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Thermal Mapper concept to study volcanism on Io

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Thermal Mapper (TMAP) is part of the payload of the proposed Discovery mission IVO. TMAP will provide near-global coverage at 0.1–20 km/pixel to map heat flow and monitor volcanism. It is a high spatial- resolution thermal imaging system optimized for observing Io with heritage from the ESA AIDA mission's Minaturized Asteroid infrared Imager (MAIR) and Radiometer instrument and the Bepi-Colombo mission's MErcury Radiometer and Thermal Infrared Spectrometer (MERTIS). Minor modifications of the three-mirror antistigma (TMA) optics and the updating of the discontinued ULIS microbolometer provide over five times better spatial resolution than the MERTIS and MAIR instrument.
TMAP has two channels: a multispectral imager (microbolometer) and a radiometer, which provides greater precision than the imager for background temperatures (80–150 K) over broad regions. A flip-mirror selects the channel and serves as a calibration target for the imager. TMAP uses an uncooled, amorphous silicon, 640 □480 pixel microbolometer. The ULIS PICO640E (UL 04322-039), at TRL 5, is an updated version of the MERTIS detector and will be space-qualified following the same approach for MERTIS. The radiometers (two 15 pixel thermopile detectors identical to MERTIS) are arranged end to end and provide temperatures with 1-K NETD at 100 K, 500 ms dwell time. The radiometer array is operated in pushbroom mode with 15× coarser spatial scale than the imager.
All components are immune to single event latchup and are rad-hard to >100 krad except for 6 parts that will be spot shielded. TMAP sensor and electronics housing are steel to reduce TID to <100 krad, and spot shielding will be employed on the more sensitive parts. Transient noise from energetic particles at Io has an insignificant impact (smaller than read noise) on the radiometer and microbolometer detectors.