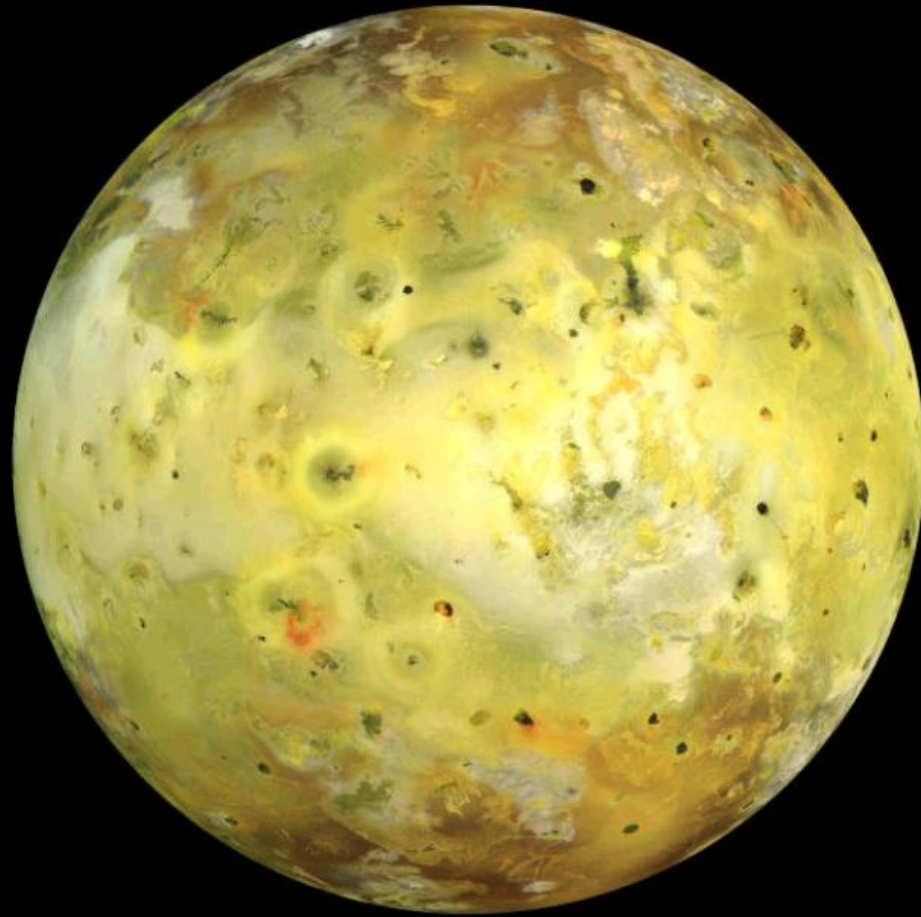


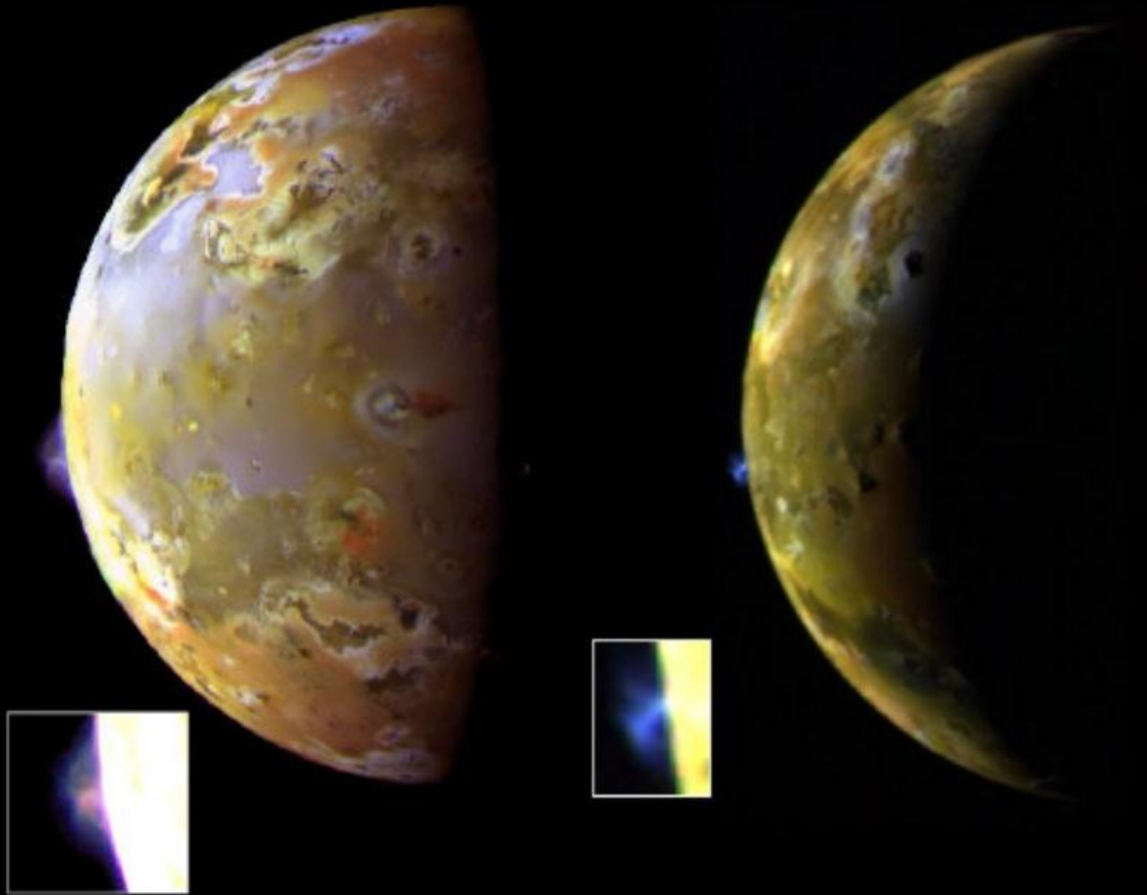
Heat Loss from Io



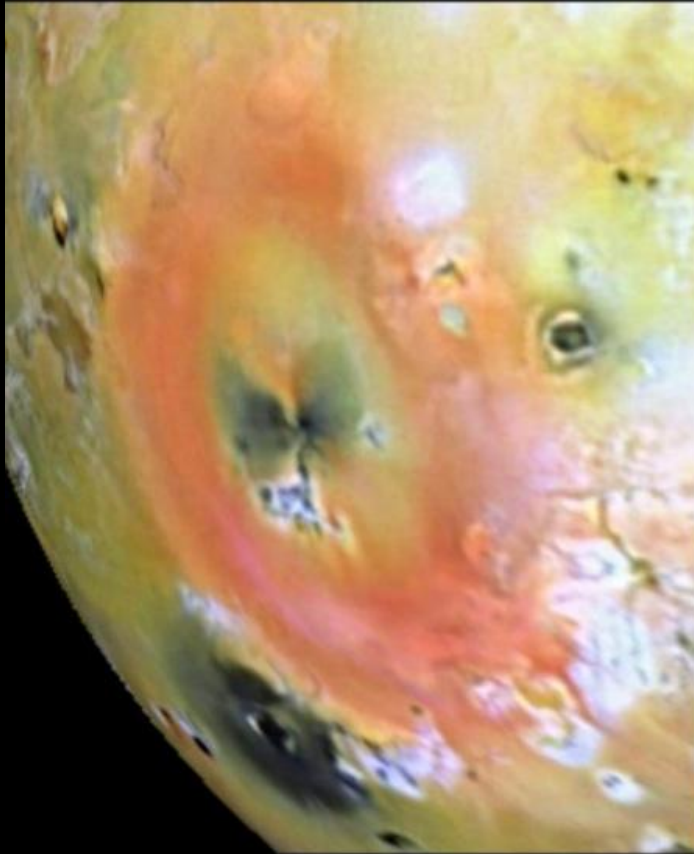
Relative Sizes



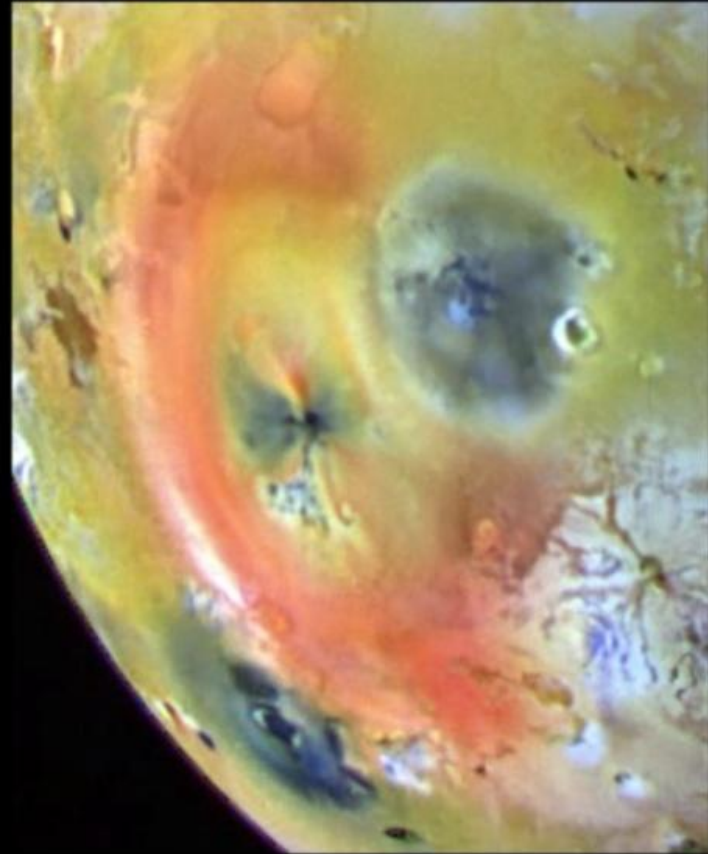
Volcanoes on Io



An Ever Changing Surface



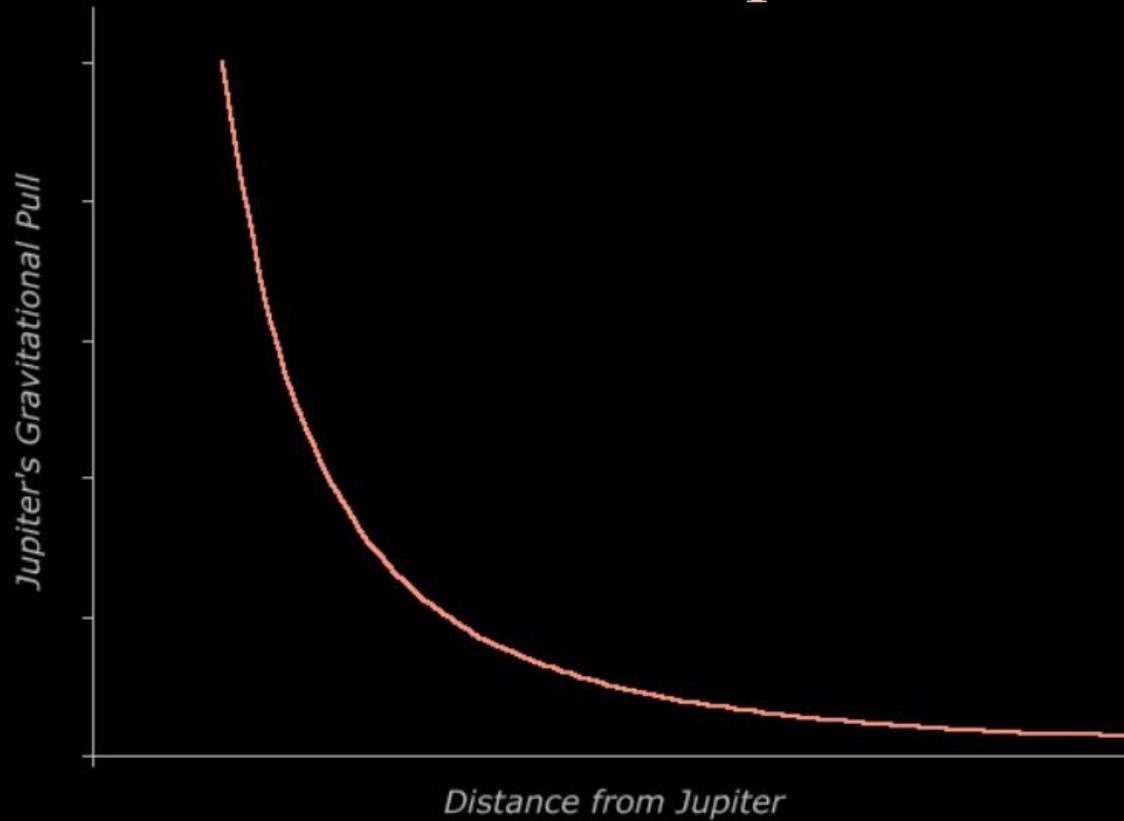
April 1997



October 1997

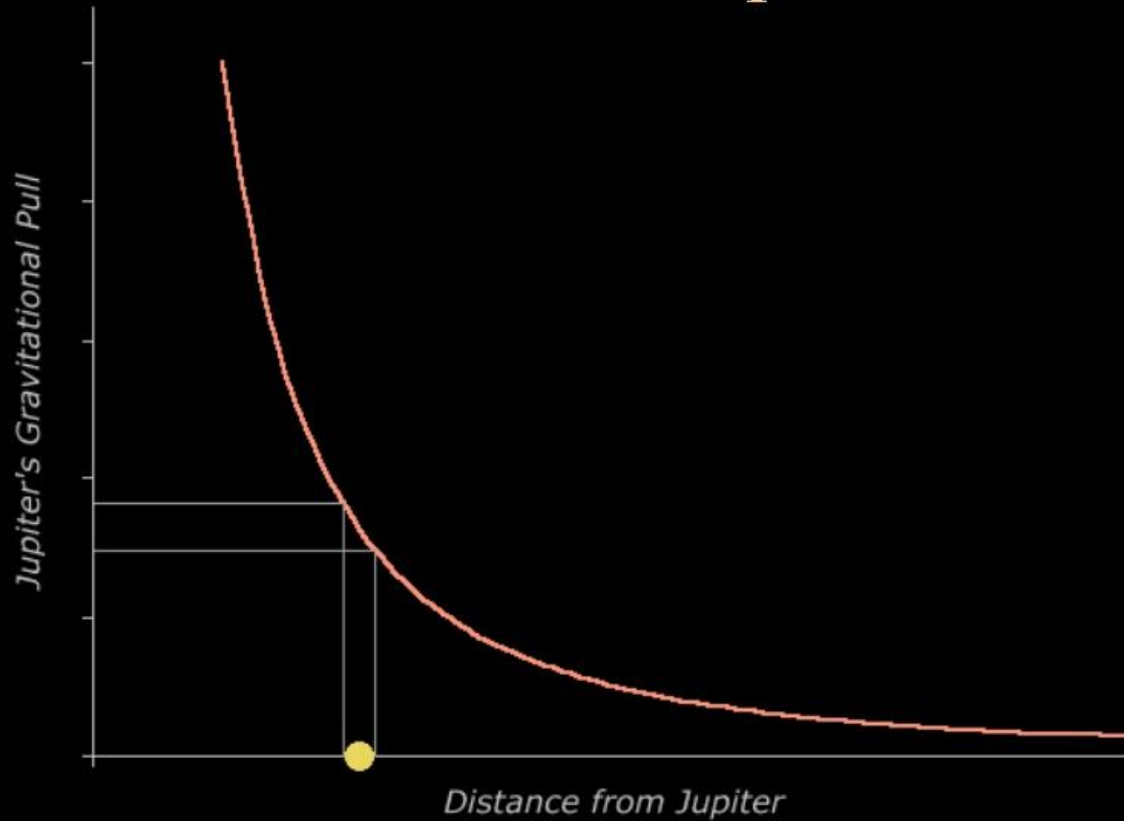
Tidal Forces

Tides from Jupiter



Tidal Forces

Tides from Jupiter



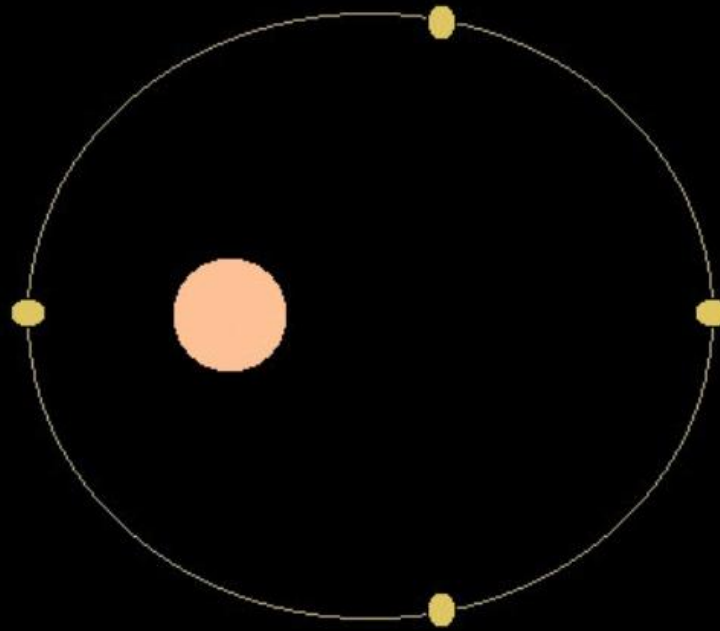
Tidal Forces

Tides from Jupiter



Eccentricity

Io's Eccentric Orbit



Tidal Forces

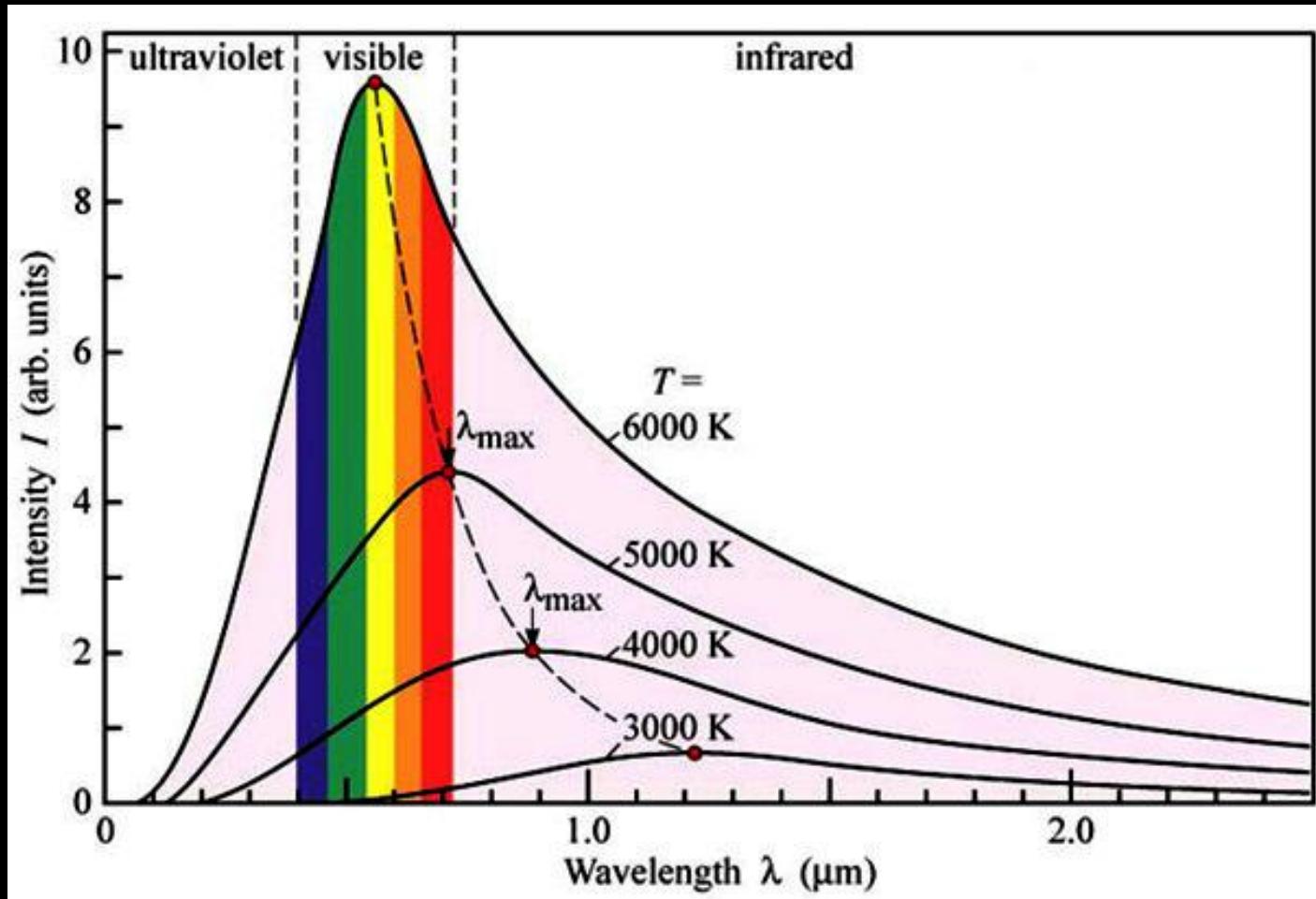
Tides from Jupiter



So What Can Make a Moon Volcanic?

- Proximity to Massive Object
- Large size results in large difference between near and far side
- Eccentric orbit required to “stretch” out moon

Blackbodies!



Stefan-Boltzmann and Wien's Law

- Stefan-Boltzmann Law

$$E = \sigma T^4$$

- Wien's Law

$$\lambda_{\max} T = 3000$$

Sample Calculation

- If object A has a temperature of 600K, and Object B has a temperature of 300K, how much more energy is object A emitting than object B?
- $(T_A/T_B)^4 = (E_A/E_B)$
- $(600/300)^4 = (2)^4 = 16$, so 16 times more energy

Sample Calculation

- But what if they have different area?
- $(\text{Area}_A/\text{Area}_B) \times (T_A/T_B)^4 = (E_A/E_B)$
- Note that we can also use this to find temperature if we have energy
- $(T_A/T_B)^4 = (E_A/E_B) \times (\text{Area}_B/\text{Area}_A)$

Tips

- To get fourth root, either take the square root twice or raise it to the 0.25 power
- Assume all the energy is coming from the dark areas, since those are the hottest
- Area E has no dark areas, so just count all the pixels
- For #1, don't just write equation; explain it in words