Neoarchean, Paleoproterozoic, and Neoproterozoic arc magmatisms in the Lützow-Holm Complex, East Antarctica: implications for multiple collisional events during Gondwana amalgamation

*Toshiaki Tsunogae[1], Kazuki Takahashi[2], Yusuke Takamura[2]

1. Univ. Tsukuba (LES), 2. Univ. Tsukuba (EES)

The Lützow–Holm Complex (LHC) of East Antarctica, which contains various amphibolite- to granulite-facies rocks with the latest Neoproterozoic peak metamorphic ages (600-550 Ma), forms a part of the crustal segment of the East African–Antarctic Orogen. Similar high-grade metamorphic rocks exposes in adjacent Gondwana fragments such as Sri Lanka, Southern India, and Madagascar. Here, we present new petrological, geochemical, and zircon U–Pb data for meta-igneous rocks from the LHC, as well as our published data, and evaluate the presence of several magmatic arcs that accreted and collided each other before the final collision and formation of Gondwana Supercontinent.
The oldest crustal fragment in the LHC occurs in the southwestern part of the complex such as ca. 2.5 Ga charnockite from Vesleknausen and Sudare-iwa (Tsunogae et al., 2014, 2016). Geochemical signatures of the rocks suggest the protoliths of the charnockite was formed through Neoarchean arc magmatism. Zircon Lu-Hf data of the Neoarchean charnockites indicate that the protolith magma was sourced from Paleo- to Neoarchean juvenile components mixed with reworked ancient crustal materials.
Neoproterozoic arc magmatic rocks derived from juvenile sources have been reported from several localities throughout the LHC such as Hutatu-iwa, Innhovde, Tama Point, Kasumi-iwa, and Langhovde (Tsunogae et al., 2015, 2016). Metagabbro from Akarui Point shows zircon U-Pb age of ca. 850 Ma with minor xenocrystic zircons of 1026-882 Ma (Kazami et al., 2016), suggest crustal reworking.
Paleoproterozoic magmatic ages of ca. 1.8 Ga have been reported from Austhovde, Telen, Skallevikshalsen, and Skallen, which corresponds to the highest-grade portion of the complex. Geochemical signatures of the ca. 1.8 Ga metaigneous rocks also suggest arc magmatism for the formation of the protolith. The ca. 1.8 Ga magmatic terrane occurs as a belt between the ca. 2.5 Ga microcontinent and ca. 1.0 Ga magmatic arc, suggesting that the LHC was formed by a series of arc-continent collisional during the latest Neoproterozoic.

References:

Kazami, S., Tsunogae, T., Santosh, M., Tsutsumi, Y., Takamura, Y., 2016. Petrology, geochemistry and zircon U-Pb geochronology of a layered igneous complex from Akarui Point in the Lützow-Holm Complex, East Antarctica: Implications for Antarctica-Sri Lanka correlation. Journal of Asian Earth Sciences, 130, 206-222.

Tsunogae, T., Dunkley, D.J., Horie, K., Endo, T., Miyamoto, T., Kato, M., 2014. Petrology and SHRIMP zircon geochronology of granulites from Vesleknausen, Lützow-Holm Complex, East Antarctica: Neoarchean magmatism and Neoproterozoic high-grade metamorphism. Geoscience Frontiers, 5(2), 167-182.

Tsunogae, T., Yang, Q.Y., Santosh, M., 2015. Early Neoproterozoic arc magmatism in the Lützow-Holm Complex, East Antarctica: Petrology, geochemistry, zircon U-Pb geochronology and Lu-Hf isotopes and tectonic implications. Precambrian Research 266, 467-489.

Tsunogae, T., Yang, Q.Y., Santosh, M., 2016. Neoarchean –Early Paleoproterozoic and Early Neoproterozoic arc magmatism in the Lützow-Holm Complex, East Antarctica: Insights from petrology, geochemistry, zircon U-Pb geochronology and Lu-Hf isotopes. Lithos 263, 239-256.

Keywords: arc magmatism, Gondwana, zircon geochronology

