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New Horizons LORRI Observations of Io's Plume Atmospheres in Eclipse

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The Long Range Reconnaissance Imager (LORRI) of the New Horizons spacecraft observed Io in eclipse during the Jupiter encounter in late February 2007. These observations during three separate eclipse events revealed atmospheric emissions from Io, in addition to optical emissions from volcanic hotspots on the surface of Io. Like previous clear-filter imaging with Galileo SSI and Cassini ISS, these images contain a combination of molecular and atomic emissions from different atmospheric constituents. The active Tvashtar plume is dramatically aglow in auroral emissions. In another case, emission near the East Girru volcanic hot spot is observed in two components – one near the surface and one at high altitude, reaching up to $\sim$400 km above the limb. Several other gaseous plumes are distinctly revealed by their auroral emissions. Numerous small volcanic bright spot emissions are also detected, which are either blackbody emissions from the surface or indicate very local atmospheric density enhancements. Previously observed sub-jovian and anti-jovian equatorial spot auroral features and limb glows created by the plasma interaction are also apparent. These observations provide constraints for detailed electrodynamic simulations of Io's interaction with Jupiter's magnetosphere that include individual plume atmospheres.