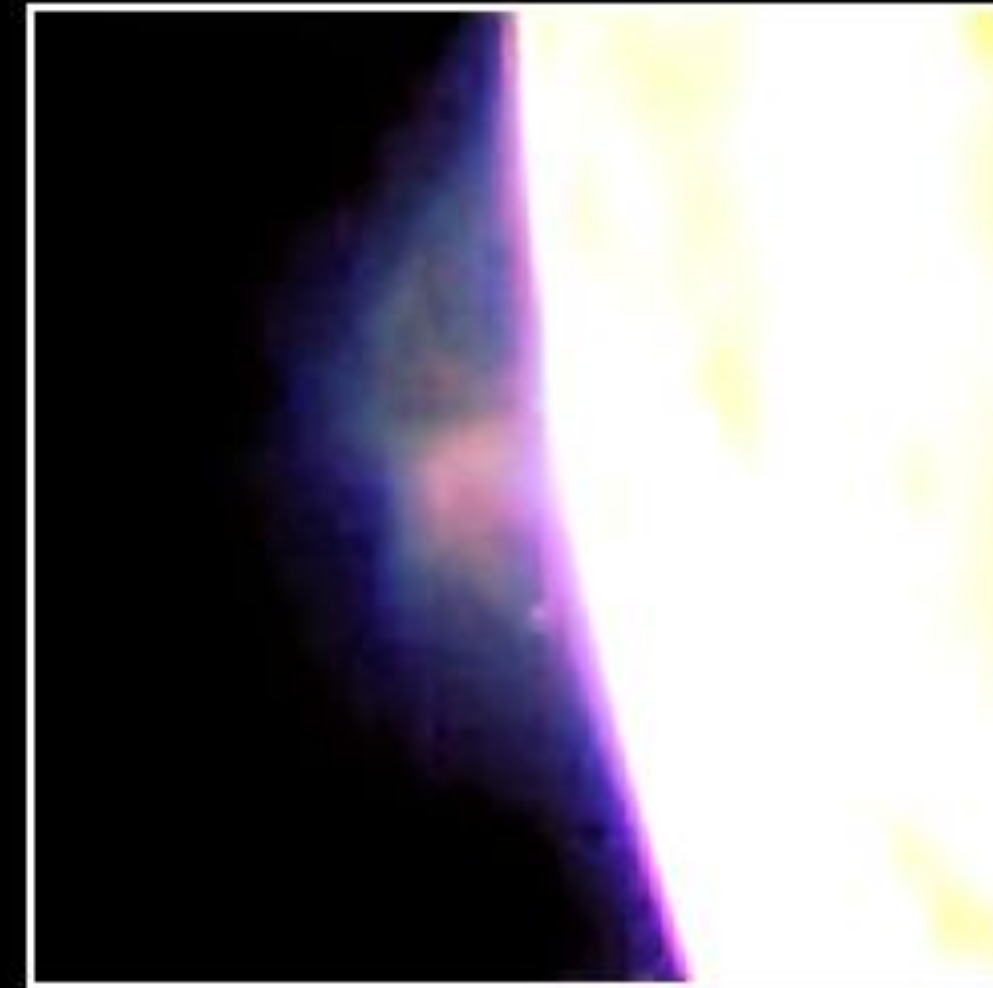
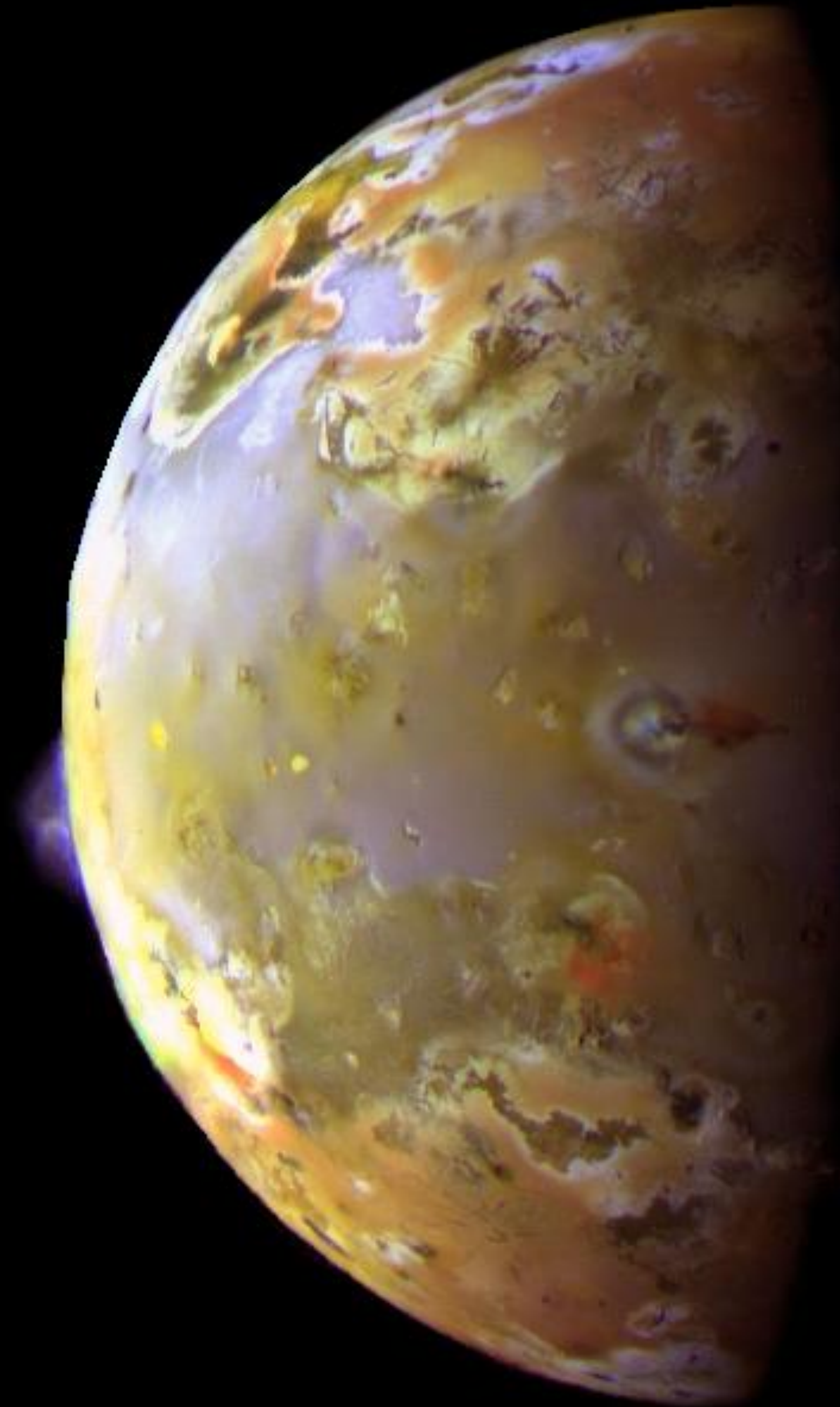


Diagnosing the Solids in Io's Volcanic Plumes



Plumes at Pillan Patera & Prometheus, 1997. Galileo SSI violet, green, and near-infrared filters. NASA/JPL, PIA00703.

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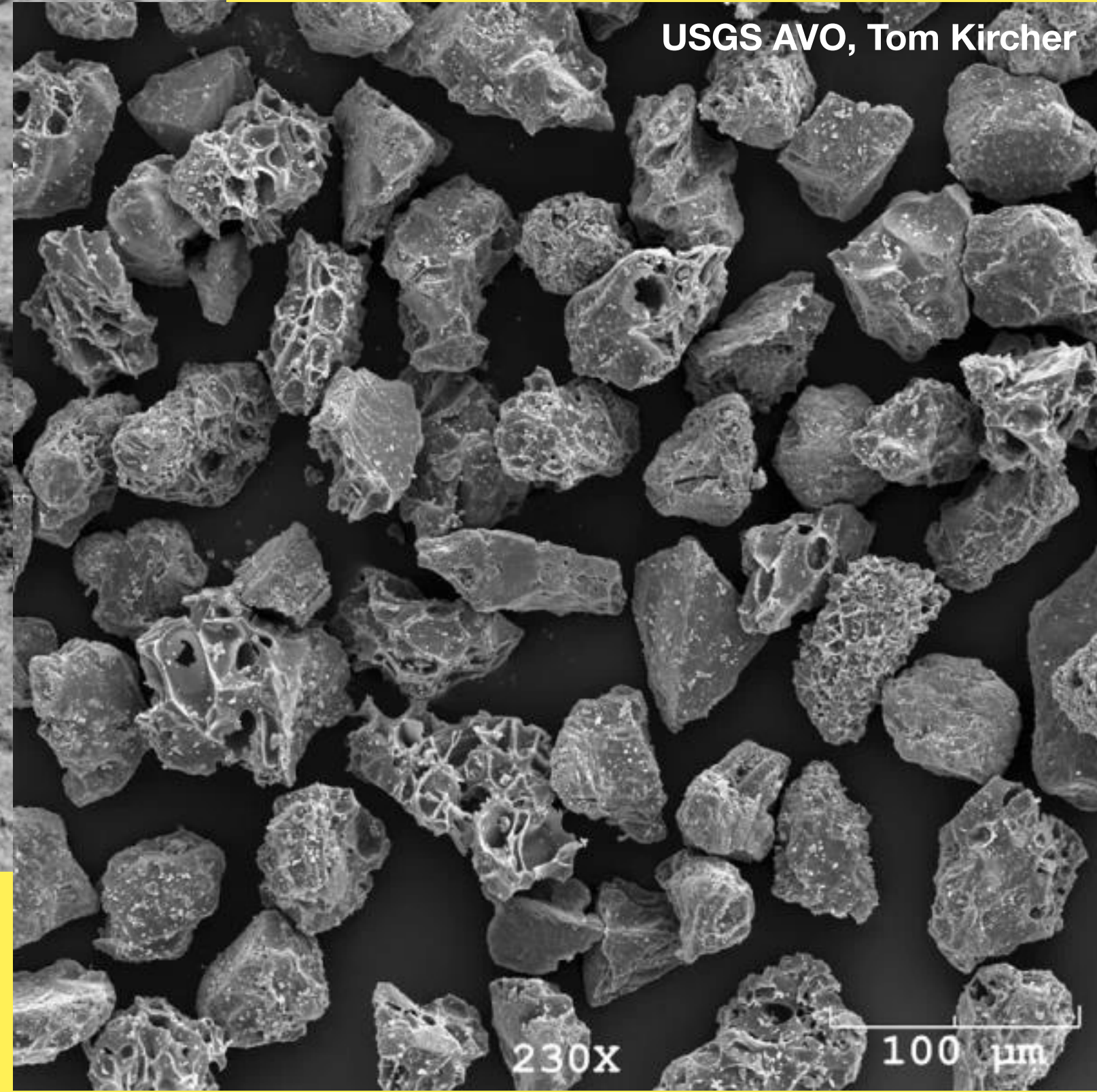
Mount Saint Helens, 1980

USGS



USGS

Car buried in volcanic ash

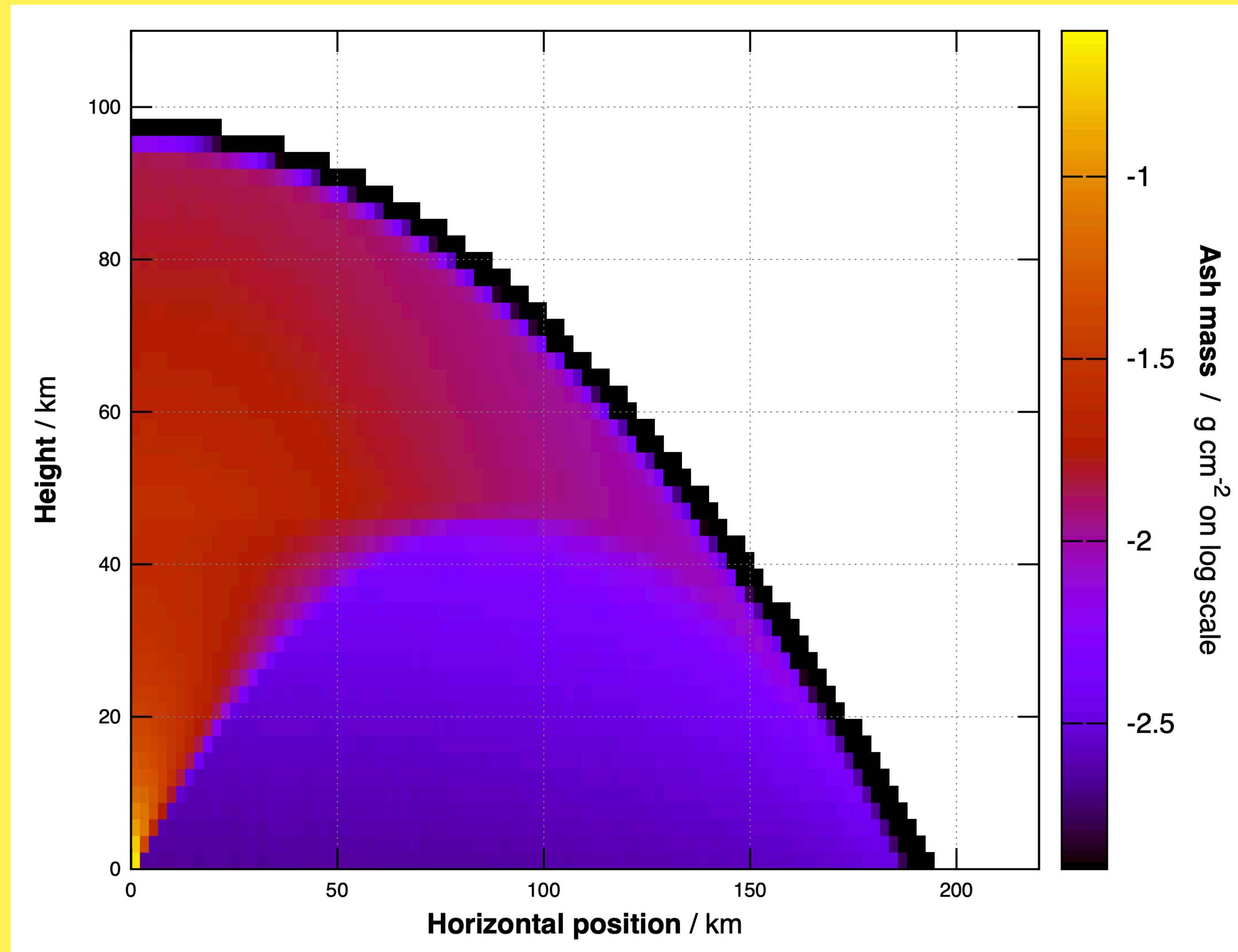


Volcanic ash under the microscope

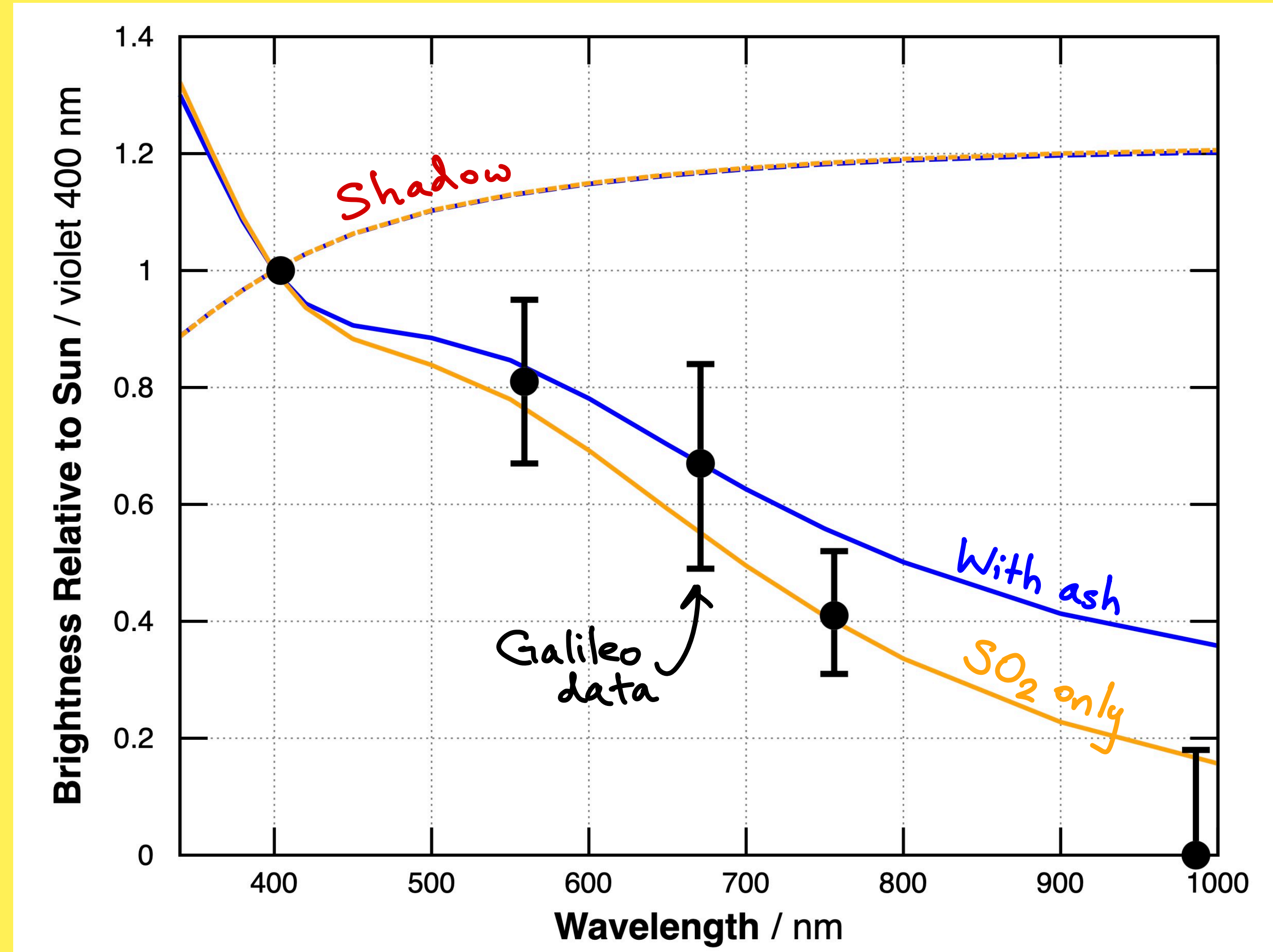
Why model Io's plumes?

- **Explain Io's lack of impact craters.**
- **Understand how Prometheus plume stays active across Voyager, Galileo, Juno spanning 45+ years.**
- **Motivate possible proposal to NASA of Prometheus plume fly-through & sample return concept.**

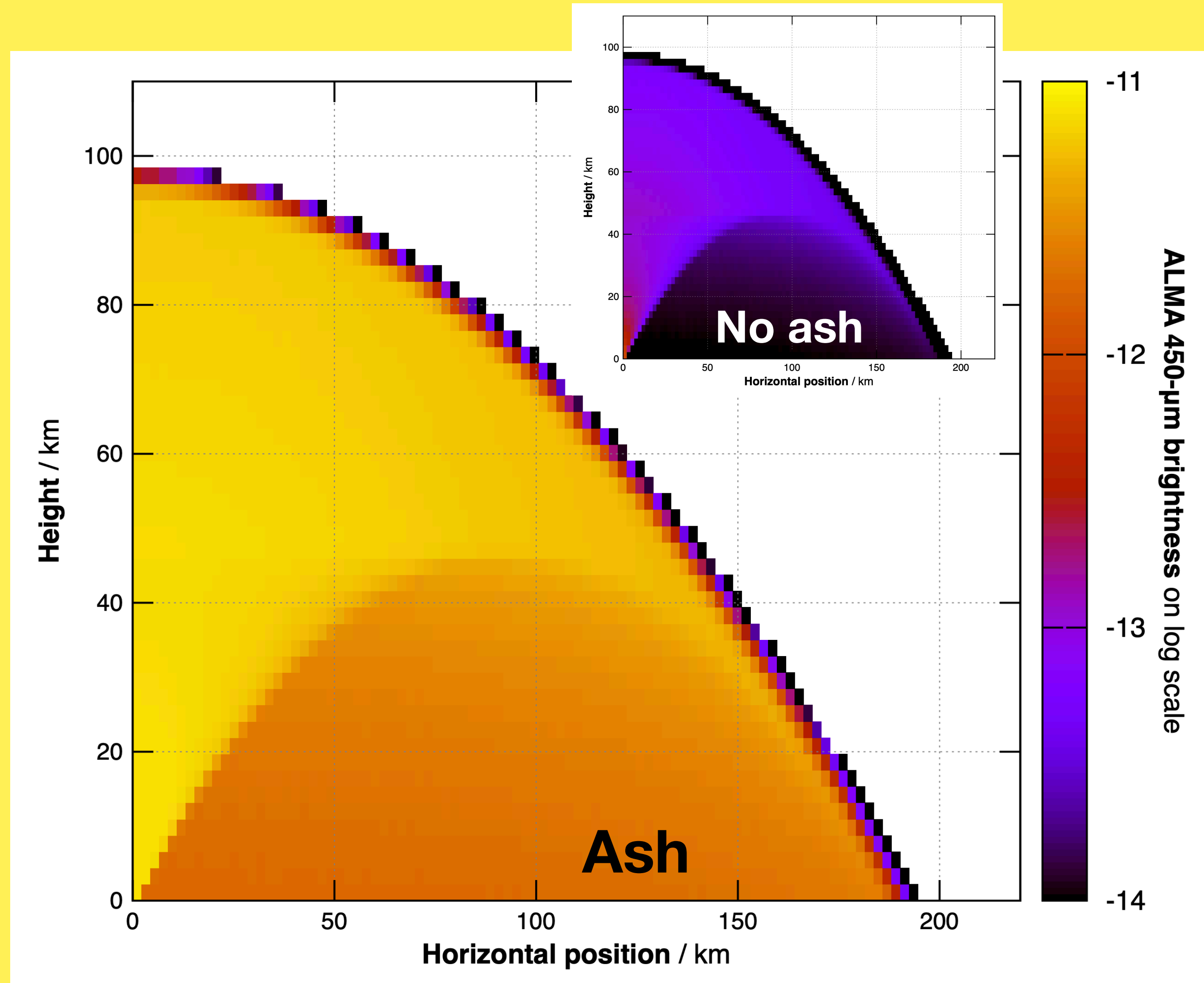
We model ash formation as magma rises in volcanic vent & ash trajectories once ejected into the plume



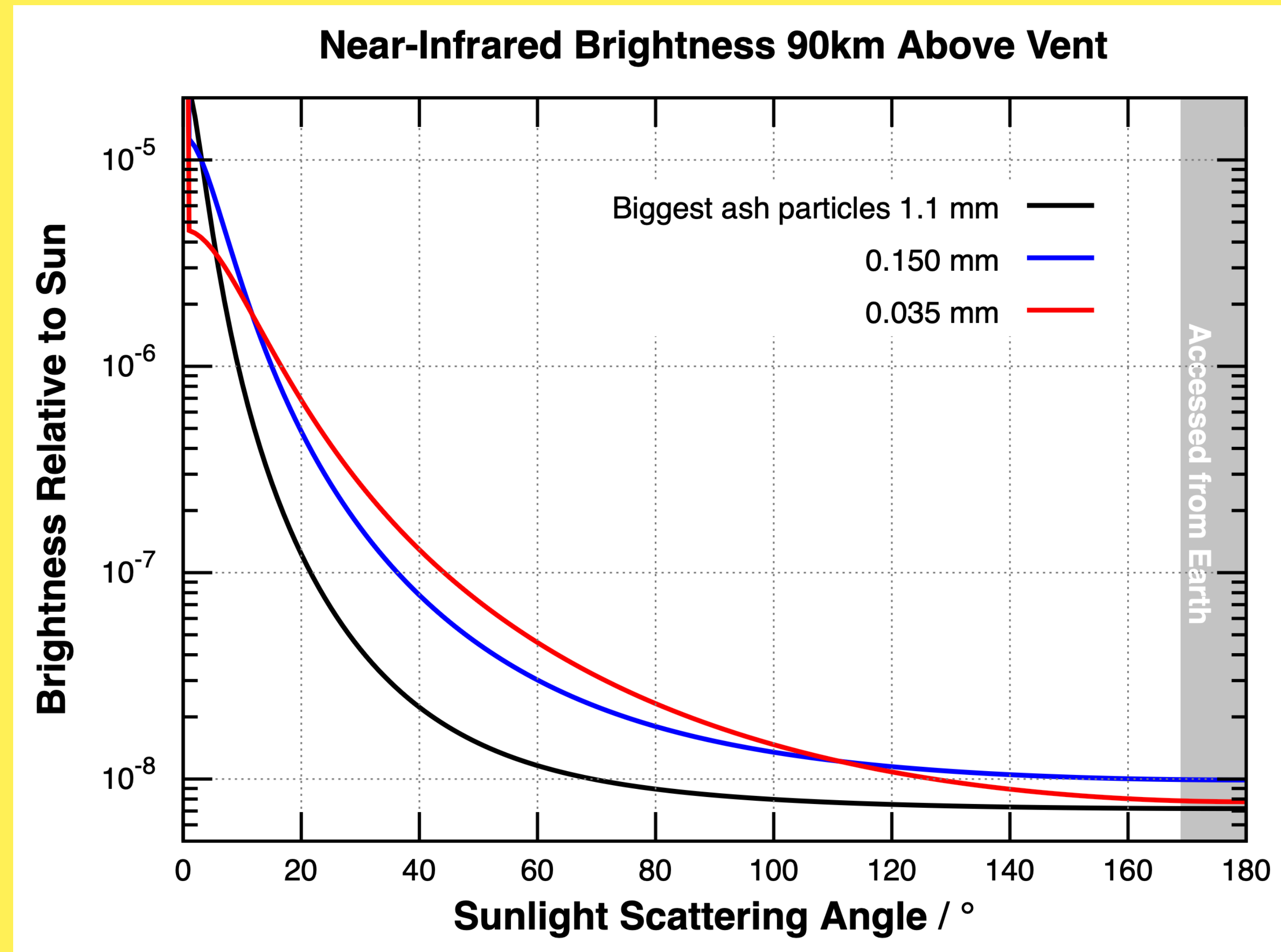
Ash is hidden at optical wavelengths by tiny particles of sulfur dioxide condensing from the plume

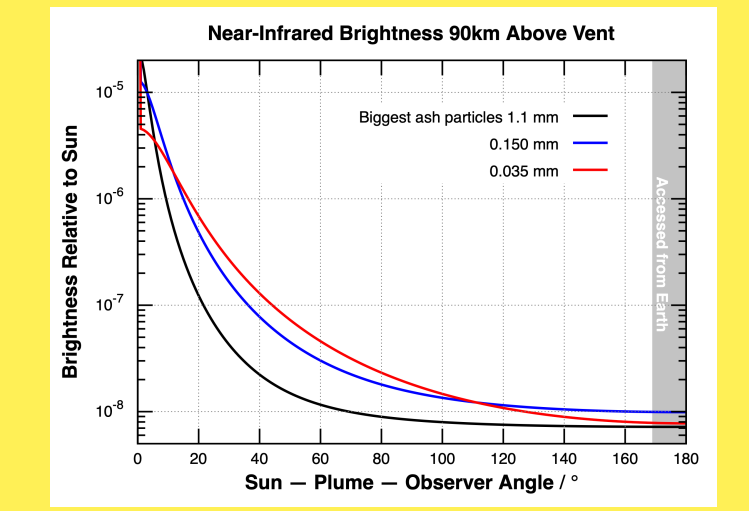
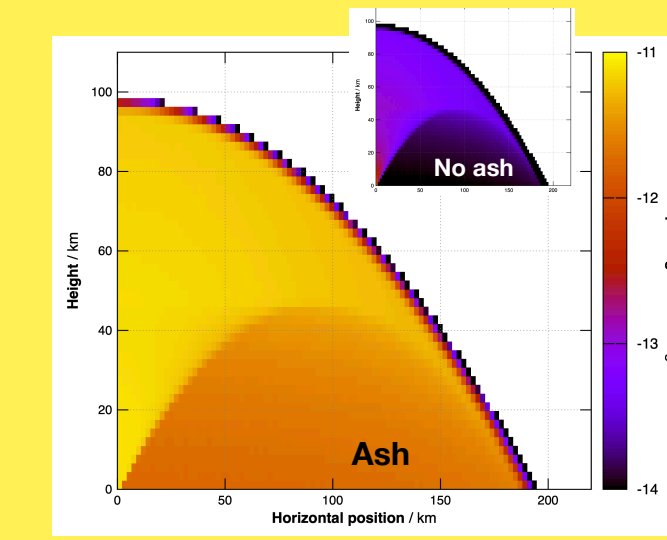
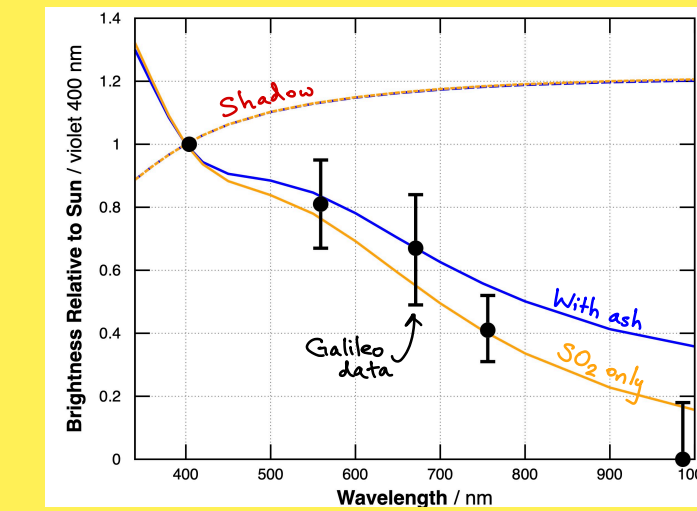
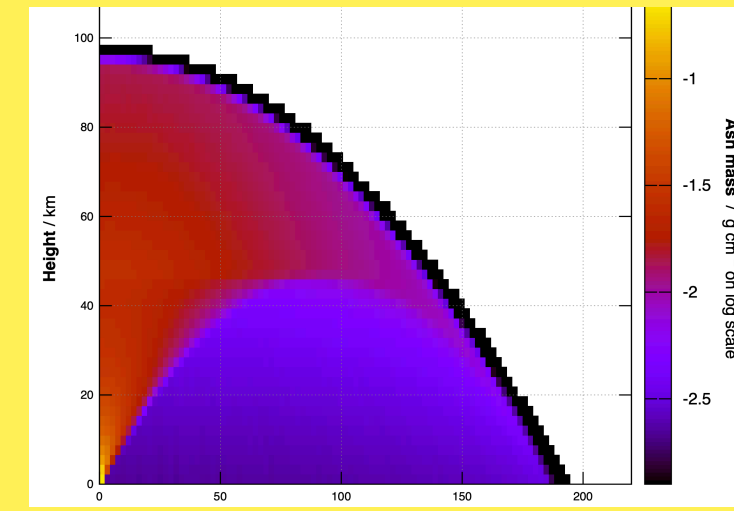
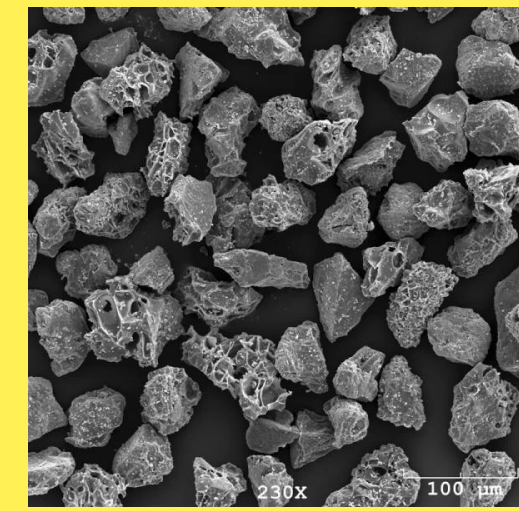
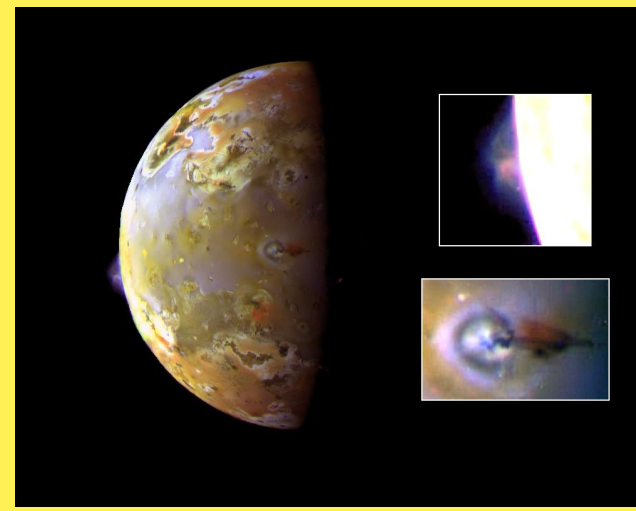


We predict ash dramatically affects plume's brightness in sub-millimeter wavebands seen by ALMA



Sending a probe into plume's shadow could gauge ash size in preparation for fly-through to collect ash sample





Diagnosing the Solids in Io's Volcanic Plumes

Radiation modeling – Neal Turner (JPL/Caltech & SETI Institute)

Volcano modeling – Ryan Ogliore (U. Central Florida), Lionel Wilson (Lancaster U.)

Earth-based telescope proposals – Katherine de Kleer (Caltech), Alexis Matter (OCA), Roy van Boekel (MPIA), Imke de Pater (UC Berkeley), Walter Jaffe (Leiden Obs.)

Galileo data comparison – Rosaly Lopes (JPL/Caltech)

AAS 248 press conference “Fire and Ice in Planetary Systems Near and Far”, 2026 June 16th