Abstract Submitted
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Dynamics of a thermally-driven mantle plume with Stereo PIV and Thermochromic Liquid Crystals[1] WILLIAM NEWSOME, ALINE COTEL, University of Michigan, CAROLINA LITHGOW-BERTELLONI, University College London, STANLEY HART, JOHN WHITEHEAD, Woods Hole Oceanographic Institution — Although many have studied the chemistry and dynamics of mantle plumes, fundamental questions remain. These can be grouped into two general issues: a) Plume structure and dynamical interaction with the surrounding mantle, b) The degree of entrainment and mixing in mantle plumes of chemically distinct material from the deep mantle. Heat is used as the driving convective mechanism to form a single thermal plume. The experiments are conducted in a Plexiglas tank (inner dimensions of 26.5×26.5×26.5 cm). A small heater of 2.0 cm diameter and centered in the tank bottom is connected to programmable power supply. By varying voltage settings we can simulate varying heat fluxes in the deep mantle. Our experiments utilize Stereoscopic Particle Image Velocimetry (SPIV) and Thermochromic Liquid Crystals (TLC's) to reconstruct the 3D flow and temperature fields within the tank. Penetration height, plume head size, velocity and vorticity fields are determined using SPIV providing insight into the plume structure and the nature of the entrainment process.

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