

Zircon megacrysts in alkaline basalts record low- $\delta^{18}\text{O}$ domains in Zealandia's lithospheric mantle

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Megacrystic zircon from two alkaline basaltic fields in Zealandia have U-Pb ages of 12.1 - 19.8 Ma that precede eruption by up to 7 Ma, $\epsilon\text{Hf}(t)$ values of +3.3 to +10.4 that mostly overlap with metasomatized peridotitic mantle xenoliths, and $\delta^{18}\text{O}$ that ranges from low to mantle-like compositions (3.8-5.1‰). The zircons also have low Hf concentrations, no Eu anomalies, and elevated U/Yb compared to Nb/Yb. The chemical and isotopic properties are interpreted to represent crystallisation of zircon from low-degree melts derived from a combination of pre-existing subduction- and carbonatite-modified mantle metasomes and the depleted mantle lithosphere. The low and varied $\delta^{18}\text{O}$ shows no correlation with Hf isotopic composition or trace element parameters, and likely reflects ambient mantle conditions rather than a characteristic of any metasomatic flux. Since the Zealandia lithospheric mantle formed through accretion at an active margin, the low $\delta^{18}\text{O}$ mantle domains are likely remnants of high-temperature hydrothermal alteration associated with continent formation.