneous rocks that were derived from the subduction of young hot oceanic crust. Recently, Kamei et al. (2013) and Owada et al. (2013) proposed the existence of two types of meta-igneous rocks in the southwestern terrane based on the Sr and Nd isotopic composition and some researchers (e.g. Nakano et al., 2013; Shiraishi et al., 2008 and reference therein) have reported the isotopic data from the metamorphic rocks except for pure carbonate rocks in other regions of the northeastern terrane. However, these data were only used for understanding the continental information such as igneous and metamorphic events in the Sør Rondane Mountains. By determining the Nd isotopic composition in pure and impure metacarbonate and basic rocks from the Balchen region, the Sør Rondane Mountains, East Antarctica, it is possible to discuss the relationship with continent and depositional basin of carbonate sediments.

The epsilon Nd vs. epsilon Sr diagram of carbonate and meta-basic rocks in the Sør Rondane Mountains shows varying relationships between continent and ocean depending on regions. In the Balchen area, the epsilon values of basic rocks vary widely, however, that of carbonate rocks is restricted to small area. Additionally, Nd model ages from pure carbonate rocks (T2DM) exhibit ages around 1.3 to 1.5 Ga, whereas the ages (TDM) from basic rocks show older ages of about 1.7 to 2.4 Ga. This may represent the existence of an older continent near the depositional site of the sedimentary rocks in the Balchen region, which is supported by the detrital zircon data (Osanai et al., 2013). In other regions, for example the Brattnipene region, pure carbonate, impure carbonate rocks and meta-igneous rocks show a linear mixing trend on the epsilon diagram and have similar model ages suggesting a seawater-continent interaction. Furthermore, this region shows some relation with tonalitic rocks from the southwestern area in the Sør Rondane Mountains. From these data, Sr and Nd isotopic composition may be a key for understanding the position of the continent during the deposition of carbonate rocks. In our presentation we attempt to discuss

the merits of using Sr and Nd isotopic composition of metacarbonate rocks that can potentially represent as oceanic composition, which can lead to reveal the processes during closure of oceans, before the continental collision.

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