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The Io Volcano Observer (IVO) for NASA Discovery 2015

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IVO, first proposed as a NASA Discovery mission in 2010, uses advanced lightweight solar arrays and a 1-dimensional pivot to achieve observing flexibility during a series of fast (~18 km/s) flybys of Io. All science objectives from the Io Observer New Frontiers concept recommended in the 2011 Planetary Science Decadal Survey are addressed by IVO's five instruments plus gravity science: Narrow- and wide- angle cameras (NAC and WAC, from APL and UA), dual fluxgate magnetometers (DMAG, from UCLA), a thermal mapper (TMAP, from DLR), and particle environment package for Io (PEPI) consisting of an ion and neutral mass spectrometer (INMS, from UBE) and a plasma ion analyzer (PIA, from IRF). A student collaboration hotspot mapper (HOTMAP) is also an option. The NAC and TMAP are on a ±90° pivot for off-nadir targeting during encounters and for distant monitoring. WAC and HOTMAP are mounted on the S/C nadir deck, and observe during ±20 minutes of Io closest approach. PEPI is mounted on the S/C structure with the INMS field of view in the ram direction when the S/C nadir deck points at Io, and the PIA and has a large (hemispheric) field of view to include the upstream direction. The DMAG sensors are on the end and middle of 3.8-m boom and collect data continuously. IVO launches in 2021, arriving at Jupiter in early 2026. Its highly elliptical orbit with perijove near Io is inclined >40° to Jupiter's orbital plane, which provides opportunities to observe Io's poorly explored high latitudes and also minimizes total ionizing radiation dose compared to other Jupiter orbiters (<10% that of JUICE). Four of the encounters are designed for optimal measurement of induced magnetic signature from mantle melt. Two encounters will include gravity science, pointing the high-gain antenna at Earth when near Io. The final flyby includes a flythrough of Pele's plume, if it is active, for gas composition. Encounter periods last ~1 week, including global monitoring and four Io eclipses, with distant monitoring and data playback. The apoapse period of each orbit provides extended monitoring of Io and Europa at high phase angles (>120°), best to detect and monitor volcanic plumes as well as high-temperature hot spots on Io. IVO will collect at least 20 Gb of science data per encounter: a total of 900 times the Io data from the 8-year Galileo tour.