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Laminar thermochemical plumes in viscous fluids ICHIRO KUMAGAI, Earthquake Research Institute, Univ. Tokyo, ANNE DAVAILLE, Institut de Physique du Globe de Paris, KEI KURITA, Earthquake Research Institute, Univ. Tokyo — Experimental studies on a laminar starting plume generated from a thermal boundary layer which is stratified in composition were carried out using simultaneous visualization of temperature and composition fields. The plume morphology and amount of dense material carried upwards depend on the initial buoyancy ratio B, the ratio of the stabilizing chemical buoyancy to the destabilizing thermal buoyancy. For small B, the destabilizing thermal density anomaly is sufficiently strong to counterbalance the stabilizing compositional density anomaly, and the whole thermal boundary layer becomes unstable, generating starting plume morphology close to the purely thermal case. For large B, the thermal density anomaly cannot counterbalance the compositional anomaly and convection develops above the compositional interface. For intermediate B, the interplay between the thermal and compositional effects generates complicated morphologies. As the thermo-chemical plume material rises, it cools down and looses its buoyancy. Therefore the compositionally denser blob rises only up to the level of neutral buoyancy, where it stops, then sink back down. The secondary thermally buoyant plumes are generated from the hot sinking blob and thin tendrils of the dense material are entrained by the convective motion.

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