

# Formation of Neoproterozoic juvenile crust in Eastern Dronning Maud Land, East Antarctica

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The Sor Rondane Mountains (SRM), eastern Dronning Maud Land, East Antarctica, are situated within the Pan-African suture zone (PASZ), between West and East Gondwana, and the timing of collision event is regarded as geological time scale from the late Neoproterozoic to early Cambrian. The reduction to pole magnetic anomalies image around SRM suggests that major tectonic boundary represents a lineation between PASZ and the Rayner belt in Indo-Antarctica craton. SRM is composed of northeast terrane (NE terrane) and southwest terrane (SW terrane) separated by Main tectonic boundary (MTB). MTB is cut by the lineation between PASZ and Indo-Antarctica craton, indicating the formation of MTB should be prior to amalgamation event of PASZ and Indo-Antarctica craton.

Lithology of SW terrane consists of Layered gneiss complex and Tonalite complex bounded by Main shear zone (MSZ). Kamei et al. (2013) reported that Tonalite complex was Neoproterozoic oceanic arc in terms of geochemical study. In addition, Jacobs et al. (2015) obtained new geochronological date from the western part of SRM, and they proposed Tonian Oceanic Arc Super Terrane (TOAST). TOAST is covered by wide area in the southern part of PASZ. Considering the tectonic background of SRM, understanding geological evolution of the inside of PASZ is one of important subject for reconstruction of Gondwana supercontinent.

Igneous activity of SW terrane started at 1100 Ma and ceased at 700 Ma through the voluminous phase between 1000 Ma and 900 Ma. Tonalite complex locally intrudes Layered gneiss complex around MSZ. Layered gneiss complex consists mainly of tonalitic gneiss, amphibolite and pelitic gneiss with small amounts of calcsilicate gneiss, charnockite, metagabbro and metadolerite. Based on field occurrence, the tonalitic gneiss, amphibolite, charnockite, metagabbro and metadolerite would be of rocks derived from igneous origin. The zircon U-Pb dating of Layered gneiss complex traces back to 1100 Ma although the intrusive age of charnockite and gneissose tonalite shows 950 Ma and 920 Ma, respectively. The bulk rock analyses for amphibolite, metagabbro and metadolerite have geochemical signature similar to volcanic arc and/or back arc basalts. The charnockite geochemically shows tholeiitic series with arc related signature whereas the tonalitic gneiss belongs to calc-alkaline series with adakitic character.

Tonalite complex consists mainly of tonalite associated with microgabbro occurring as magmatic enclaves (MME) and later dikes. The later dikes intrude the host tonalite and MME. The tonalite is geochemically subdivided into tholeiitic tonalite (TH tonalite) and calc-alkaline tonalite (CA tonalite) with adakitic features. The zircon U-Pb ages of TH tonalite are concentrated at 998 to 995 Ma whereas CA tonalite shows younger ages from 945 to 935 Ma. MME and microgabbro dike geochemically show arc tholeiite and back arc basin basalt, respectively. The zircon U-Pb ages show c. 990 Ma for MME and 950-930 Ma for the dikes. Finally, tonalite dikes intruded in Tonalite complex at 770 Ma. Petrological studies of Tonalite complex including the tonalite dike reveal that the most plausible tectonic setting is an oceanic arc.

Granitic rocks are generally produced by melting of the middle and lower crust, and hence serve as a

probe for the bulk of the continental crust. Therefore, Nd isotope data of granitic rocks give important information for evolution of continental crust. The tonalite, charnockite, tonalitic gneiss and tonalite dike have epsilon Nd values more than zero corrected with each intrusive age. Therefore, all granitic rocks in SW terrane were produced by partial melting of a juvenile continental crust. Taking geochemical investigation into account, SW terrane as a whole represents a juvenile arc crust in PASZ, and were built during Neoproterozoic time from 1100 Ma to 700 Ma.

Keywords: Sor Rondane Mountains, Juvenile crust, Neoproterozoic