Geophysical Research Abstracts
Vol. 21, EGU2019-18552, 2019
EGU General Assembly 2019

The Io Volcano Observer (IVO): Follow The Heat

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The IVO Discovery mission proposal has been re-focused in 2019 towards understanding tidal heating as a fundamental planetary process. IVO will determine how heat is generated in Io's interior, transported to the sur-face, and lost to space primarily via active volcanism. Tidal heating is key to the evolution and habitability of many worlds across our Solar System and beyond. The Laplace resonance between Jupiter's moons, Io, Europa, and Ganymede, results in extreme tidal heating within Io, and this system provides the greatest potential for ad-vances in the next few decades. The easily observed heat flow of Io, from hundreds of continually erupting volca-noes, makes it the ideal target for further investigation, and the missing link along with missions in development (e.g., Europa Clipper and JUICE) to understand the Laplace system. The spacecraft will orbit Jupiter at an inclination of ∼45[U+F0B0], minimizing total radiation dose to ∼20 krad per flyby, and IVO's total dose over 10 orbits will be less than one tenth that of Europa Clipper. The ge-ometry of each Io encounter has been carefully designed to accomplish the objectives. Key science questions IVO will address are: (A) How and where is tidal heat gener-ated, and what is the melt distribution within Io? (B) How is tidal heat transported to the surface, and how is it lost at the surface? (C) How has Io evolved with time, and are the orbit, volatiles, lithosphere, and interior in a steady state? Key measurements include astrometry of Io's orbit; amplitude of k2 tidal Love number; libration amplitude; multi-frequency magnetic induction; near-global mapping of volcanic and tectonic landforms, hot spots, plumes, and heat flow; lava compositions; and volcanic eruption style. European contributions include a thermal mapper and a neutral mass spectrometer.