Young Lunar Volcanic Features: Thermophysical Properties and Formation

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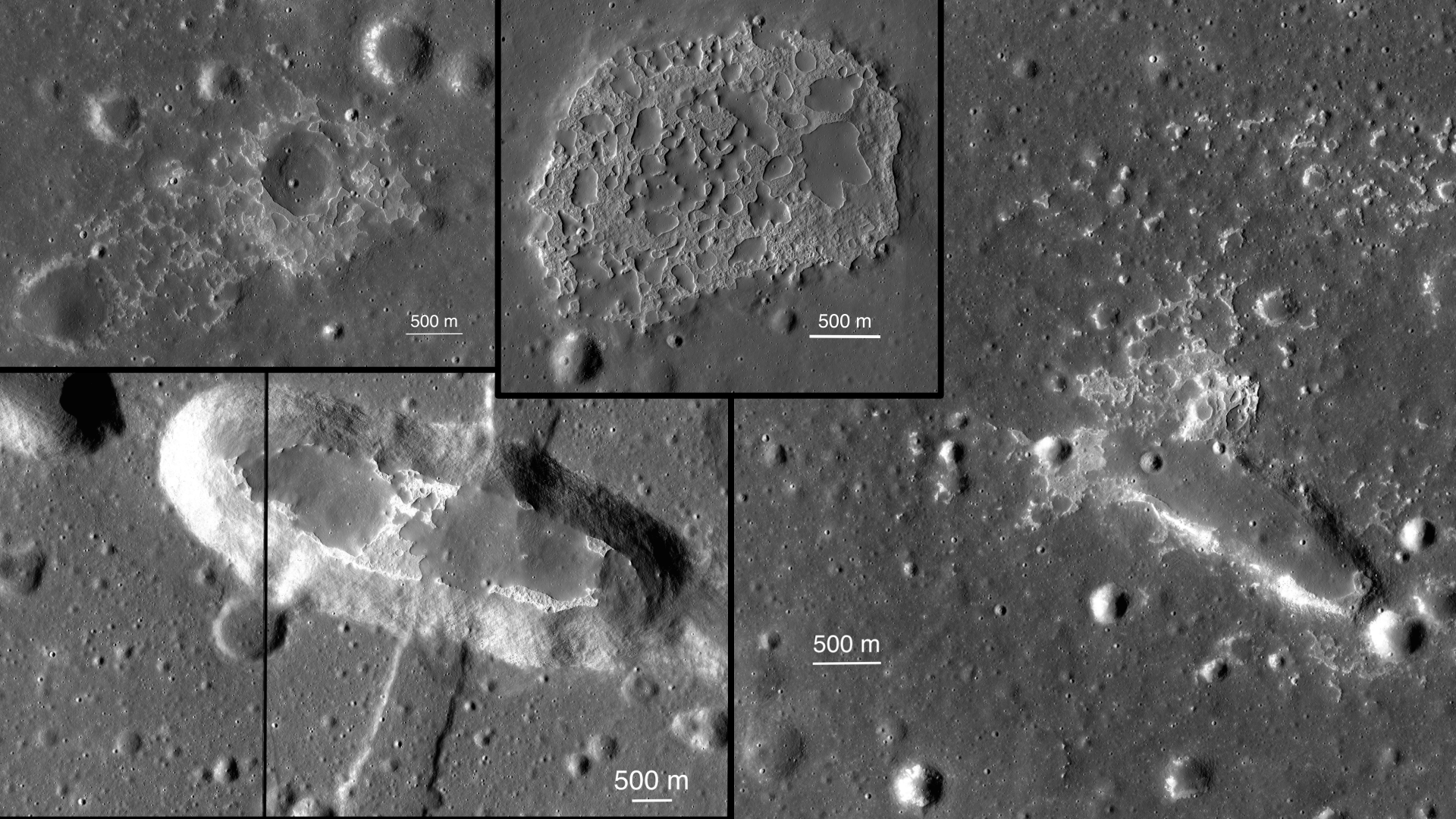

500 m
500 m
500 m
500 m

Irregular Mare Patches (IMPs)

- 10's of Myr old (crater counting, spectral maturity, topographic relief)
  - The Moon should not have been volcanically active this recently!
- Spectra resemble freshly exposed high-titanium basalts (Clementine, M^3)
- Several IMPs are surrounded by low albedo halos
- Radar indicates that Cauchy-5 and Hyginus are surrounded by fine-grained, block-poor halos (Arecibo, Green Bank)

500 m

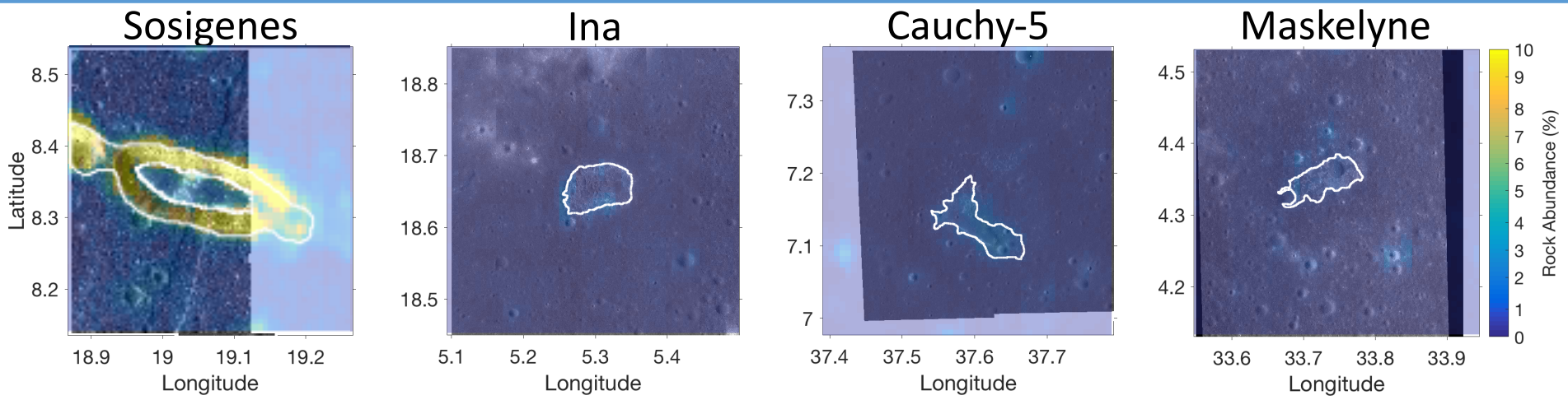
500 m

500 m

Formation Hypotheses

- Explosive outgassing (Schultz et al., 2006)
- Lava flow inflation (Garry et al., 2012)
- Pyroclastic eruptions (Carter et al., 2013)
- Regolith drainage due to seismic shaking (Qiao et al., 2016)

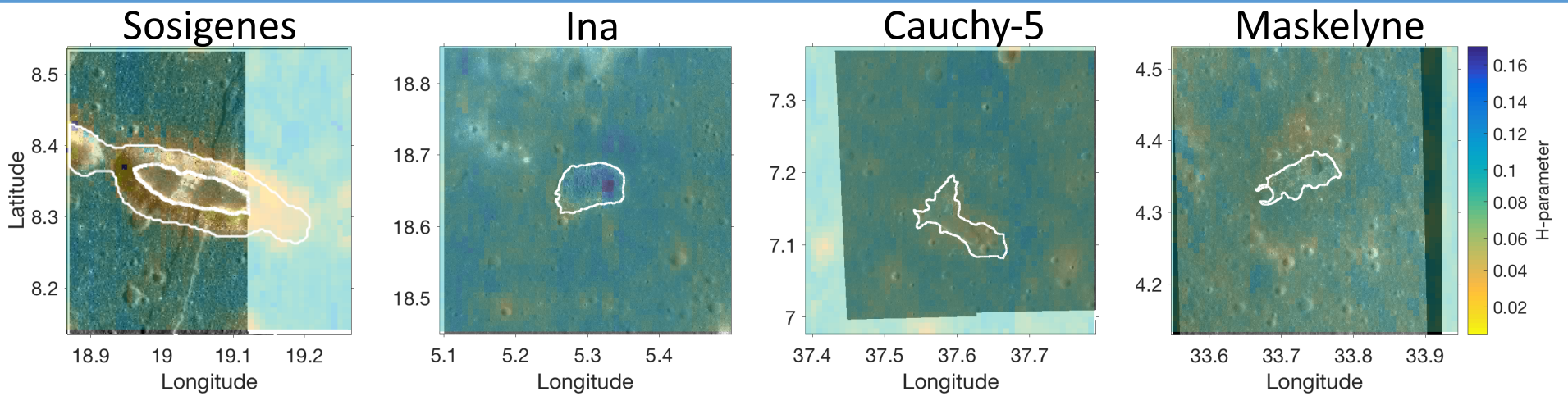
Diviner Rock Abundance

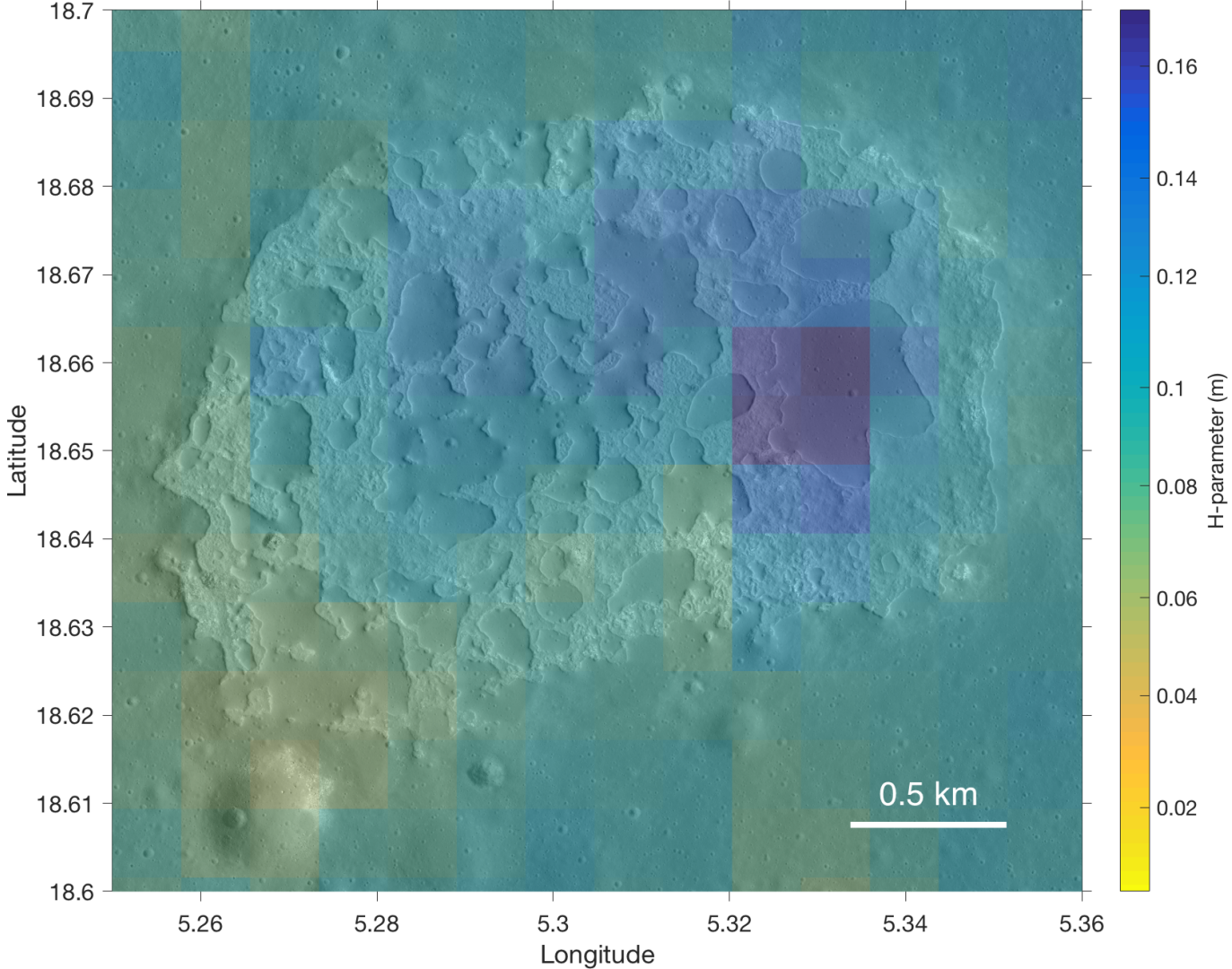


	Sosigenes	Ina	Cauchy-5	Maskelyne	Global average
RA	1.9%	0.7%	1.2%	0.8%	0.4 %

See Bandfield et al. (2011) for description of method

Diviner H-parameter




18.7
18.69
18.68
18.67
18.66
18.65
18.64
18.63
18.62
18.61
18.6
Latitude
5.26
5.28
5.3
5.32
5.34
5.36
Longitude
0.5 km
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
H-parameter (m)

Implications

	Seismic Drainage	Lava Flows	Removal by Outgassing	Pyroclastic Eruption
Rock Abundance	✔	✔	✔	✔
Thermal Inertia				

Implications

	Seismic Drainage	Lava Flows	Removal by Outgassing	Pyroclastic Eruption
Rock Abundance	✔	✔	✔	✔
Thermal Inertia	✘	✘	✔	✔

Conclusions

- Basaltic lava flows or seismic drainage of regolith
  → Cannot explain low thermal inertia material, dark halos, or radar observations
- Pyroclastic eruptions
  → Could explain all observations

Basaltic lava flows or seismic drainage alone cannot explain irregular mare patches (IMPs)