

## Boundary element method applied to plume dynamics

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We apply the fast multipole formulation of the boundary element method (FMM-BEM) to the temporal evolution of a rising mantle plume interacting with a mid mantle density/viscosity discontinuity. Detailed monitoring of the possible evolutions in time how the plumes may have a steady, a pulsating or a stalled behaviour. We map out the density and viscosity conditions controlling the three patterns and show that realistic radial mantle Earth profiles allow them to happen. We evaluate therefore possible scenarios for the dynamical evolution of the lower mantle convection and propose which ones are compatible with the surface geological observation of island plumes.