Light stable isotope (H-Li-O) investigation of hydrous minerals in the Gardiner Complex; insights into the roles of fractionation, outgassing and contamination

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The mantle forms a significant water reservoir that exchanges water with the surface. Water is mainly added through incomplete dehydration of subducting slabs. The equivocal presence of water in global magmatic systems facilitates outgassing but there is no consensus on whether these fluxes are balanced or how they have developed over time. Because of the isotopic difference between ocean and mantle water, long-term disequilibrium should be detectable in the hydrogen isotope composition of both reservoirs. Constraining the H isotopic composition of the mantle is challenging. Previous studies have often relied on melt or fluid inclusion data from early crystallizing olivine which is hampered by the diffusivity of H which can cause large fractionation in the magma plumbing system. Here, we focus on hydrous minerals from the 50Ma Gardiner alkaline complex in East Greenland in which hydrogen is structurally bound. Initial results show two distinct H isotope populations between amphibole- ($\delta D \approx -80‰$) and phlogopite-bearing ($\delta D \approx -60‰$) lithologies. The consistent values suggest that mineral-melt partitioning effects may be significant but that melt fractionation at crustal levels does not significantly alter H isotope compositions; hydrous minerals therefore have the potential to robustly record H isotope compositions of mantle-derived melts.