The Bounce of SL-9 Impact Ejecta Plumes on Re-Entry

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We have generated synthetic light curves of the re-entry of SL-9 ejecta plumes into Jupiter's atmosphere and have modeled the periodic oscillation of the observed R plume light curves (P. D. Nicholson *et al.* 1995, *Geophys. Res. Lett.* **22**, 1613–1616) as a hydrodynamic bounce. Our model is separated into plume and atmospheric components. The plume portion of the model is a ballistic Monte Carlo calculation (Harrington and Deming, this meeting). In this paper we describe the atmospheric portion of the model. The infalling plume is divided over a spatial grid (in latitude/longitude). The plume is layered, and joined to a 1-D Lagrangian radiative-hydrodynamic model of the atmosphere, at each grid point. The radiative-hydrodynamic code solves the momentum, energy, and radiative transfer equations for both the infalling plume layers and the underlying atmosphere using an explicit finite difference scheme. It currently uses gray opacities for both the plume and the atmosphere, and the calculations indicate that a much greater opacity is needed for the plume than for the atmosphere. We compute the emergent infrared intensity at each grid point, and integrate spatially to yield a synthetic light curve. These curves exhibit many features in common with observed light curves, including a rapid rise to maximum light followed by a gradual decline due to radiative damping. Oscillatory behavior (the "bounce") is a persistent feature of the light curves, and is caused by the elastic nature of the plume impact. In addition to synthetic light curves, the model also calculates temperature profiles for the jovian atmosphere as heated by the plume infall.

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