P and S wave velocities of granulites from Napier Complex: Crustal structure and tectonics of Pan-African belt, East Antarctica

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Linking laboratory measurement of rock velocity with seismic velocity profile is a key to understand structure and evolution of continental crusts, but little study has been done for the Pan-African orogenic in the East Antarctica. Here we report P-wave (Vp) and S-wave velocities (Vs) of granulites from East Antarctica measured at high P-T. We combine the seismic data with geology and present a new crustal model for the East Antarctica.

We measured Vp and Vs in ultra-high temperature granulites (UHT) up to 1.0 GPa from 25C to 400C with a piston-cylinder-type high-pressure apparatus with 34 mm bore hole. Rocks measured are meta-igneous UHT rocks collected from Mount Riiser-Larsen, Amundsen Bay, Napier Complex. Core rock samples with 14mm in diameter and 12mm long were subjected to high-pressure measurements. The Vp values mobrained at 1.0 GPa and 400C are 7.17 km/s for the meta-pyroxenite, 6.93 km/s, 6.88 km/s for the mafic granulites and 6.17 km/s for the orthopyroxene felsic gneiss. The Vs values of the mafic granulite measured at the same condition are 3.81 km/s. The Vp value measured for the Napier mafic granulite are comparable to those of JARE 21 data.

Combining the present data with geological data reported from the Napier Complex and Lutzow-Holm Complex) in the East Antarctica, we proposed that the East Gondwanaland (Archean Napier Complex) lies under the Pan-African orogenic belt (550-530 Ma Lutzow-Holm Complex) in the East Antarctica. We further propose a new model for late Proterozoic to early Phanerozoic East Antarctica continent. It is inferred that the East Gondwanaland subducted westward and the West Gondwanaland descended eastward under the Pan-African belt. The coalescence of both East- and West Gondwanaland, the formation of Gondwana super-continent, is interpreted as a collision tectonics along with symmetrical subductions where late Proterozoic island arcs and ophiolites were put between East Gondwanaland and West Gondwanaland.