The role of water in Precambrian ultramafic magmatism: Insights from an in situ microbeam and nanobeam assessment of hydromagmatic amphibole

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New in situ trace and isotopic data of amphiboles from a range of Archaean and Proterozoic komatiites and ferropicrites provide insights into the controversial role of water in Precambrian magmatism. The results of this study (1) comprehensively document and integrate grain scale variations in abundance, texture, and trace element and isotopic composition of relict amphiboles from Archaean and Proterozoic komatiites and ferropicrites, and (2) characterise the source of volatiles that are implicated in Precambrian magmatism.

Amphibole-bearing samples were collected from ferropicrites of the Lower Proterozoic Pechenga Greenstone Belt (Russia) and the Archaean Abitibi Greenstone Belt (Canada), and amphibole-bearing komatiites from the Wiluna, Mount Keith and Mount Clifford domains of the Norseman-Wiluna Greenstone Belt (Australia).

Geochemical and textural data show that amphiboles in komatiites and ferropicrites are primary. Trace element and radiogenic isotopic dats on amphiboles rule out local or upper crustal assimilation as a source of the volatiles.

The range of in situ D values ($-70‰$ to $-170‰$) is consistent with the presence of magmatic water, which might be derived from the asthenospheric mantle (Deloule et al., 1991) or through interactions with metasomatised SCLM. In situ boron isotopic values (B up to $+4.5‰$) are surprisingly high, thus indicating the possible contamination of the source of volatiles in Precambrian komatiites and ferropicrites with a ^{11}B-enriched component.

Reference

Deloule, E., Albarède, F., Sheppard, S.M.F., 1991. *ESPL* **105**, 543–553.