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# Volcanic signatures of thermo-chemical plumes in the Earth's mantle predicted by fluid dynamic experiments

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The arrival of hot mantle plumes at the Earth's surface is responsible for intraplate volcanism. As shown in the recent seismic tomographic images, a variety of mantle plumes are observed such as classical head-tail plumes, patchy plumes, domes, bottom fat plumes, etc. Our fluid dynamic studies have demonstrated that such plumes diversity is expected if there is a chemically heterogeneous layer at the bottom of the Earth's mantle.
In this presentation, we shall focus on the mantle plumes signatures on the Earth's surface. Our laboratory experiments show that the spatial and temporal distribution of volcanic activity reflects the temperature, heat flux and compositional structure of the plume impact beneath the lithosphere, which in turn is controlled by the morphology and behavior of the thermochemical mantle plume at depth. All these characteristics can be quantitatively predicted as a function of the intensity of convection, the buoyancy ratio and the viscosity structure of the mantle.
We show that pulsations in the buoyancy and volcanic fluxes along Tristan and St Helena in the Atlantic, and Hawaii in the Pacific are typical features of thermochemical plume dynamics. Moreover, the interplay of compositional and thermal heterogeneities can create complex dynamics and recirculation within the plume conduit, which results in a "fat" plume conduit, as well as a complex distribution of molten material (depending on temperature and fertility of mantle material). The latter could explain the existence of two or three parallel volcanic chains along Hawaii, Samoa and Marquises hotspots.