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In-situ strontium isotopes in Archean anorthosites: constraining early mantle evolution.

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Long-lived radiogenic isotope systems offer an invaluable record of early crust and mantle evolution, with the emergence of a depleted mantle signature correlating with the growth of continental crust [1]. Currently, the isotopic record of the early Earth overly relies on zircon, a robust mineral archive; however, many mantle-derived rocks, which are zircon-poor, are excluded in this approach. This study investigates the timing and rate of mantle depletion by determining the strontium isotope composition of plagioclase from Archean anorthosite complexes. These are mantle-derived cumulate rocks that comprise a minor but distinctive component of many Archean granite-greenstone terranes. The use of strontium isotopes in the Archean has historically been limited, due to higher susceptibility to disturbance of the Rb-Sr isotopic system in the commonly analysed terrestrial rock record. However, the use of in-situ analytical techniques such as LA-MC-ICPMS, combined with careful sample selection and screening, can significantly improve data quality. Here, we report in-situ plagioclase strontium isotope compositions from several Eoarchean to Paleoarchean anorthosite complexes, including highly unradiogenic $^{87}Sr/^{86}Sr$ from well-preserved igneous plagioclase ($An_{70\text{-}80}$) from 3730 Ma anorthosites [2] of the Yilgarn Craton, Western Australia. The implications for the composition and evolution of the early mantle are discussed.

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