

Io Questions

- Source Material
 - Io observer concept study for last decadal
 - Satellites chapter of decadal
 - Io white paper (Williams et al.)

Volcanoes: control process, spatial and temporal variability

- >100 active volcanic centers
- Still don't know:
 - How do they form?
 - What controls eruption style and duration?
 - What is magma composition and does it change with time (for a single volcano)?
 - What is the extent of minor volcanic types such as sulfur or SO₂?
- V&V Q2, Q7, Q10
- **1. What are the processes that control Io's volcanic eruptions and how do they vary spatially and temporally?**

Mountains: formation, tectonics under high heat-flow conditions

- >100 mountains on Io, mostly tectonic, rather than volcanic, structures
- No obvious global pattern (Except bimodal w/longitude)
- Favored formation model is due to compressive stresses from volcanic resurfacing
- Don't know details of formation process and relationship to formation of paterae
 - Did it change with time?
- V&V: Q7, Q10
- **2. What processes form Io's mountains and what are the implications for tectonics under rapid resurfacing and high heat-flow conditions?**

Tidal Heating/Interior Structure

- Tidal heating drives active volcanism, also important on many other satellites
- Measured heat flow $>$ steady-state tidal heating models
- Magnetometer data suggest interior magma sea
- Temporal and spatial variability of heat flow and volcanic output not well known
- V&V: Q2, Q7, Q10
- **3. What are the magnitude, spatial distribution, temporal variability, and dissipation mechanisms of tidal heating within Io? How is heat transfer to the surface controlled by internal structure? What is the internal structure (temperature, composition, deformation), is there a magma ocean and what is its nature?**

Atmosphere: how does it interact with volcanic activity and torus, magnetosphere, aurorae

- Io's tenuous atmosphere appears to be controlled by
 - volcanic emissions
 - sublimation of surface volatiles
 - Which dominates? What does that imply?
- Interactions between Io's volcanoes, atmosphere, neutral cloud, and torus are complex and have implications for the entire Jovian system.
- V&V: Q2, Q7, Q10
- **4. What is the temporal and spatial variability of the density and composition of Io's atmosphere, how is the variability controlled, and how is the atmosphere affected by changes in volcanic activity? How does the atmosphere affect the state of the Io torus, the Jovian magnetosphere, and aurorae?**

Io Questions

1. What are the processes that control Io's volcanic eruptions and how do they vary spatially and temporally?
2. What processes form Io's mountains and what are the implications for tectonics under rapid resurfacing and high heat-flow conditions?
3. What are the magnitude, spatial distribution, temporal variability, and dissipation mechanisms of tidal heating within Io? How is heat transfer to the surface controlled by internal structure? What is the internal structure (temperature, composition, deformation), is there a magma ocean and what is its nature?
4. What is the temporal and spatial variability of the density and composition of Io's atmosphere, how is the variability controlled, and how is the atmosphere affected by changes in volcanic activity? How does the atmosphere affect the state of the Io torus, the Jovian magnetosphere, and aurorae?