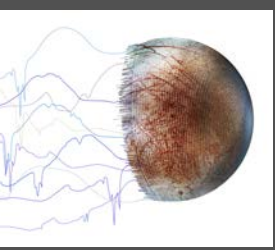


MISE: Mapping Imaging Spectrometer for Europa

Diana Blaney
August 24 , 2015
OPAG

“Nature only uses the longest threads to weave her patterns, so that each small piece of her fabric reveals the organization of the entire tapestry.”

Richard P. Feynman

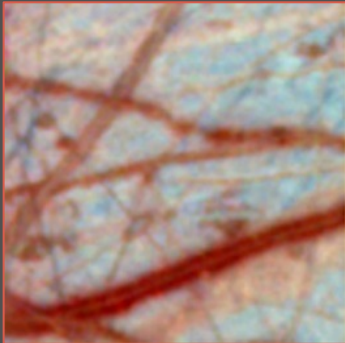


Science Goals

Goal 1: Assess the habitability of Europa's ocean by understanding the inventory and distribution of surface compounds.

Goal 2: Investigate the geologic history of Europa's surface and search for areas that are currently active.

MISE will produce maps of key compounds to answer questions about Europa's ocean and it's habitability



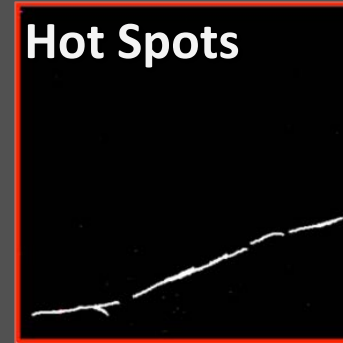
Links surface geology and composition.



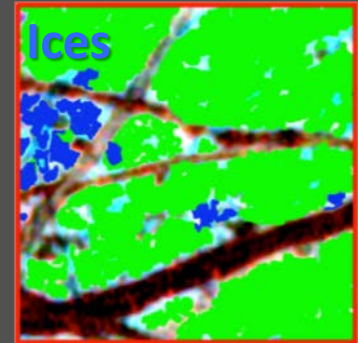
Does Europa's ocean have organics?



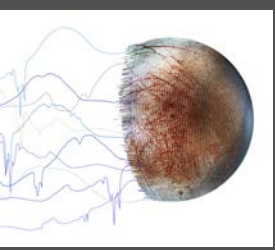
What does surface chemistry tell us about habitability?



Is Europa currently active?

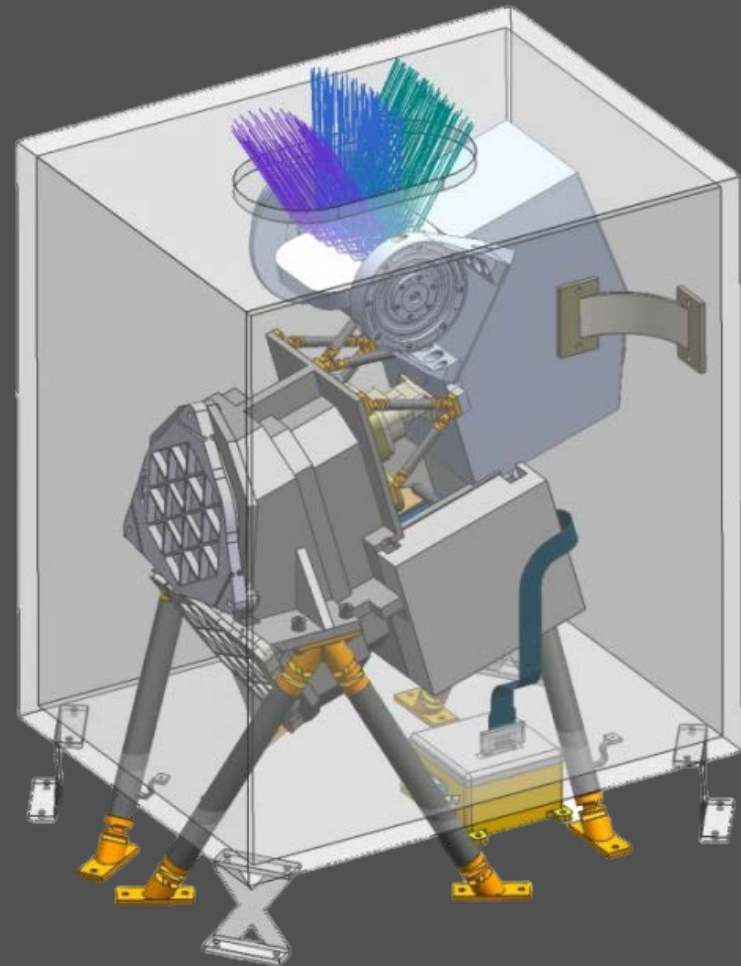


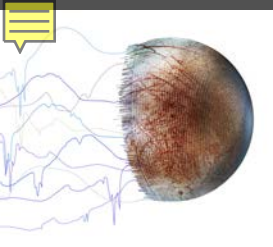
How do changes in ice crystal structure relate to the age of Europa's surface?



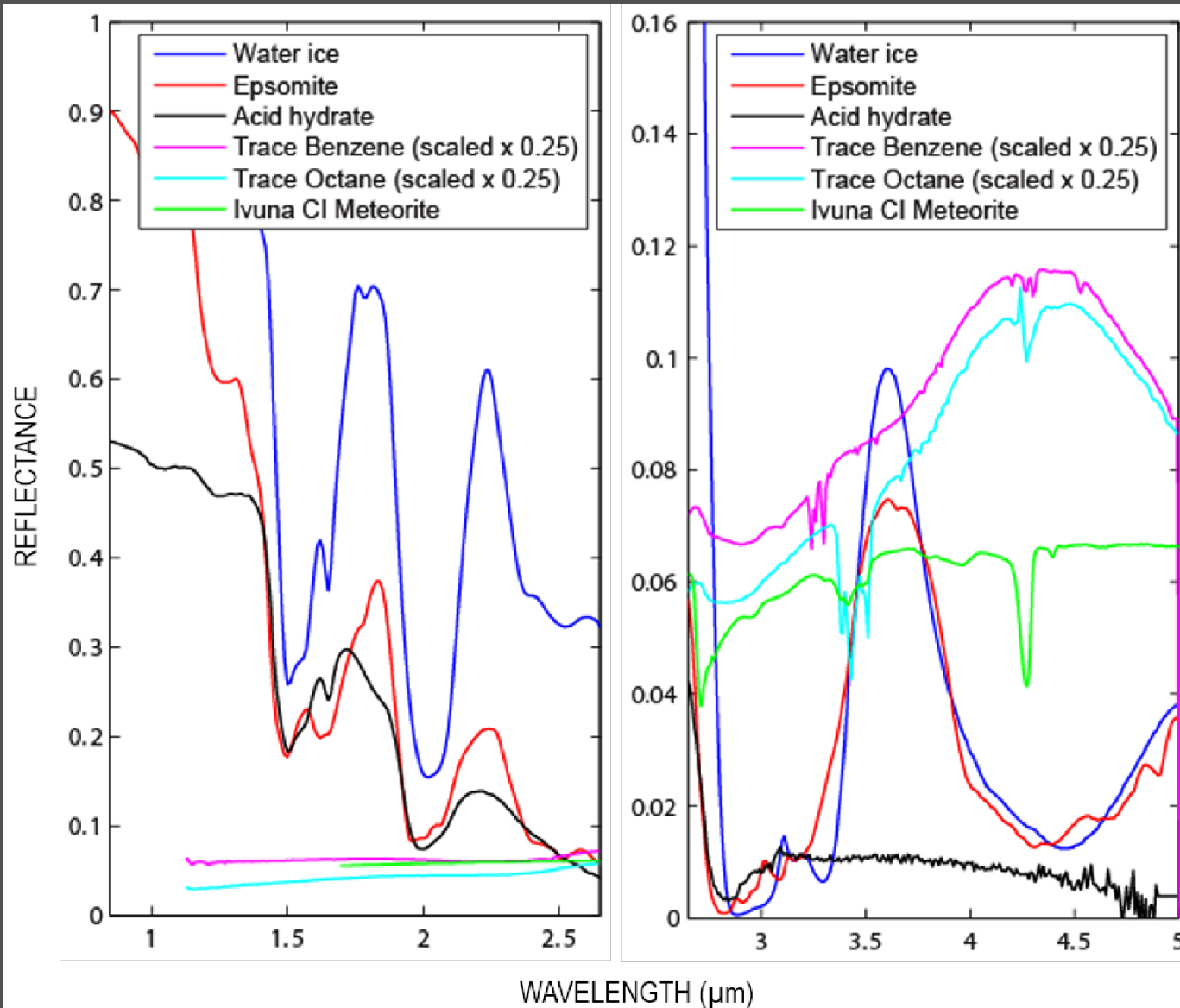
Instrument Description

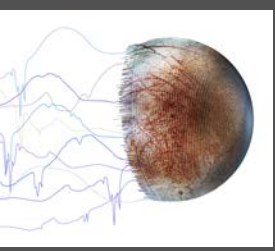
- Spectral range 0.8–5 μm with 10 nm spectral sampling in a single spectrometer.
- Tuned grating and scan mirror for high SNR at all wavelengths.
- Spatial sampling at geologic scales (25 m/pixel at 100 km).
- IFOV= 250 μrad
- Cross track FOV= 4.3° (300 pixels)
- Along Track Coverage: 0.75° to 4° (80-300 channels)
- Scan Mirror: $\pm 30^\circ$
- Mature, proven design.
- All key development risks mitigated including radiation and planetary protection.





Determining Surface Compositions





Process Spatial Scales

Local

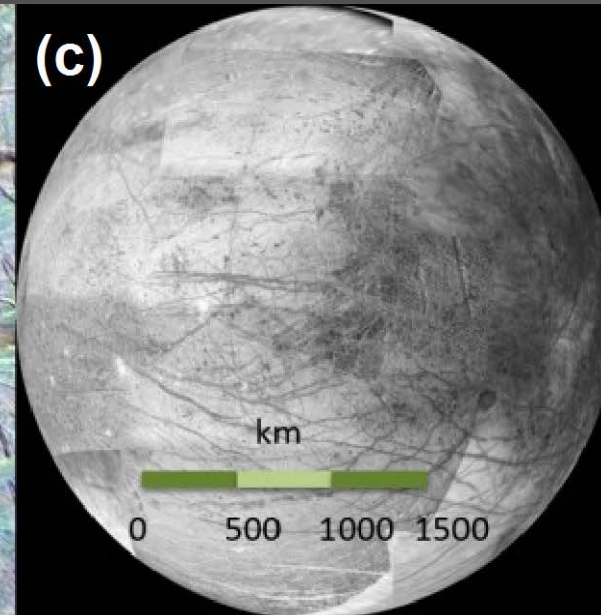
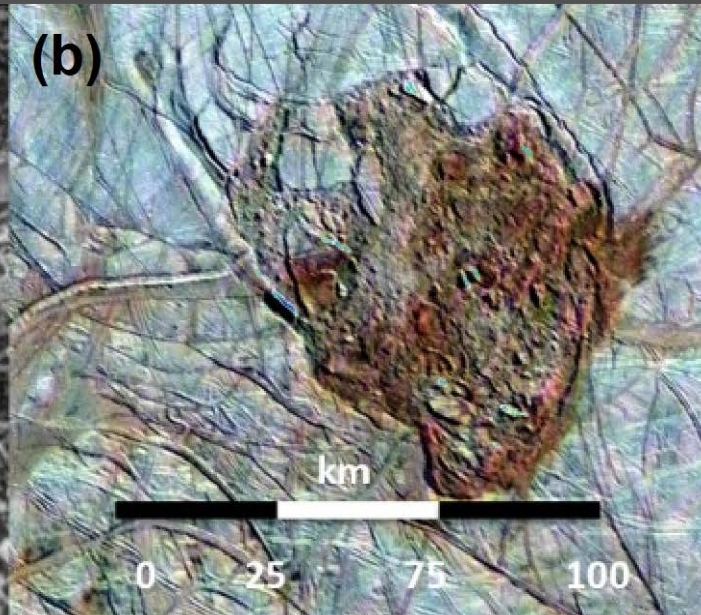
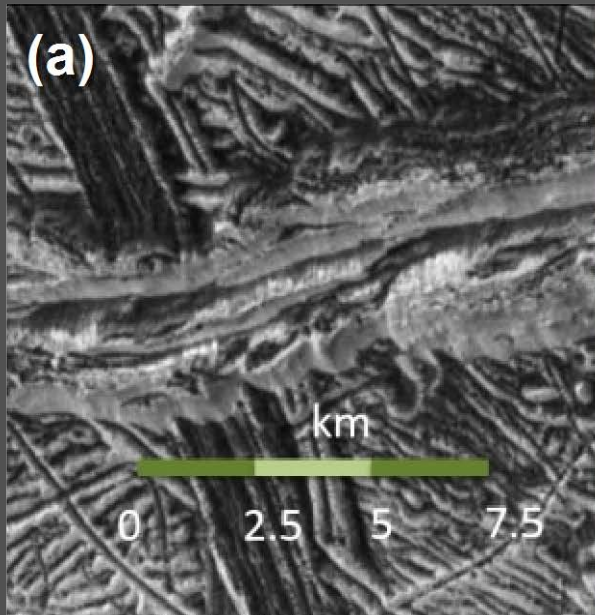
Regional

Global

(a)

(b)

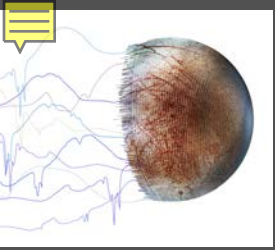
(c)



< 25 m / pixel

< 300 m / pixel

< 10 km / pixel

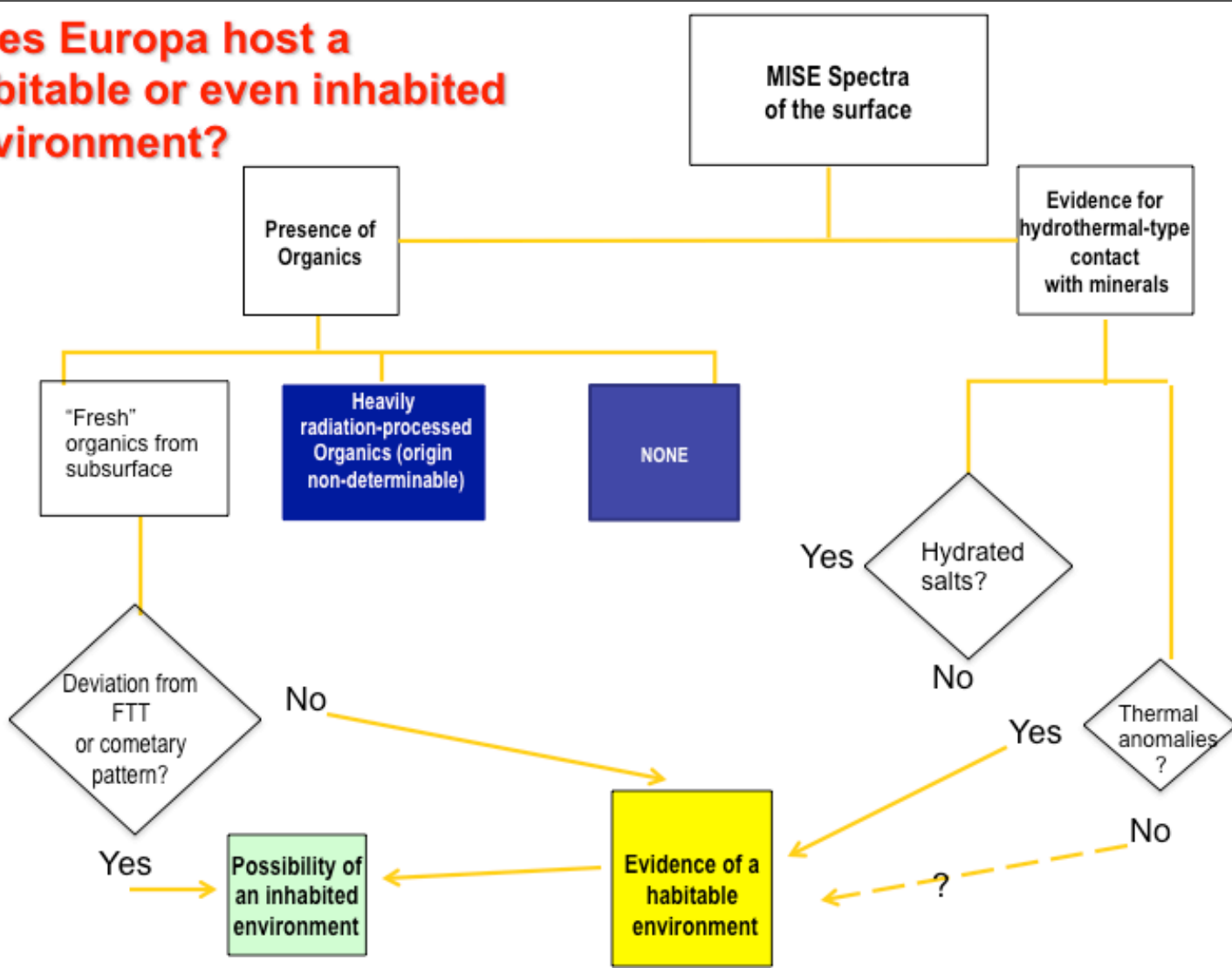


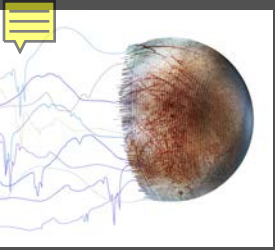
Assess Habitability

Map the composition and distribution of:

- Salts, Organics, Ices, and thermal anomalies

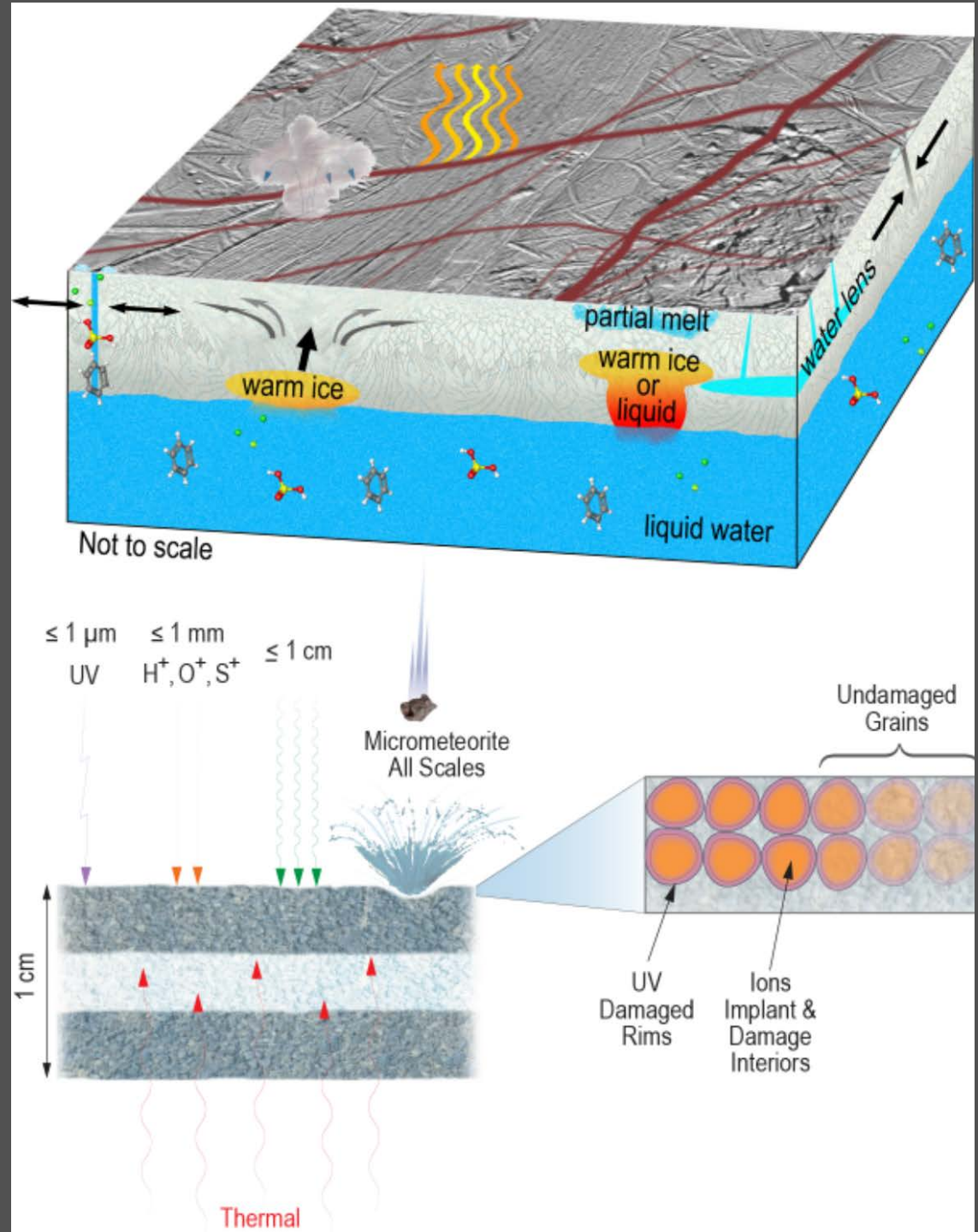
Does Europa host a habitable or even inhabited environment?





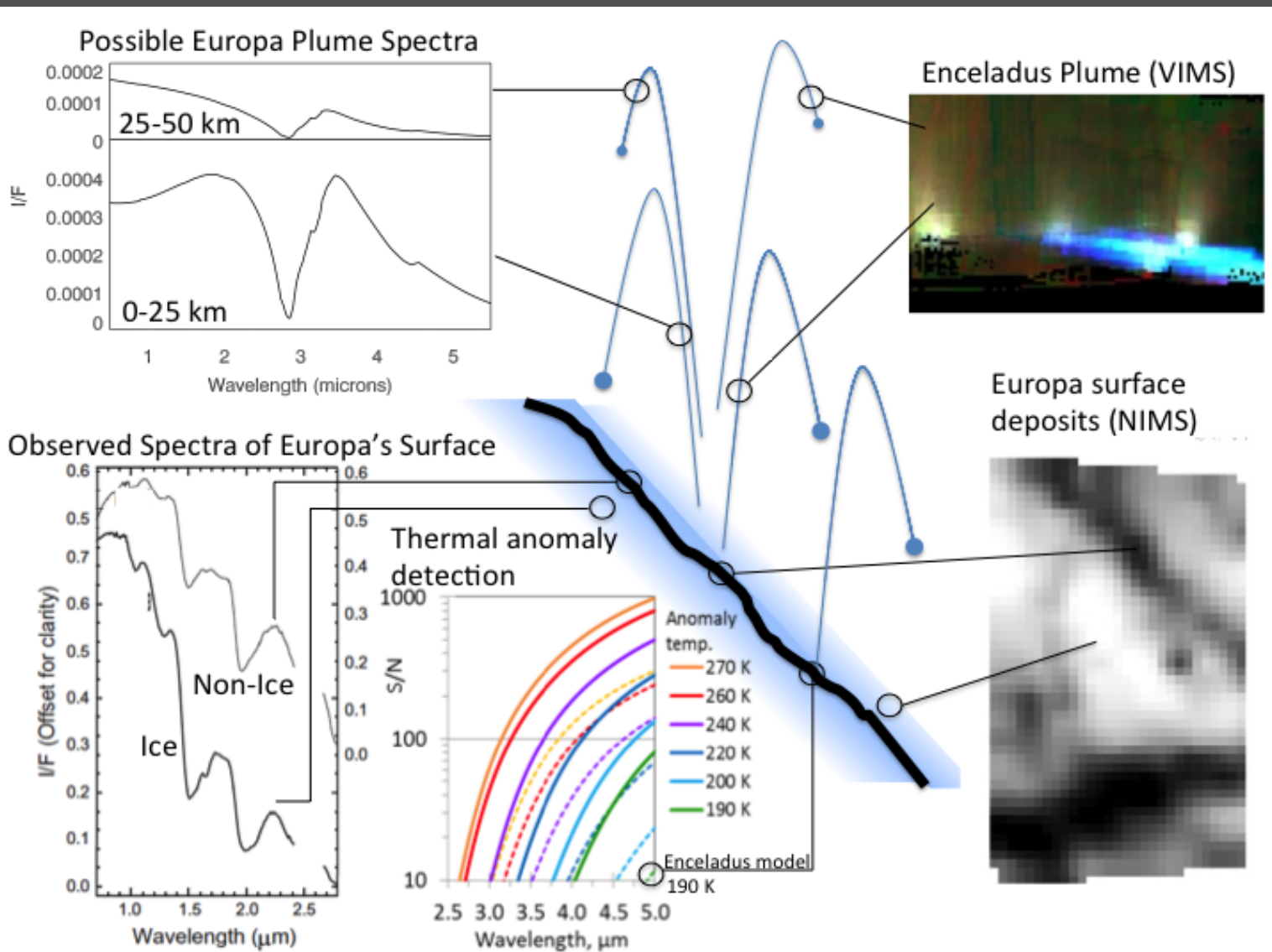
Geologic History

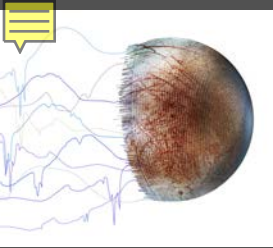
- Formation and Evolution
- Timing of Landforms
- Recent activity





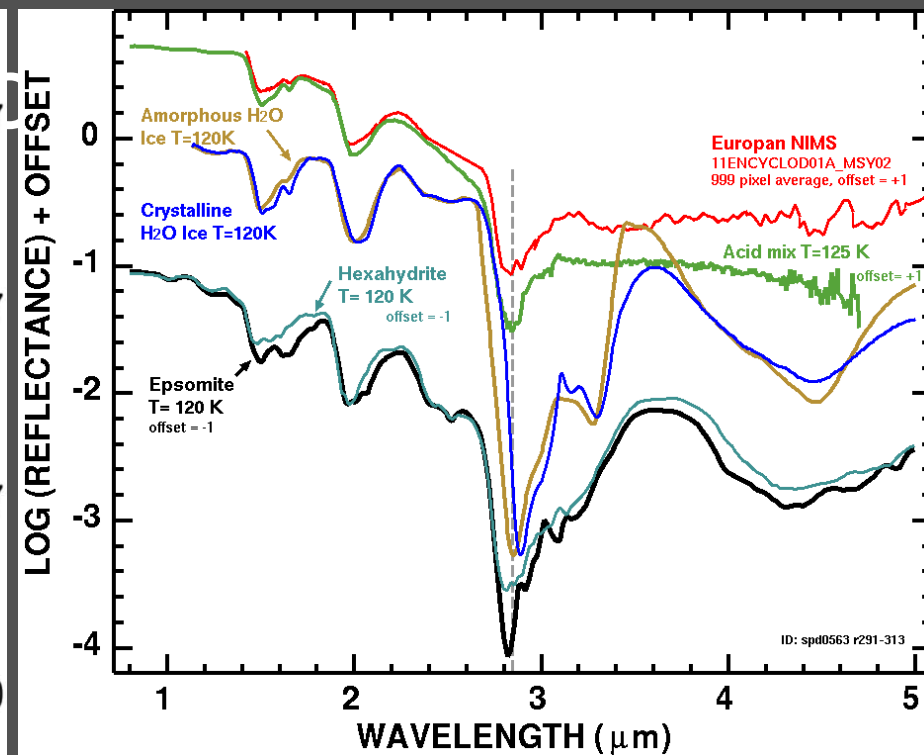
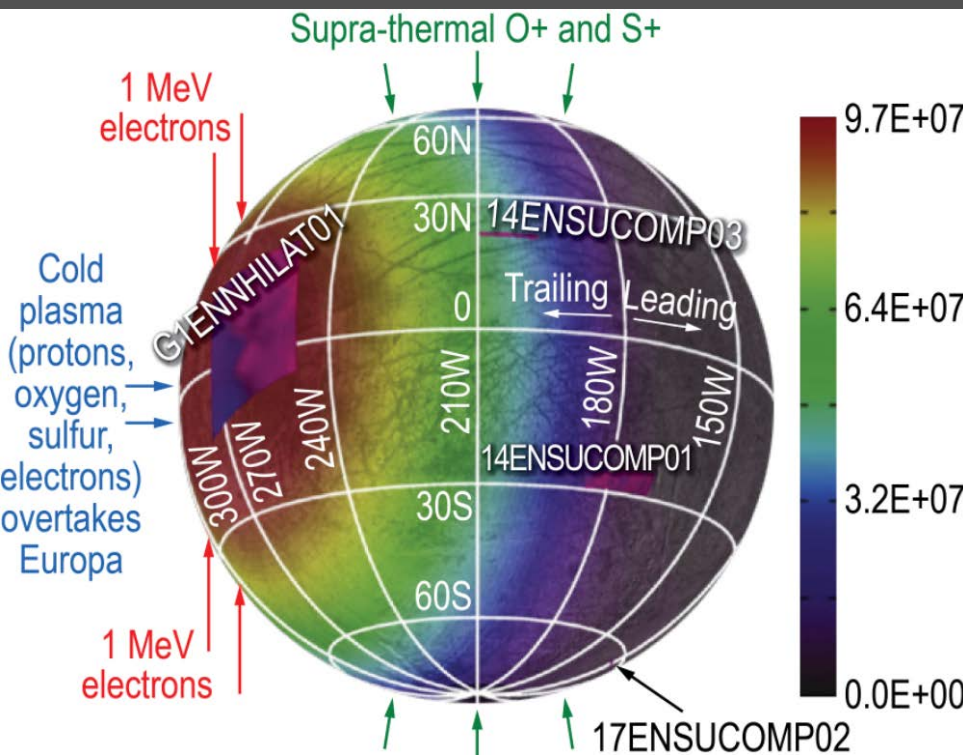
Current Activity-Plume Science

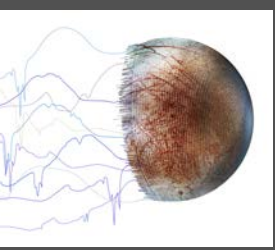




Surface Age?

Develop approaches to determine surface age via radiation implanted phases ice grain size and phase that can be used to identify 'young' or recently active areas even if not currently active.





Heritage and Radiation

Heritage:

- Imaging Spectrometer Heritage from JPL (Discovery M³ on India's Chandrayaan-1) and APL (CRISM on MRO).
- Extensive radiation and planetary protection risk reduction.

Radiation Testing Prototype



ICEE Prototype Spectrometer



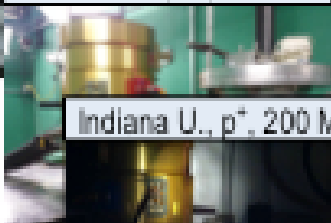
Test Shielding (1 of 3) Prototype Tested at Radiation Facilities



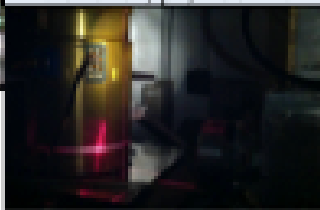
UC Davis, p⁺, 50 MeV



Brookhaven, e⁻, 70 MeV

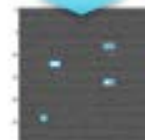
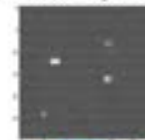


Indiana U., p⁺, 200 MeV

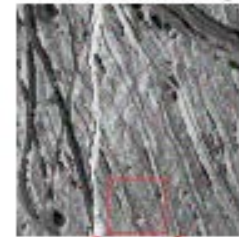


Onboard Hit Remediation Algorithms

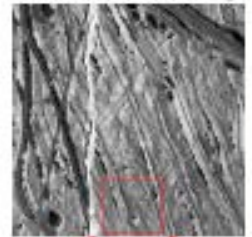
Locating Hits



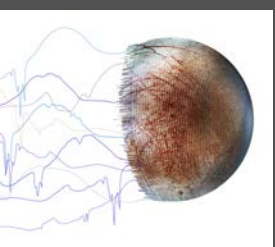
Pre-Processing



Post-Processing



Onboard algorithms detect pixels with radiation hits and exclude them. Algorithms then reduce residual radiation noise in MISE spectra.



Final Thoughts

MISE's compositional mapping at geologically relevant spatial scales will enable in depth and detailed investigation of Europa's habitability and geologic processes.

Please feel free to contact me or any MISE Team member if you have questions!

PI: Diana Blaney (JPL)

Deputy PI: Karl Hibbitts (APL)

- Rob Green (JPL)
- Roger Clark (PSI)
- Brad Dalton (JPL)
- Ashley Davies (JPL)
- Matt Hedman (U. Idaho)
- Yves Langevin (IAS)
- Jonathan Lunine (Cornell)
- Tom McCord (Bear Fight)
- Scott Murchie (APL)
- Chris Paranicas (APL)
- Frank Seelos (APL)
- Jason Soderblom (MIT)

