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Metasomatism vs Refertilisation: New Insights from Northern Victoria Land mantle xenoliths (Antarctica)

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The petrology of anhydrous (Greene Point, Handler Ridge) and amphibole-bearing (Harrow Peaks, Baker Rocks) xenolith populations from Cenozoic volcanics of Northern Victoria Land (NVL), Antarctica, provide new geochemical/geodynamic constraints on the nature and evolution of the NVL lithospheric mantle.
Based on mineral major and trace element modelling applied on the various xenolith suites, this mantle domain is supposed to represent a residuum after 10 to 20% of partial melting, with Handler Ridge showing the most fertile character. Moreover, melting models and isotopic results evidence the large geochemical contribution of melt infiltration acting in different times, from at least Jurassic to Cenozoic. The close correlation between Greene Point clinopyroxene trace element contents and those from phenocrysts of Ferrar tholeiites, allows to ascribe the first refertilisation event to the Jurassic Ferrar magmatism; this asthenospheric melt was also able to transfer a garnet signature to some NVL mantle segment. The rare presence of glassy patches and related secondary phases in Greene Point and Handler Ridge, as well as the amphibole presence in Harrow Peaks and Baker Rocks xenoliths prove that alkaline metasomatism, probably related to the West Antarctic Rift System opening, heterogeneously affected the NVL lithospheric domain.
At a fixed P of 15 Kbar, T and fO_2 were calculated; data reveal that the presence of amphibole (always < 3% modal content) does not influence the ambient redox conditions (comparable in amphibole-bearing and anhydrous Greene Point peridotites [Δlog fO_2 (QFM) -0.7)] but the anhydrous suite presents systematic higher temperature (950-1050 °C) than those amphibole bearing (850 °C).