Petrology of orthogneisses from the Mozambique Belt in southern Malawi: Preliminary report

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Detailed petrological and geochronological studies on Pan-African high-grade metamorphic rocks in East Antarctica, India, Sri Lanka, Madagascar, and East Africa for the last several years confirmed that the regions were formed by complex subduction and collisional processes related to the amalgamation of Gondwana Supercontinent during latest Neoproterozoic to Cambrian (e.g., Santosh et al., 2017; Kazami et al., 2016; Takamura et al., 2016, 2018; He et al., 2016; Takahashi et al., 2017. 2018; Tsunogae et al., 2015, 2016; Kuribara et al., 2018; Tang et al., 2018). The basement rocks in southern Malawi form part of the Mozambique Belt (or the southern Irumide Belt) which correspond a typical example of Neoproterozoic collisional orogens in southeastern Africa (e.g., Kröner et al., 2001). Southern Malawi is particularly important because the region corresponds to the junction between the East-African Orogen (ca. 600-550 Ma) and the Kuunga orogen (ca. 560-530 Ma), therefore complex magmatic/metamorphic episodes might have been recorded in high-grade metamorphic rocks exposed in this region. Below we summarize the results of our preliminary geological, petrological, and geochemical studies based on our fieldwork in southern Malawi in July 2018.

The dominant lithologies in Lilongwe-Zomba-Blantyre area in southern Malawi are biotite gneiss (biotite + quartz + microcline + plagioclase), charnockite (orthopyroxene + K-feldspar + quartz + plagioclase), mafic granulite (plagioclase + clinopyroxene + orthopyroxene + garnet + hornblende + quartz), and quartzite which are intruded by syenite (K-feldspar + biotite + calcic amphibole + quartz) and granite (quartz + K-feldspar + plagioclase + biotite). Major, minor, and REE geochemical data for selected felsic orthogneisses suggest arc-magmatic signatures of the rocks, whereas mafic orthogneisses shows both magmatic arc and non-arc signatures. Granulite-facies conditions of 750-810 °C were obtained based on conventional geothermometry of garnet-bearing mafic granulites. The results of this study suggest that the southern part of Malawi with dominant orthogneisses corresponds to a Neoproterozoic (1.0 Ga; Kröner et al., 2001) magmatic arc which was metamorphosed during the latest Neoproterozoic collision of the Kalahari and the Congo Cratons.

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