

The Global distribution and temporal variability of Io's volcanism

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Io's volcanic activity has been monitored by instruments aboard the Galileo spacecraft since June 28, 1996. We present results from observations by the Near-Infrared Mapping Spectrometer (NIMS) for Galileo and the first 3 orbits of the Galileo Europa Mission. We correlate these results with those from Galileo's Solid State System (SSI) and from ground-based observations, and compare them to what was known about Io's volcanic activity from observations made during the two Voyager fly-bys in 1979. A total of 61 active volcanic centers (hot spots and plumes sites) were identified from Galileo, Voyager, and ground-based observations. Of these, 41 are hot spots detected by NIMS and/or SSI.

The distribution of active volcanic centers on Io's surface does not show any clear correlation with latitude, longitude, Voyager-derived topography, or with heat flow patterns predicted by competing tidal dissipation models. Hot spots are correlated with surface colors, particularly dark and red deposits, and generally anti-correlated with white, SO₂-rich areas. Surface features corresponding to all the hot spots, mostly calderas or flows, were identified from Galileo and Voyager images. Hot spot temperatures obtained from both NIMS and SSI are consistent with silicate volcanism, which appears to be widespread on Io. The activity of hot spots has been monitored by Galileo from 1996-1998 and results indicate that two types of activity are present: persistent-type, lasting from months to years, and sporadic events, which may represent short-lived or low-level activity. Sporadic events are not often detected, but may make an important contribution to Io's heat flow and resurfacing.
