

Hot Spots and Plumes on Europa

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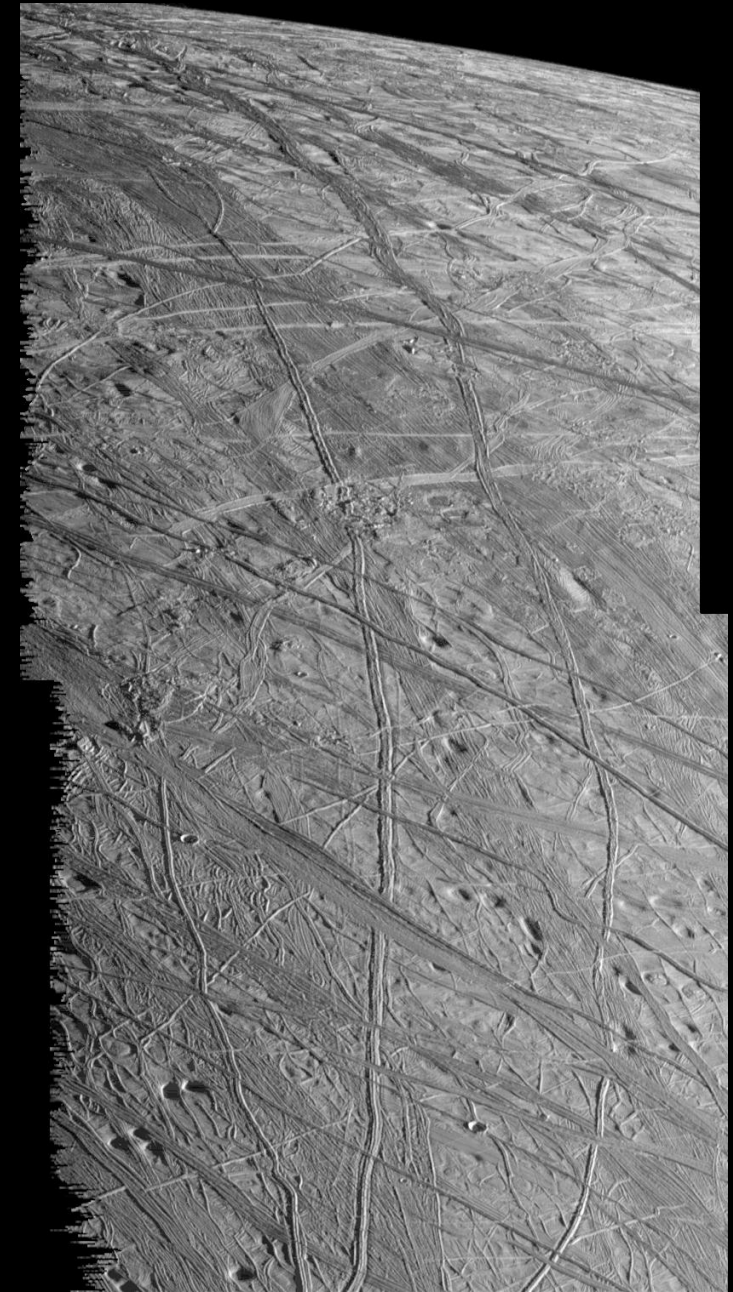
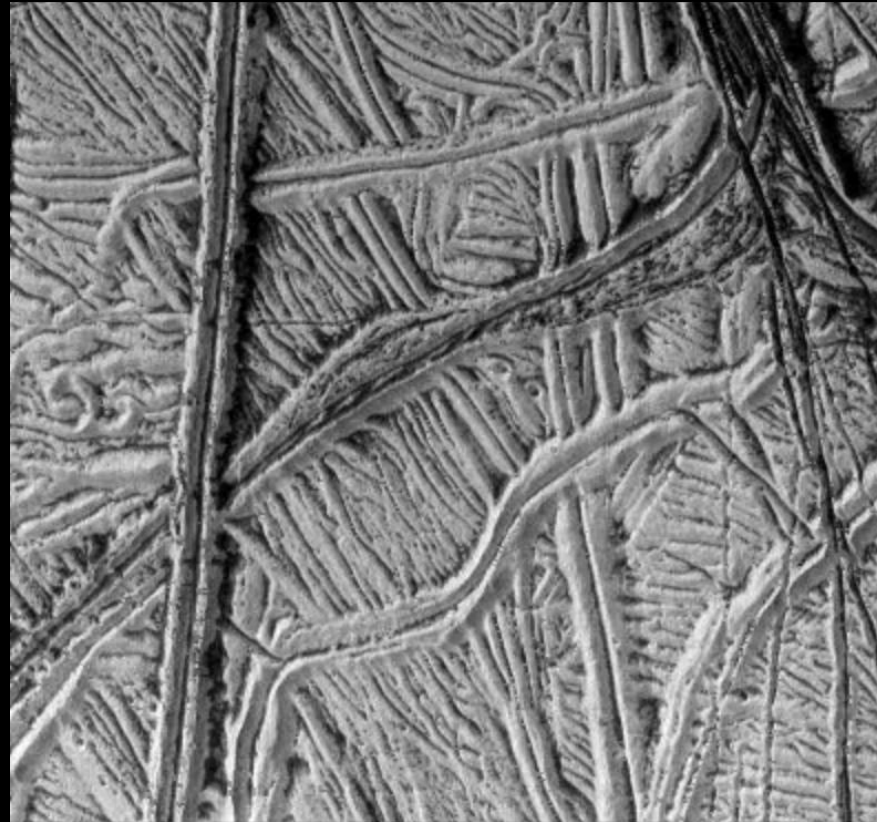
Duane D221

MY RESEARCH FOCUSES ON THE SURFACES AND ATMOSPHERES OF ICY PLANETS AND MOONS

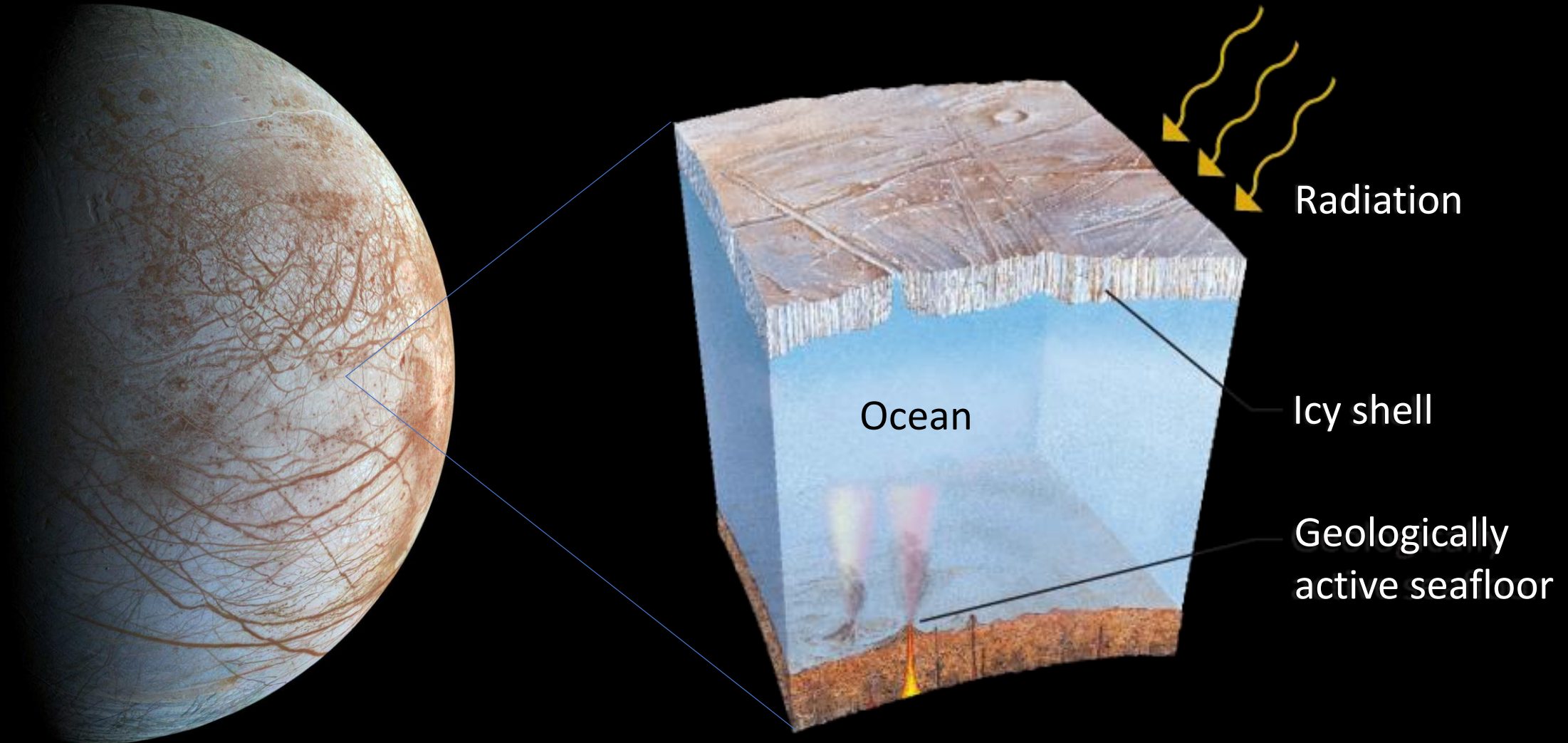


Especially thermal behavior and dynamic phenomena!

Europa: A Fractured World



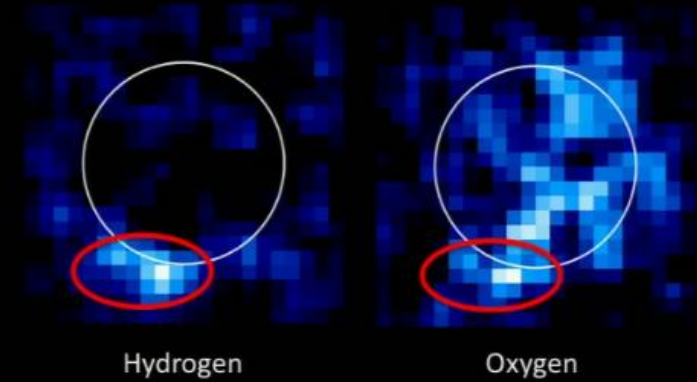
Europa: An Ocean World



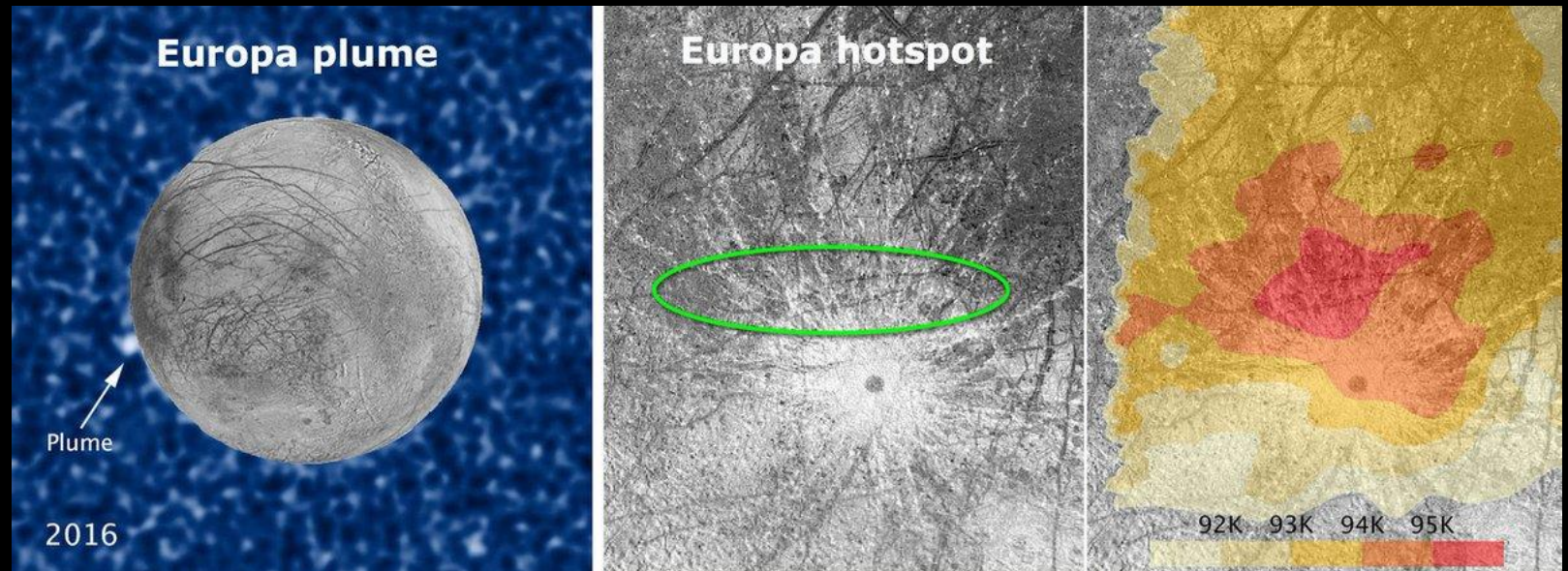
Europa: An Active World?

- Recent HST observations suggest presence of plumes
- If real, Europa is active today!
- Greater plume intensity than Enceladus

Hubble Observations: December 2012

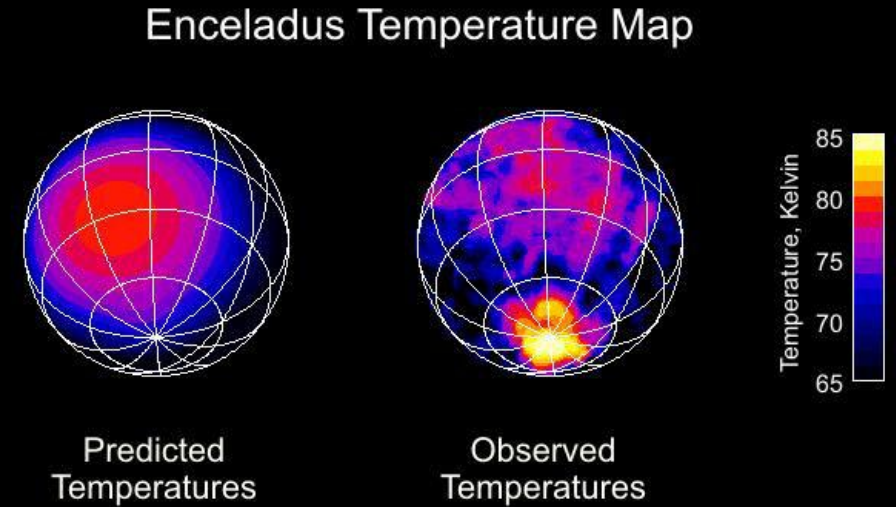
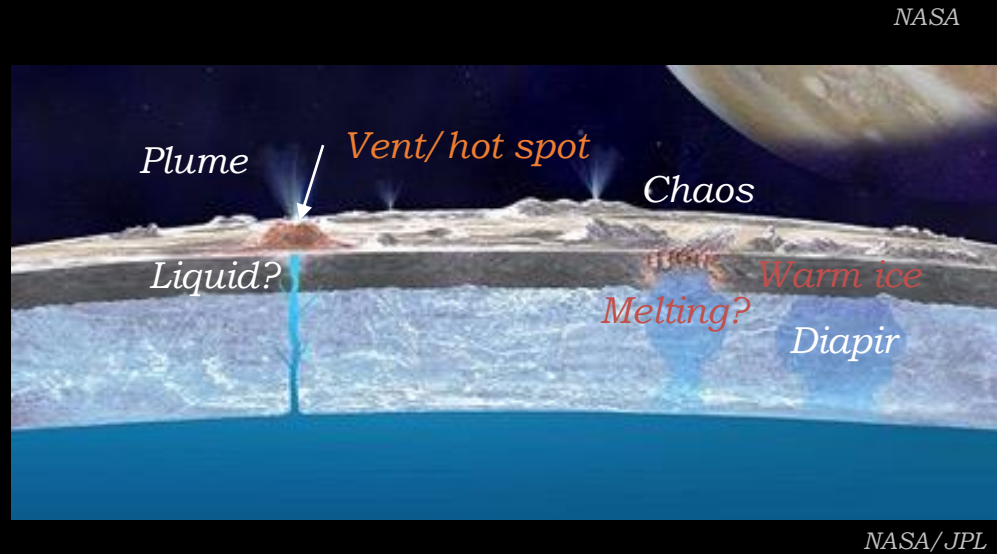


Roth et al. (2014)



Sparks et al. (2017)

Motivation

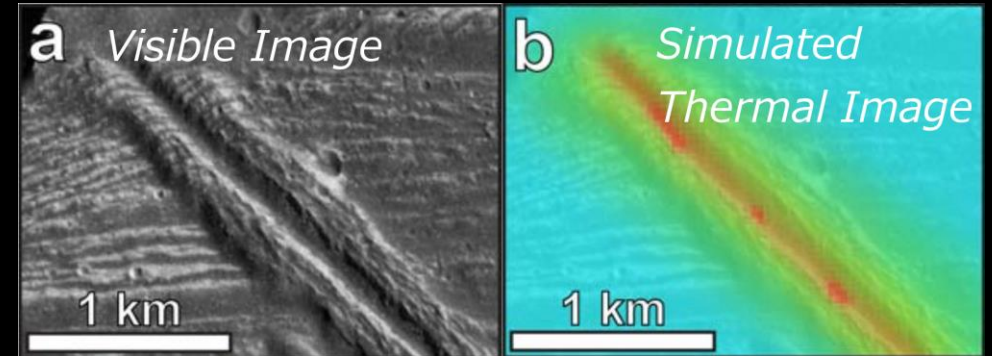
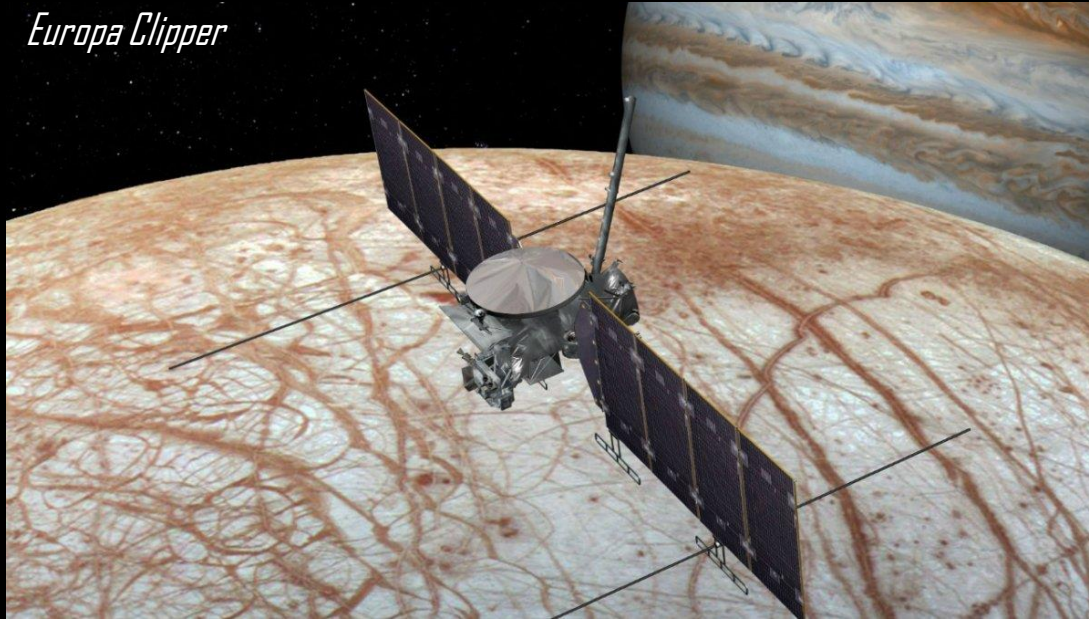


- Temperature is a fundamental indicator of internal activity on ocean worlds

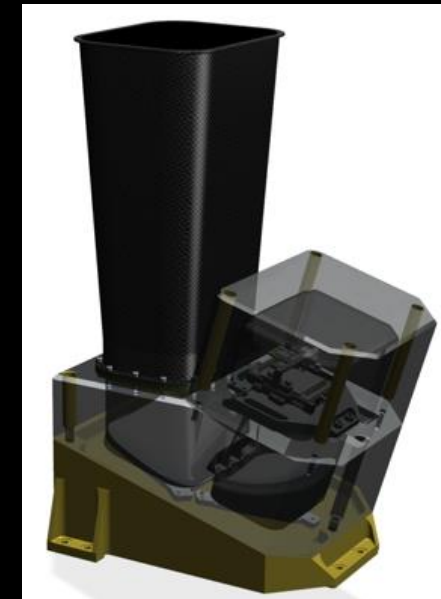


E-THEMIS: Measuring Endogenic Heat

Europa Clipper



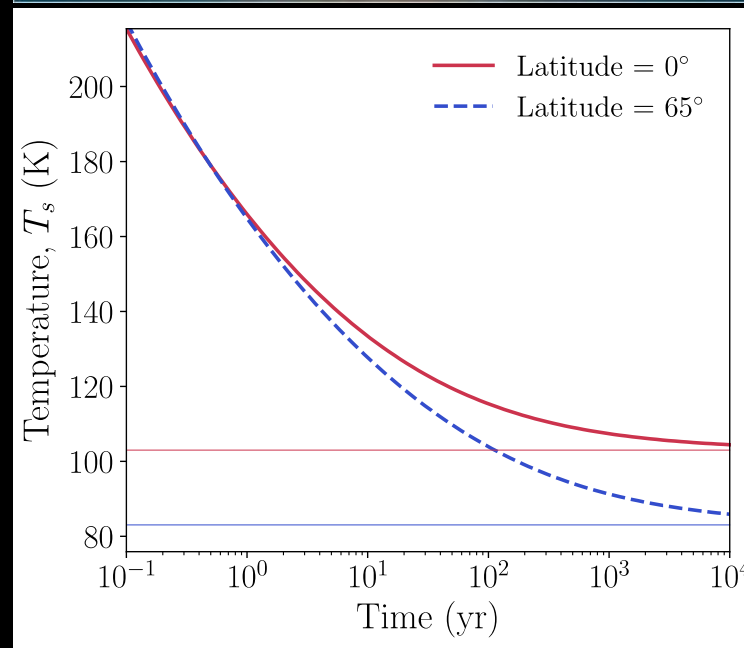
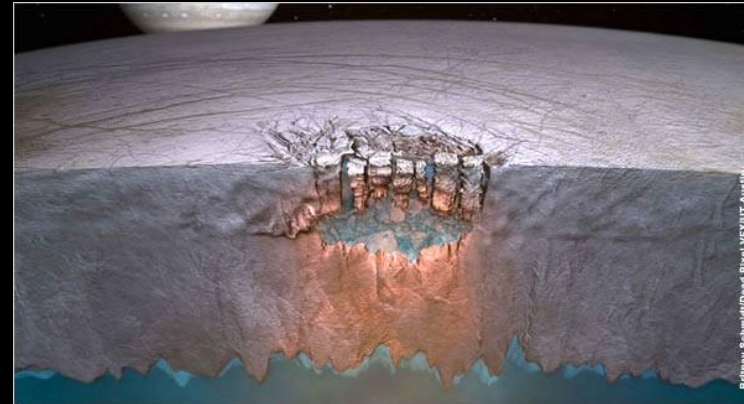
- Preparing for Europa Clipper mission – launch ~2023
- E-THEMIS will detect hot spots, active regions

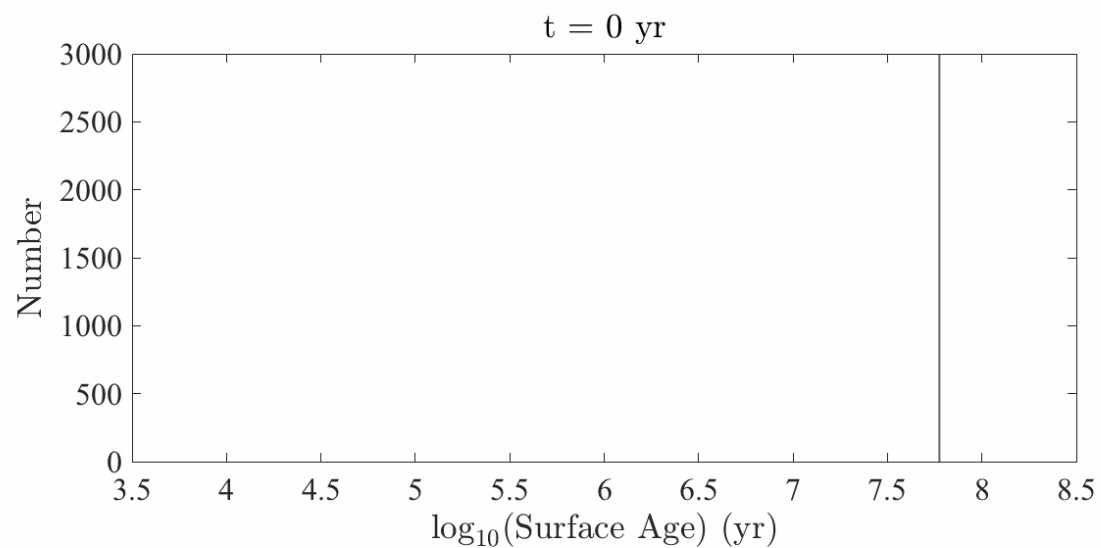
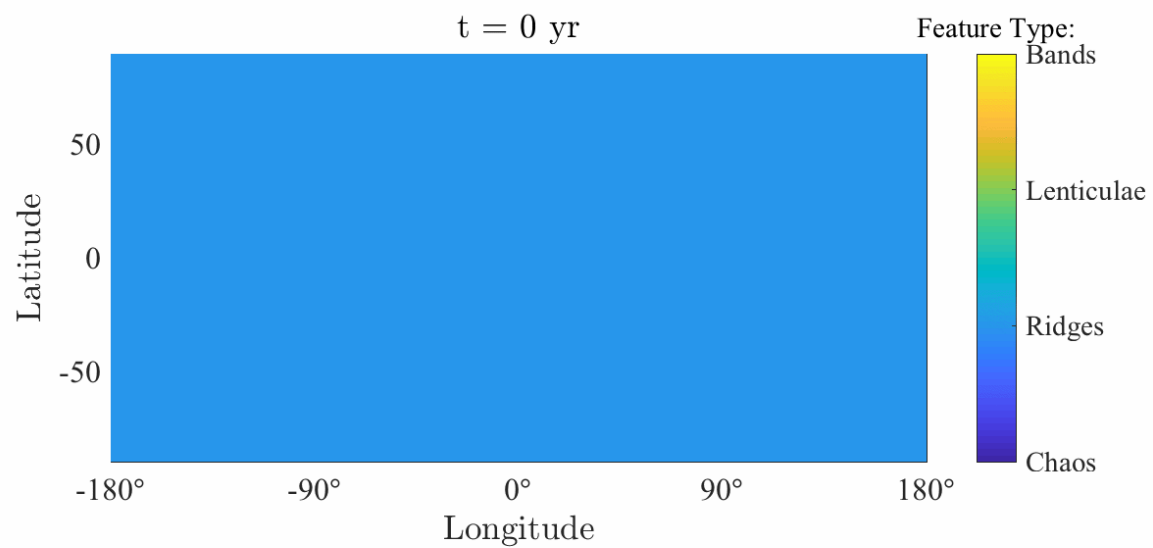
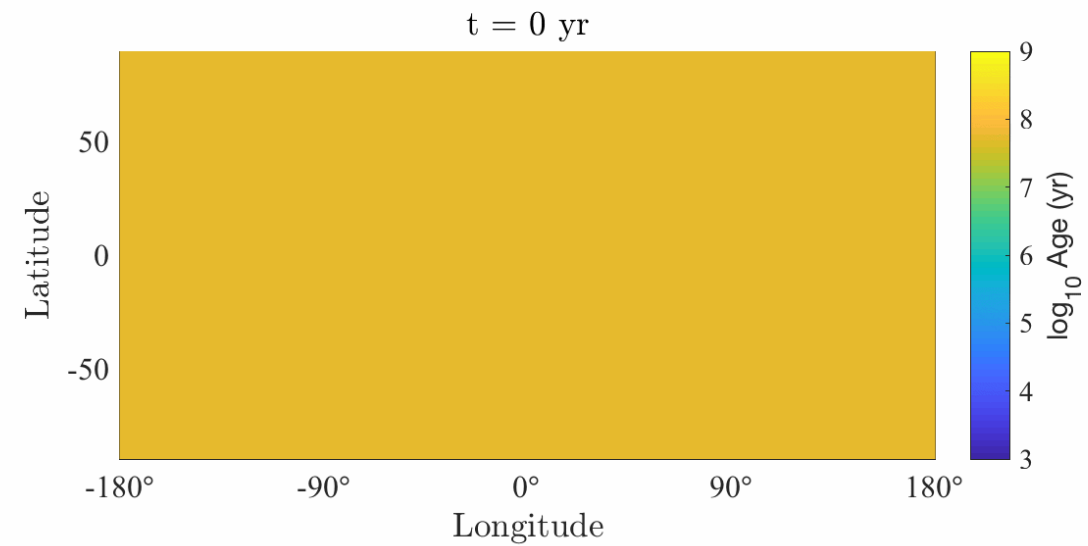
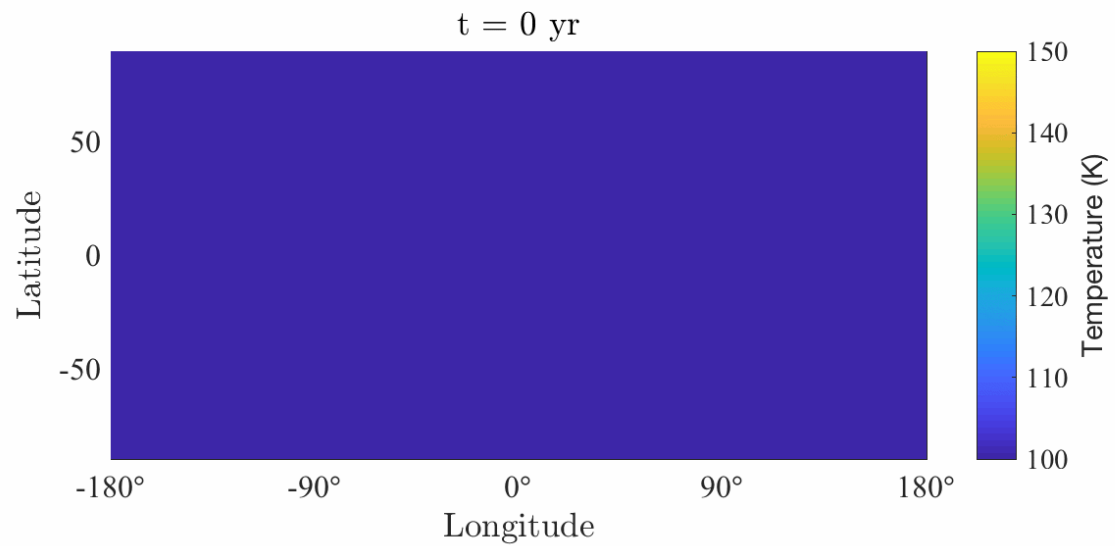


Europa Thermal Emission Imaging System (E-THEMIS)

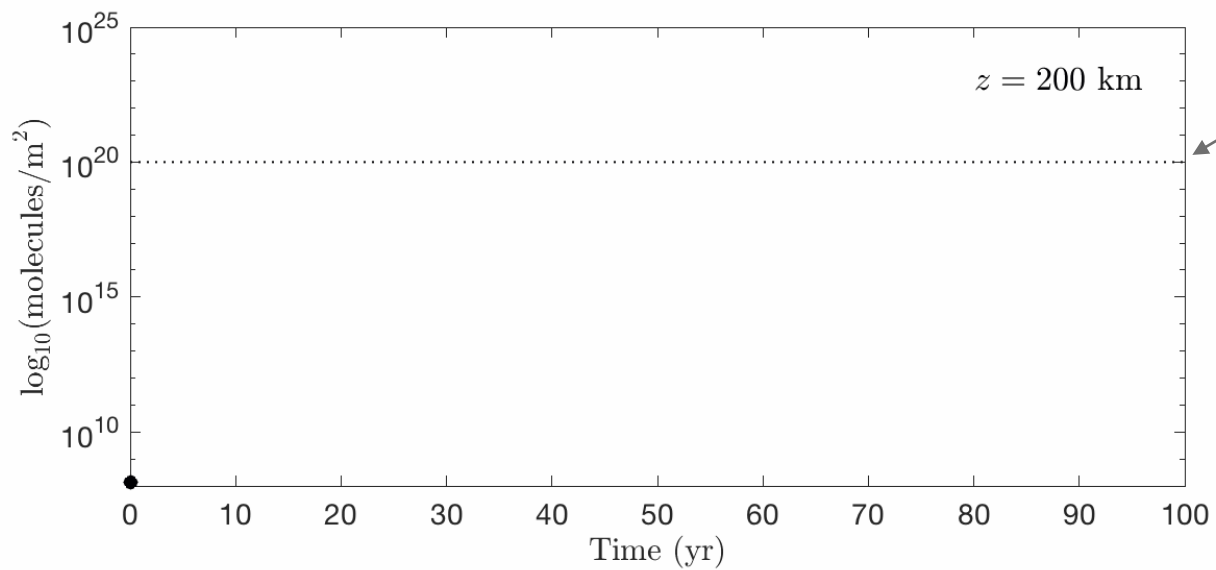
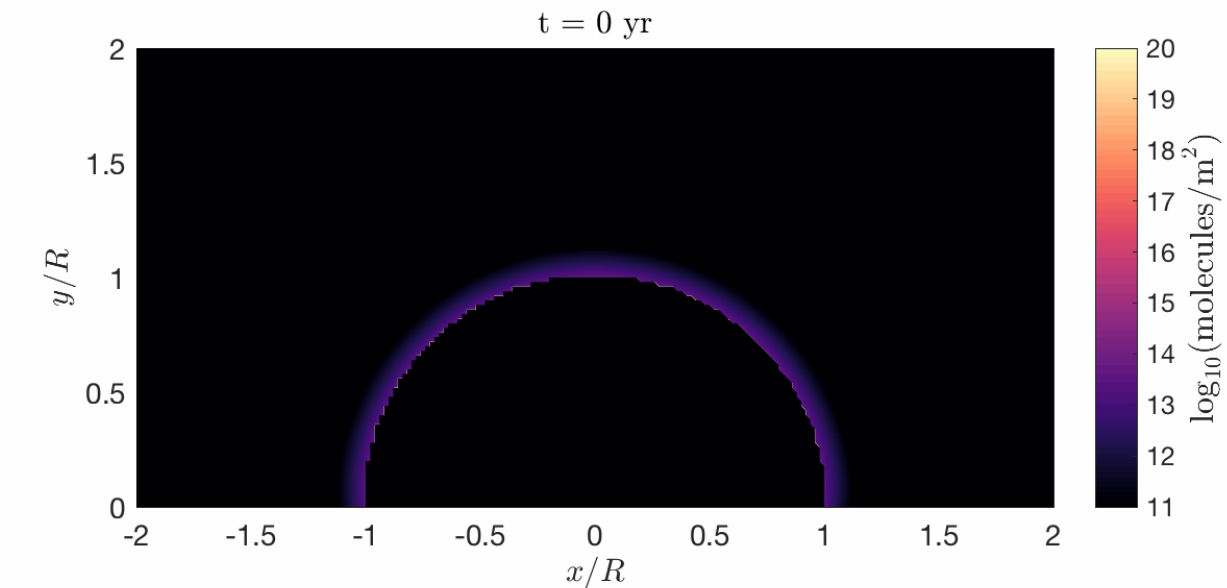
Simulating Hot Spots

- We use a combination of numerical (computer) models and analytic (pen and paper) solutions to the heat equation
- Can track surface temperatures through time for any hot spot
- Can model plume formation and decay; compare to observations



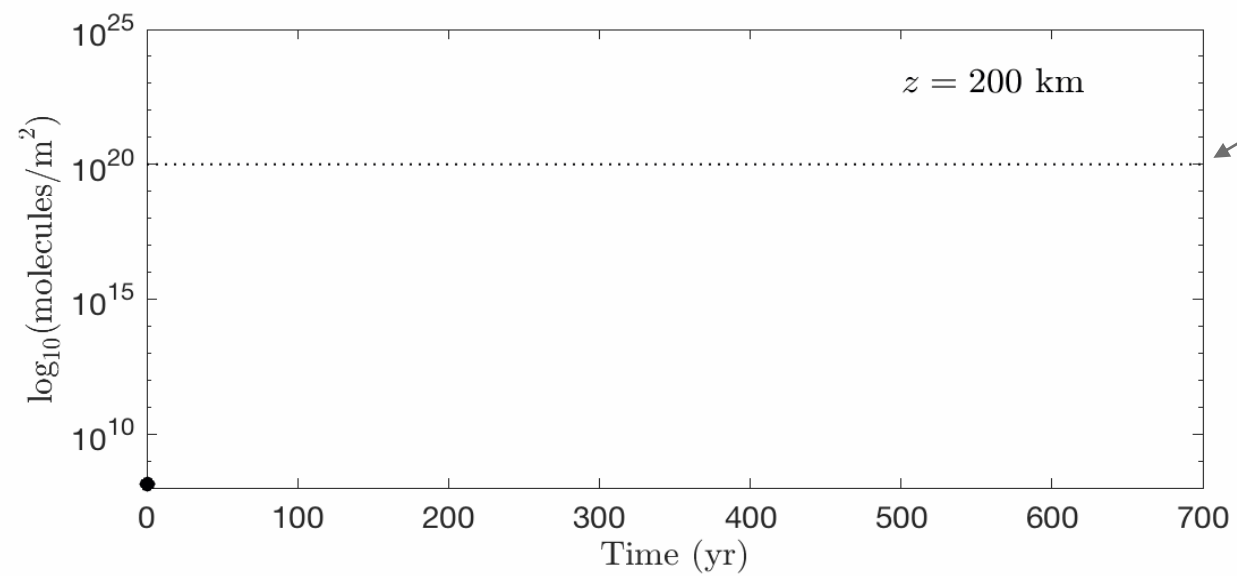
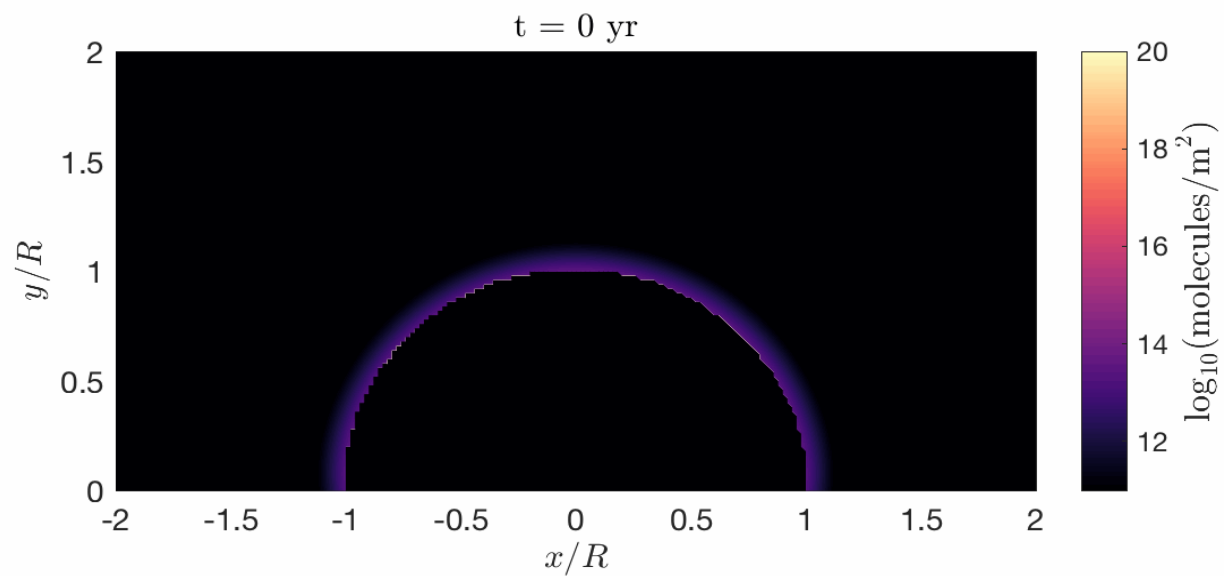


Plumes



Roth et al. (2014) detection

Plumes



Roth et al. (2014) detection

Join the EPIC Group!

Considering applications for summer 2019



Required Skills:

- Strong physics and calculus background (1+ yr of each)
- Programming proficiency in at least one language (preferred: Python, C/C++, MATLAB, IDL)
- A curious mind and dedication to 'finding things out'!



Send your resume/CV to: Paul.Hayne@Colorado.edu