Neoproterozoic arc magmatism and high-grade metamorphism of the basement rocks in southern Malawi

*Toshiaki Tsunogae[1], Sam Uthup[1], Mzee Wandembo Nyirongo[2], Md. Sazzadur Rahman[1], Yusuke Takamura[1], Kazuki Takahashi[1]

1. University of Tsukuba, 2. Malawi University of Science and Technology

The basement rocks in southern Malawi form part of the Mozambique Belt (or the southern Irumide Belt) that correspond a typical example of Neoproterozoic collisional orogens in southeastern Africa. The dominant lithologies in Lilongwe-Zomba-Blantyre area in southern Malawi are biotite gneiss (biotite + quartz + microcline + plagioclase), charnockite (orthopyroxene + K-feldspar + quartz + plagioclase + ilmenite + magnetite), and mafic granulite (plagioclase + clinopyroxene + garnet + calcic amphibole + quartz + orthopyroxene + ilmenite) which are intruded by syenite (K-feldspar + calcic amphibole + biotite + quartz + clinopyroxene) and granite (quartz + K-feldspar + plagioclase + biotite). Garnet in the mafic granulite is often mantled by plagioclase + orthopyroxene coronae, suggesting post-peak decompression. Phase equilibria modeling of the mafic granulite in the system NCKFMASHTO yielded the peak metamorphic condition of 800-920 °C and ~10 kbar with a clockwise *P-T* evolution. Major, minor, and REE geochemical data for selected felsic orthogneisses suggest arc-magmatic signatures of the rocks. The results of this study suggest that the orthogneisses in southern Malawi corresponds to a Neoproterozoic magmatic arc unit that was probably metamorphosed at high- to ultrahigh-temperature conditions during the latest Neoproterozoic East-African and Kuunga orogens.

Keywords: Mozambique Belt, Kuunga Orogen, East African Orogen, Granulite, Phase equilibria modeling

