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Do mantle xenoliths preserve water signature from the lithospheric mantle and how? An experimental and numerical approach.

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Water presence as OH point defects in the main minerals (Opx, Cpx, Ol) of the upper mantle plays an important role in its fundamental properties (i.e. melting, plasticity, conductivity). It is widely assumed that the water signature recorded by mantle xenoliths is representative of mantle conditions, but this assumption remains a hypothesis and the question of how we can interpret the extensive OH data acquired worldwide on xenoliths is still unsolved.

The aim of this work is to evaluate the effect of the transport of mantle xenoliths in the concentration and distribution of water among the mineral phases of Opx and Cpx. This work will attempt to determine the diffusion mechanisms that control hydrogen exchange between the xenoliths and the host magma; looking at the role of bulk diffusion versus grain boundary diffusion through experiments and numerical modelling. Experimental measurements done on natural samples will be used to interpret original data from mantle xenoliths.

Here we present our first results from annealing experiments performed in peridotite xenoliths from a Cenozoic strombolian volcano from the south of the French Massif Central. We jointly present the results of a finite element modeling of hydrogen diffusion in coexisting Opx and Cpx considering different diffusion rates of hydrogen in the grain boundary.