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Zircon geochronology of Mesoarchaean Ulamertoq ultramafic body in southwest Greenland

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The Akia terrane, part of the North Atlantic Craton in southwest Greenland, consists mainly of Meso- to Neoarchaean orthogneisses and is dominated by ca. 3000 Ma TTGs, with locally preserved ca. 3220 Ma dioritic bodies [1]. Recent studies have focused on ultramafic-mafic bodies (UMBs) in the terrane, debating their origins: mantle fragments vs. magmatic cumulates. Mafic cumulates such as norite associated with peridotite are critical for resolving this issue. Although the Maniitsoq Norite Belt records magmatism at ca. 3010–3000 Ma [2], the emplacement age of norites associated with peridotite has not been directly constrained. Here, we report the U–Pb age of zircon recovered from the Ulamertoq UMB.

Zircons were separated from norite and peridotite samples and analyzed by SHRIMP-IIe at the National Institute of Polar Research. Only two anhedral grains were recovered from the peridotite sample, and zircons from the norites show dark cores and bright mantles/rims in cathodoluminescence images. Norite zircons form two age clusters distinguished with Th/U ratios above and below 1. In sample 56415, Th/U >1 domains yield 3043 ± 7 Ma (n = 8) and Th/U <1 domains 3006 ± 3 Ma (n = 24). In sample 56421, Th/U >1 domains yield 3056 ± 3 Ma (n = 11) and Th/U <1 domains 3016 ± 5 Ma (n = 12). Peridotite zircons give a weighted mean age of 3007 ± 9 Ma (n = 4). The high-Th/U, older domains (3040–3050 Ma) likely record high-temperature crystallization and are interpreted as the emplacement age of the norite. The younger low-Th/U domains (3006–3016 Ma) overlap with the peridotite age and regional TTG magmatism, suggesting metasomatic modification by felsic melts. The metasomatism was most likely related to ca. 3000–3050 Ma TTG magmatism in the Akia terrane.

[1] Garde., Friend, Nutman & Marker (2000), *Bulletin of the Geological Society of Denmark*, 47, 1-27.

[2] Waterton, Hyde, Tusch,, Hollis, Kirkland, Kinney, Yakymchuk, Gardiner, Zakharov, Olierook, Lightfoot, & Szilas (2020), *Frontiers in Earth Science*, 8, 562062.