Amphibole as a proxy for the volatile content of the Archean mantle

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The amount of volatiles (F, Cl and H_2O) dissolved in primary melts of Archean age and, in turn, the volatile content of the Archean mantle are still not fully understood. Such an uncertainity is related to the paucity of ancient volatile archives. Previous attempts to access the volatile content of the Archean mantle were based on fluid inclusions [1, 2]. Being capable to incorporate and fix significant amounts of volatiles, magmatic amphibole hosted in several Precambrian ultramafic complexes (Archean to Paleoproterozoic), may represent an alternative archive to infer the volatile contents of the Archean mantle. We selected amphiboles from ultramafic rocks in the Agnew-Wiluna (2.7 Ga), Abitibi (2.7 Ga) and Pechenga (1.98 Ga) greenstone belts. All amphibole were characterized for major and trace element composition by EMPA and LA-ICP-MS and for the volatile contents (H_2O, F, Cl) and their isotope signature (D/H and $\delta^{18}O$) by ion microprobe.

All anlysed amphiboles have textural and compositional features compatible with an igneous origin and the same geochemical affinity of the host rock. The H_2O contents are generally lower than 1.25 wt.% thus revealing a significant oxo component. F and Cl contents are variable and up to 6000 and 4400 ppm, respectively. The application of $^{amph/L}D$ has allowed us to calculate the volatile content of the equilibrium melt and, consequently, to model that of the parental liquid and the mantle source. Results will be discussed in terms of the current knowledge on the volatile content of the Archean mantle and in relation to values obtained from igneous amphiboles from Phanerozoic ultramafic rocks.

[1] Marks *et al.* (2014) *EPSL* **392**, 39-49. [2] Sobolev *et al.* (2016) *Nature* **531**, 628-632.