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U-Pb Geochronology and Hf-O-H_2O of zircons from the Manamedu Ophiolite Complex, Cauvery suture zone, southern India

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Ophiolites, the remnants of ancient oceanic lithosphere, have been widely investigated to reconstruct the history of development and closure of ocean basins in the geological past. The Manamedu Ophiolite Complex (MOC), the focus of the present study within the Palghat-Cauvery Suture Zone in southern India, is dominantly composed of mafic–ultramafic group of rocks; gabbroic suite; sheeted mafic dykes of amphibolite to meta-andesite categories and plagiogranite; a thin layer of ferruginous cherts. We present new apatite U–Pb data for the plagiogranite from this complex, which gives a weighted mean ^{207}Pb-corrected age of 489.1±6.0 Ma (MSWD = 1.4). LA-ICP-MS zircon U-Pb dating of the anorthosite revealed a well-defined discordia with upper and lower intercepts in the concordia at 2671± 47 Ma and 1170±140 Ma respectively, suggesting Neoarchean magmatic emplacement of the protolith and progressive Pb loss related to the late Mesoproterozoic thermal event. Zircons in the hornblendite from the Manamedu complex analyzed in this study yield well-defined clusters on the concordia and show a weighted mean ^{206}Pb/^{238}U ages of 799.3 ± 4.3 Ma, interpreted as the magmatic crystallization age of the hornblendite. U-Pb zircon dating of amphibolite reveals a protolith age of 771.9 ± 8.1 Ma and a metamorphic age of 505.4 ± 6.0 Ma, respectively. This study shows that the hornblendite in the Manamedu complex have mantle-like Hf–O isotopic compositions with slightly positive εHf(t) values from 0.0 to +2.9, and moderately δ^{18}O values (5.1–5.6‰). In addition, H_2O contents in mantle zircons within the hornblendite shows two main populations at 29-138 and 223-353 ppmw.