The Boulder Content of Midlatitude Ground Ice on Mars

#2613

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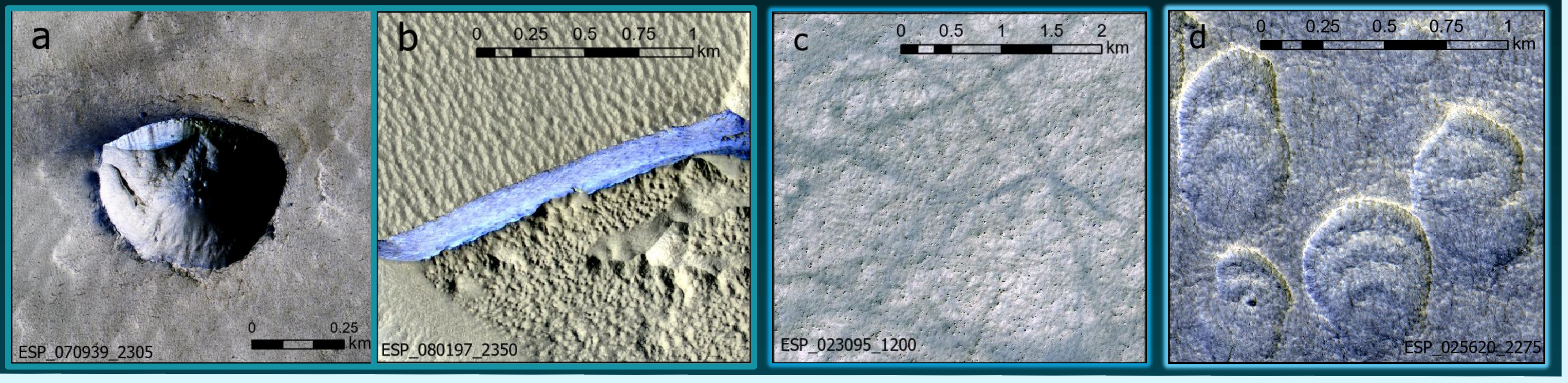
By quantifying the size-frequency distributions of boulders on ice sheets and around craters, we can understand the origin of boulder emplacement, which can inform us about the climate and habitability of Mars over time and provide insight for future in situ missions.

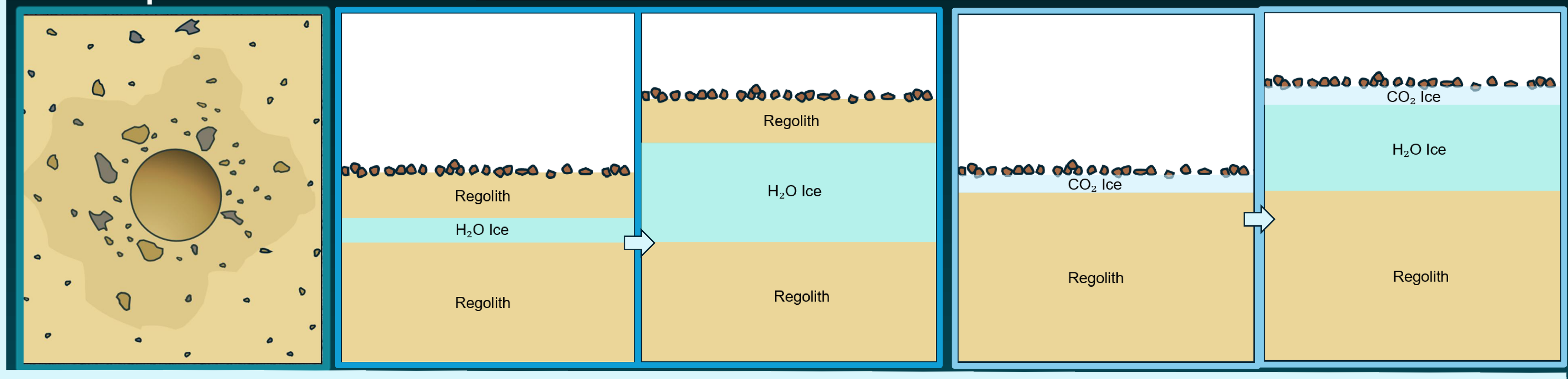
Observations

Exposed ice | Boulders on icy terrain | Sublimation thermokarsts



Hypotheses

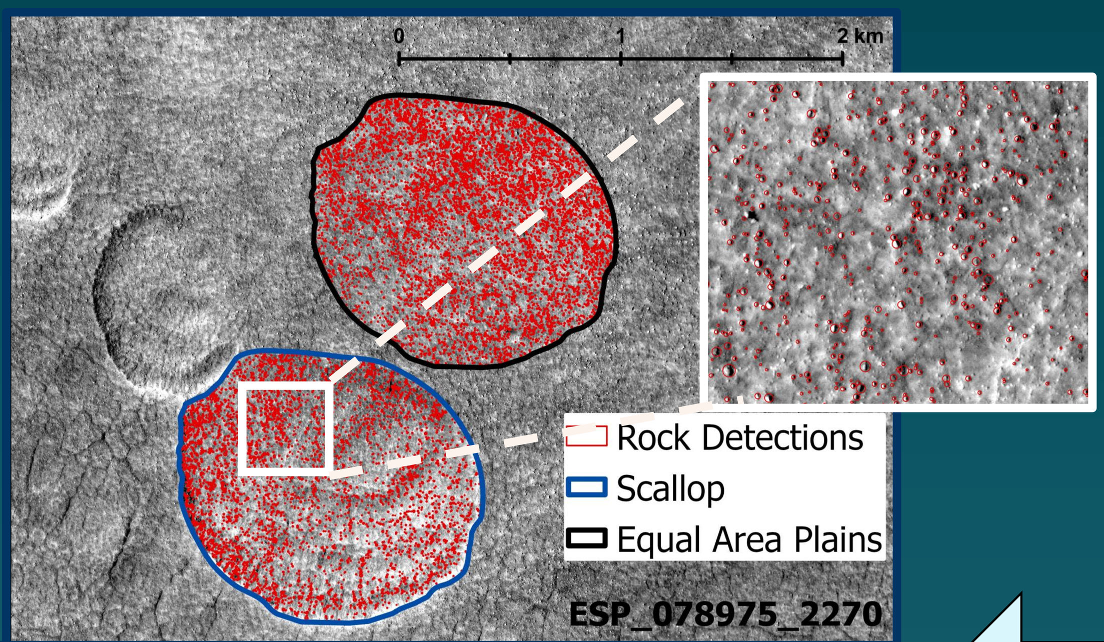
1. Impacts
2. Ice lenses
3. Seasonal frosts

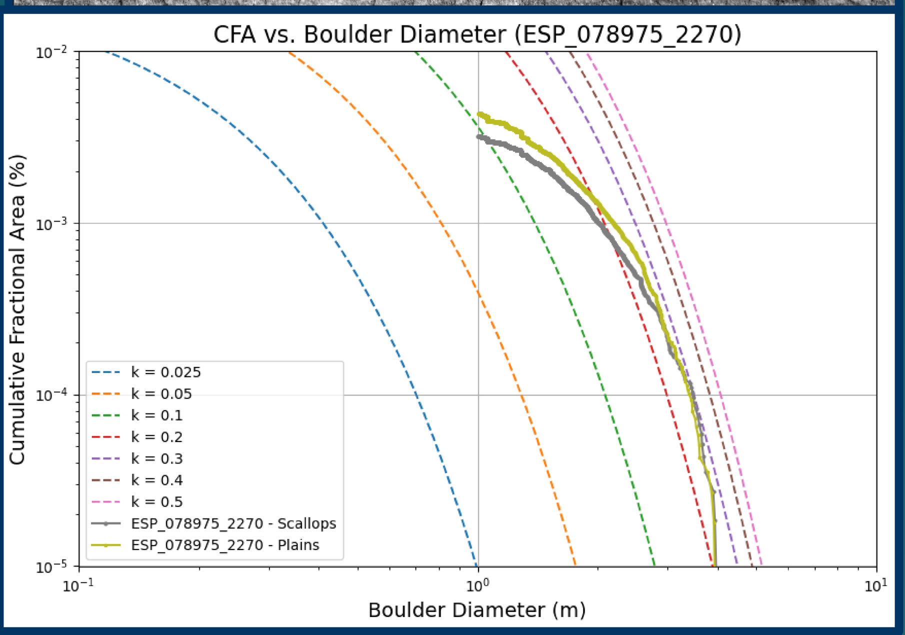


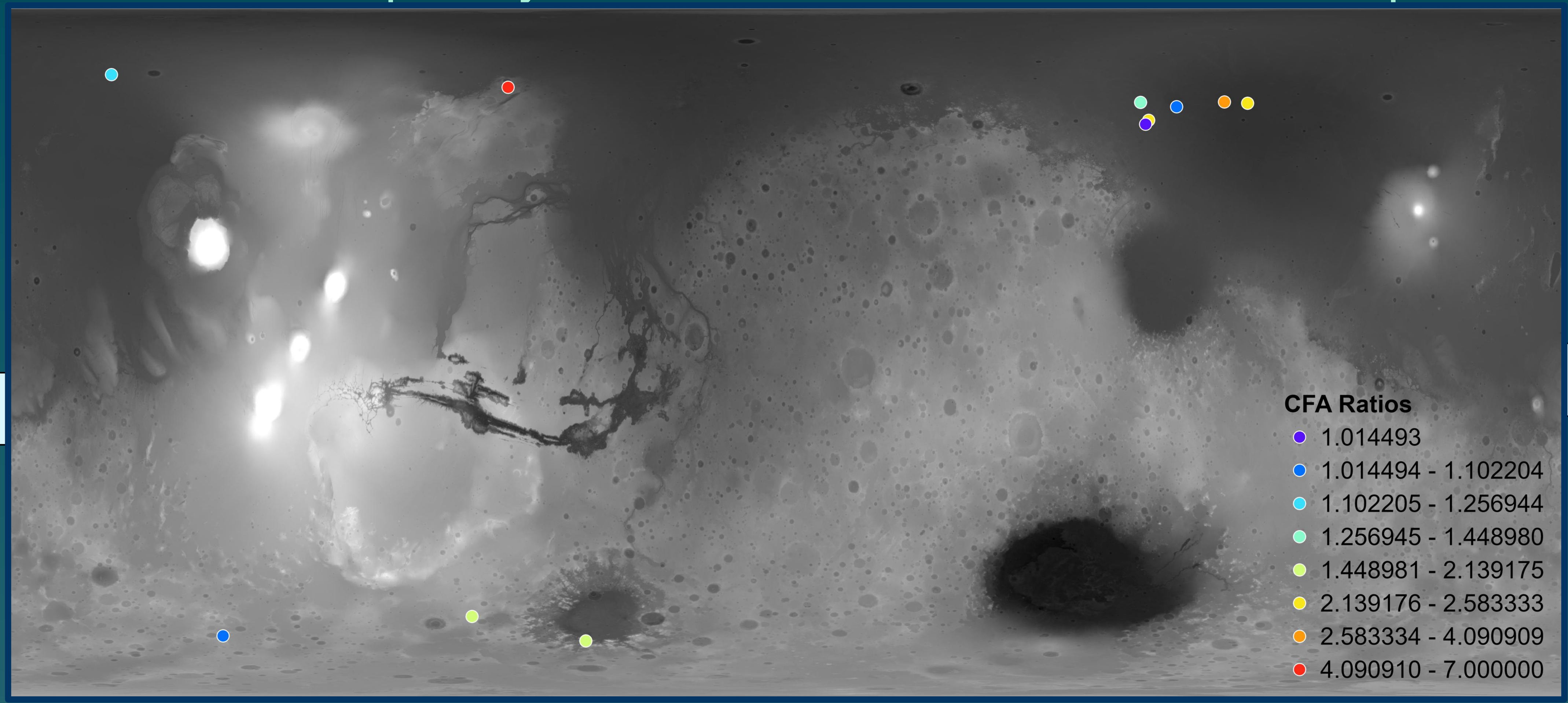
Target Feature 1: Sublimation Thermokarsts ("scallops")

Boulder Size-Frequency Distribution Ratios Between Scallops & Plains

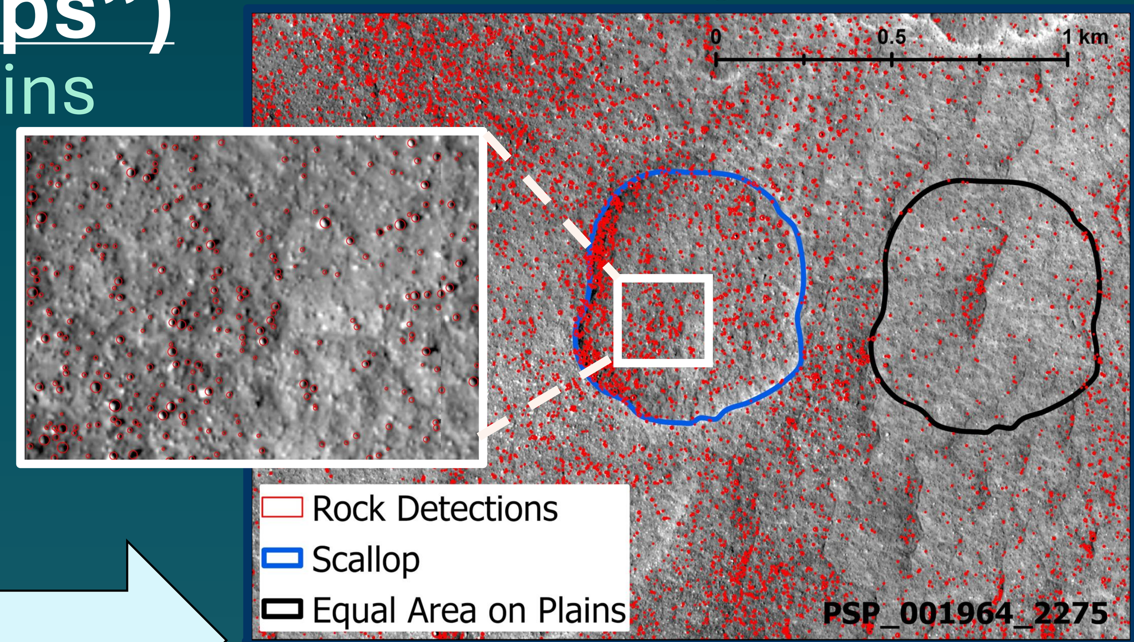
Small

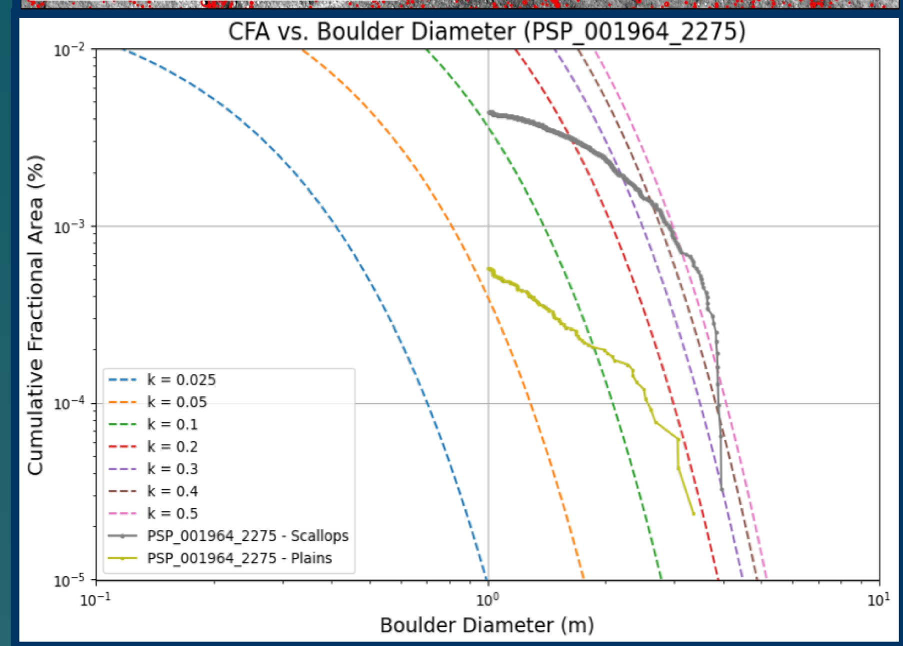






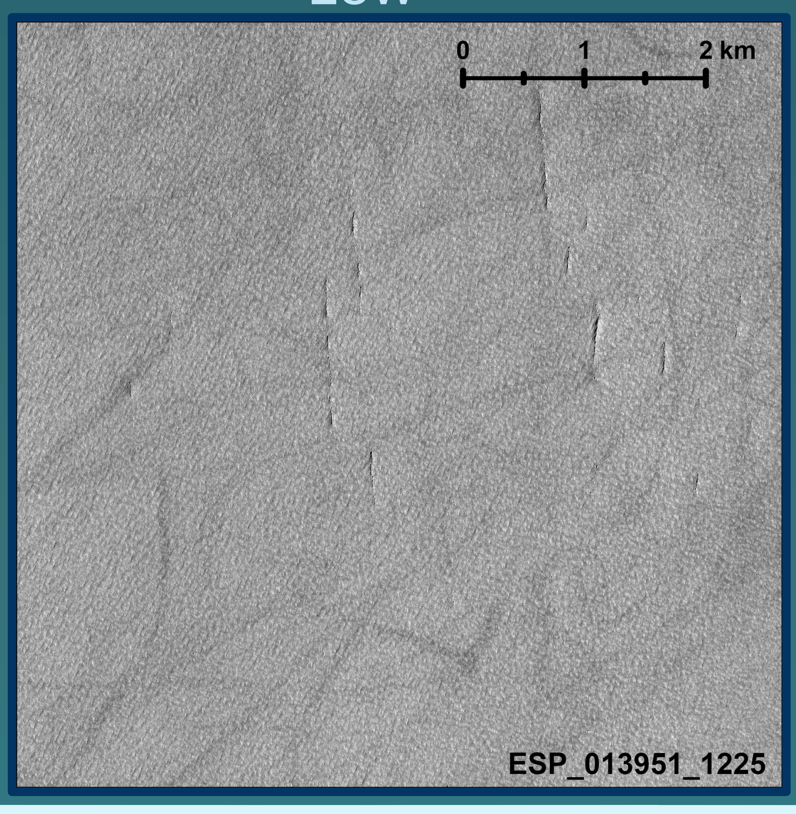
Large

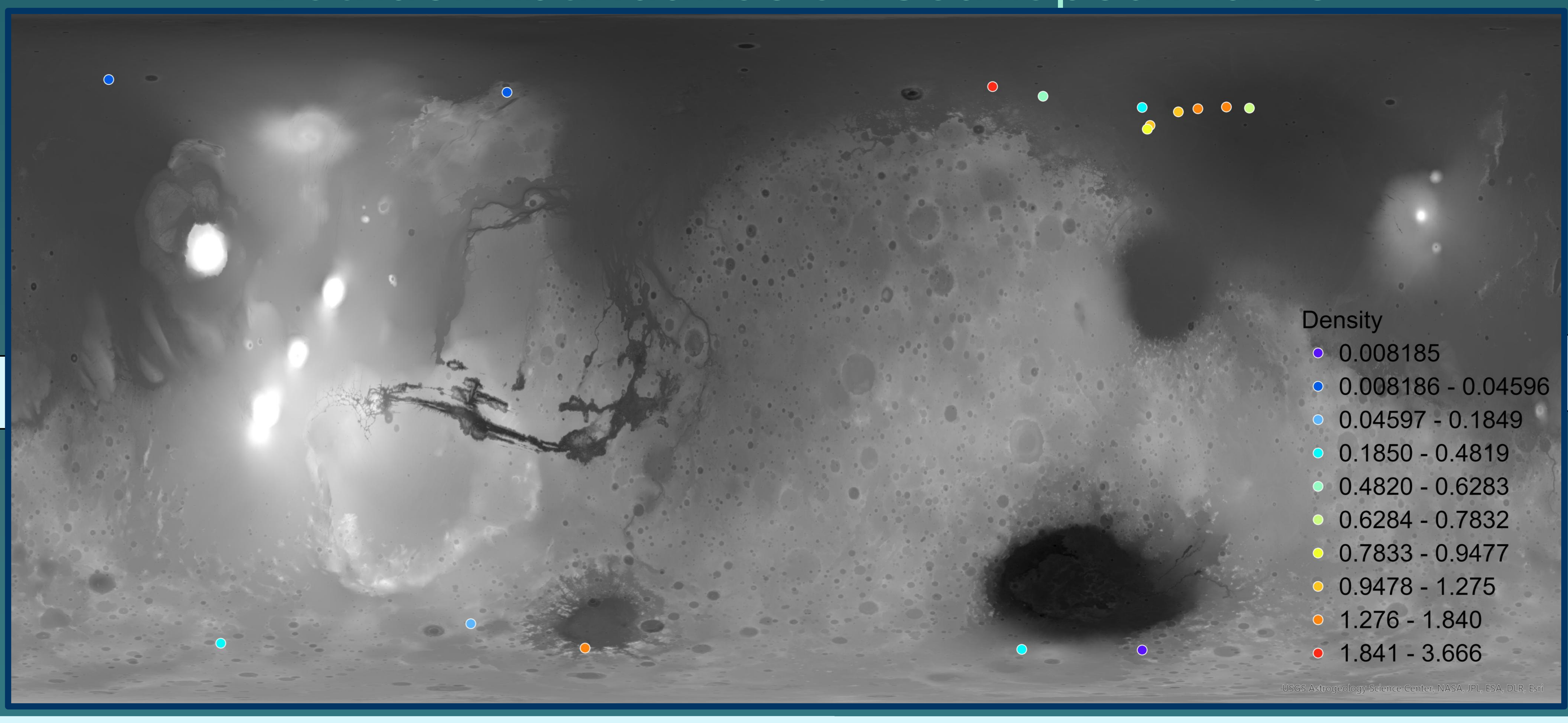




Boulder Abundance on Scalloped Plains

Low





High

Preliminary Results

- All surveyed boulder cumulative fractional areas (CFA) show scallops contain more boulders than the surrounding plains (ratios ≥ 1)
- Most boulder abundances analyzed are low (few rocky plains)
- Variations in CFA ratios inform us about boulder-ice content

Other factors to consider

- Non-uniform distribution of boulders within ice
- Trapping of fine-grained material (either from a sublimation lag or an exogenous source) within scallop pits
- Longitudinal variations in icy-mantle density, porosity, and composition

Future Work

- Survey icy landforms (scallops, icy scarps, boulder halos) globally for boulder-ice content
- Analyze the morphology of:
  - Features (slopes, circularity, layering, depths, uniformity)
  - Local area (specific landforms, regional influences, or triggers)

References

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