Mapping Geologic Surfaces

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05/25/2018

Goals

- **Start with:** Raw DN data from the PGC (georeferenced tiffs)

- **End with:** Land surface characterization, first attempt at automatically identifying surfaces based on spectral properties

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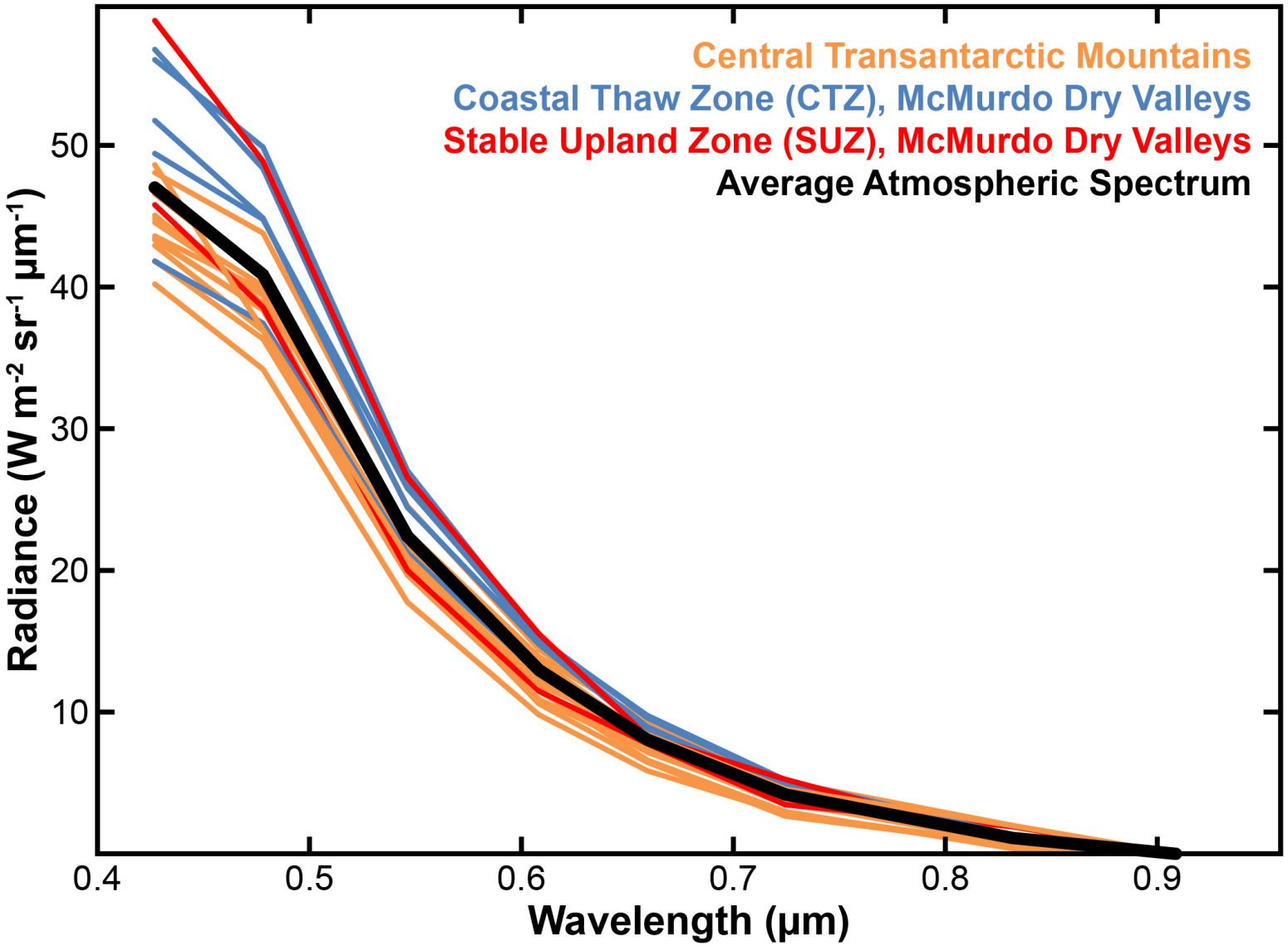
- **Start with:** Raw DN data from the PGC (georeferenced tiffs)
  - Convert **raw DN data** to **top-of-atmosphere radiance**
  - Utilize shadowed landscapes to derive the **spectral signature of atmosphere**
  - Remove **snow/ice/water** using spectral ratios and parameters
  - Remove **shadows** using spectral ratios and parameters
  - Convert **top-of-atmosphere radiance** to **surface radiance**
  - Remove **topographic influences** using PGC-derived **digital elevation models**
  - Convert **surface radiance** to **surface reflectance**
  - Derive **spectral parameters** to isolate different types of **surfaces** and **lithologies**
  - Apply spectral parameters and explore ***parameter space*** to identify unique clusters
  - **Define boundaries** to unique clusters and **assign different surface types**
- **End with:** Land surface characterization, first attempt at automatically identifying surfaces based on spectral properties

Atmospheric Correction



Derived atmospheric spectra from several images throughout the Transantarctic Mountains – lots of variety!

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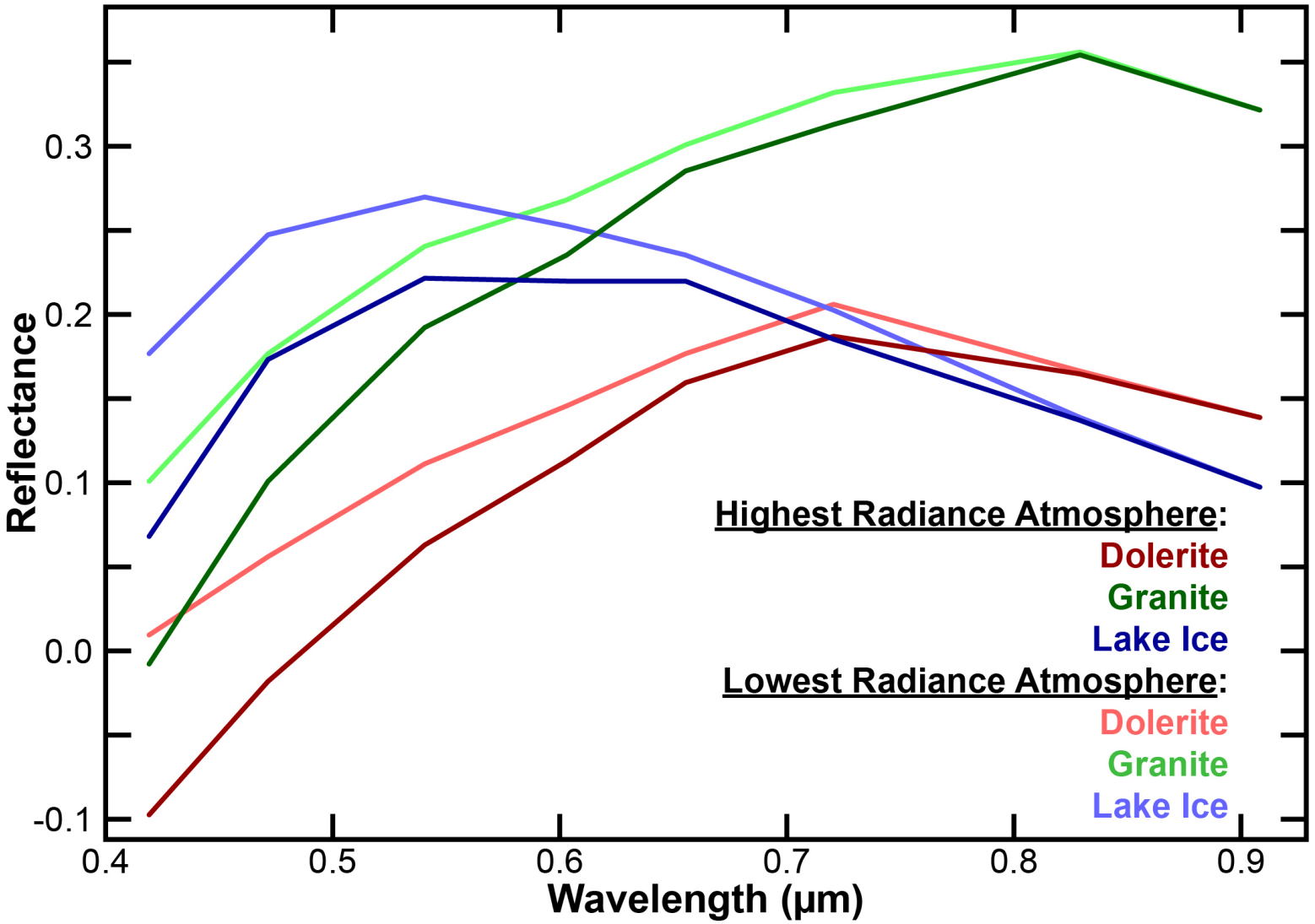

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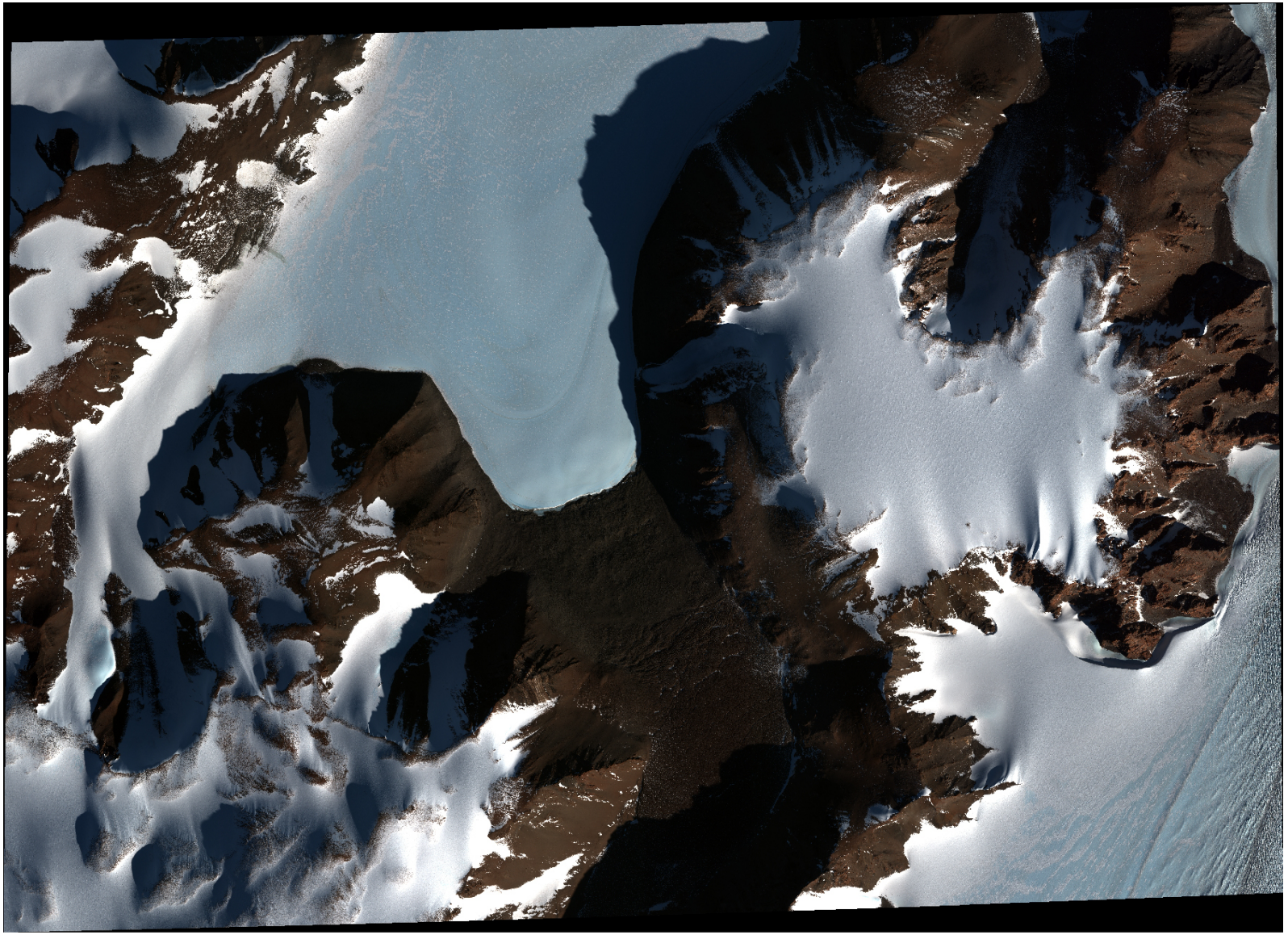
Complex Surfaces



WorldView-2 Image 17JAN14172418-M1BS-056683270010 | Ong Valley, Miller Range, Antarctica | True Color Visible Image

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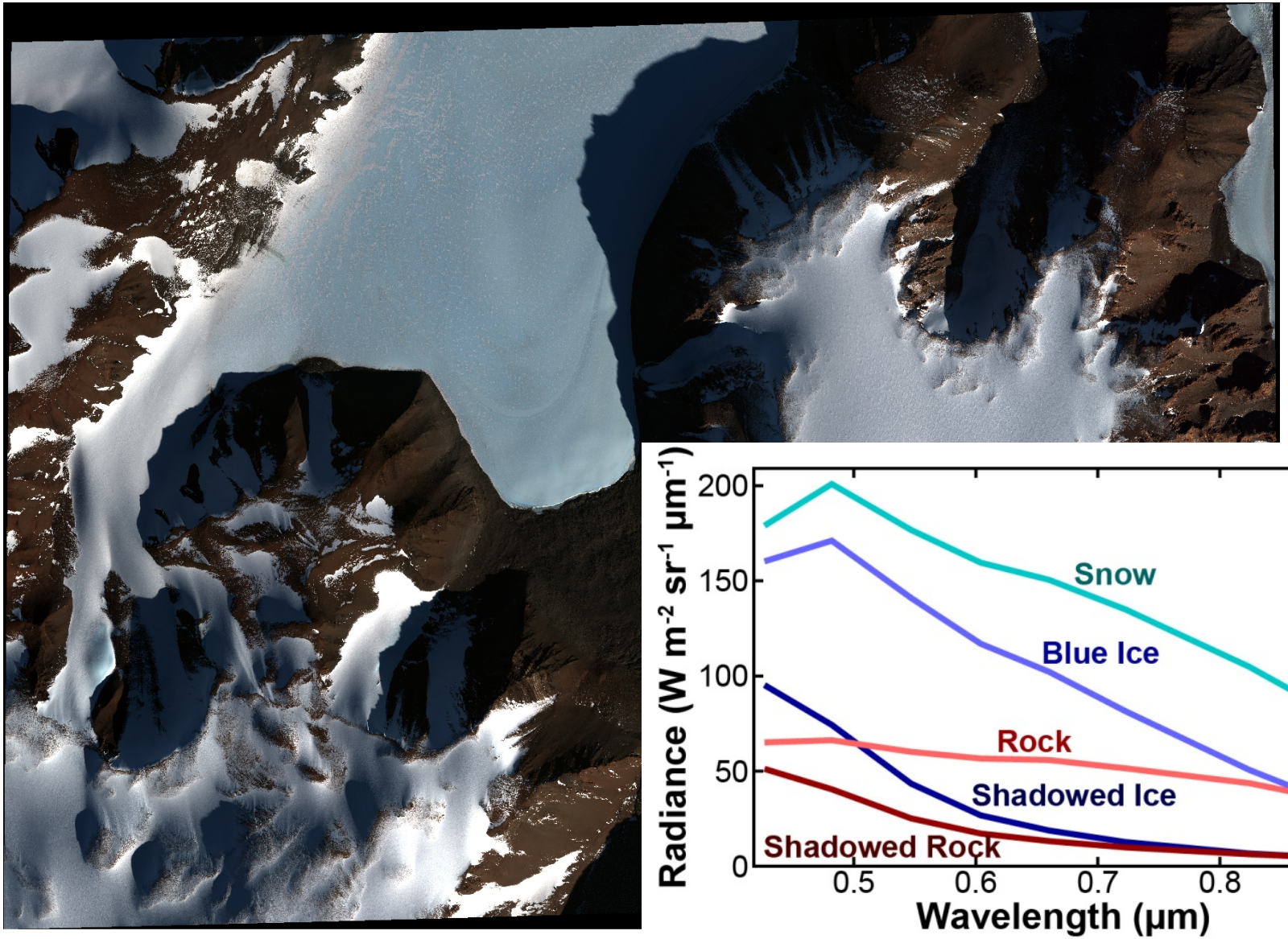

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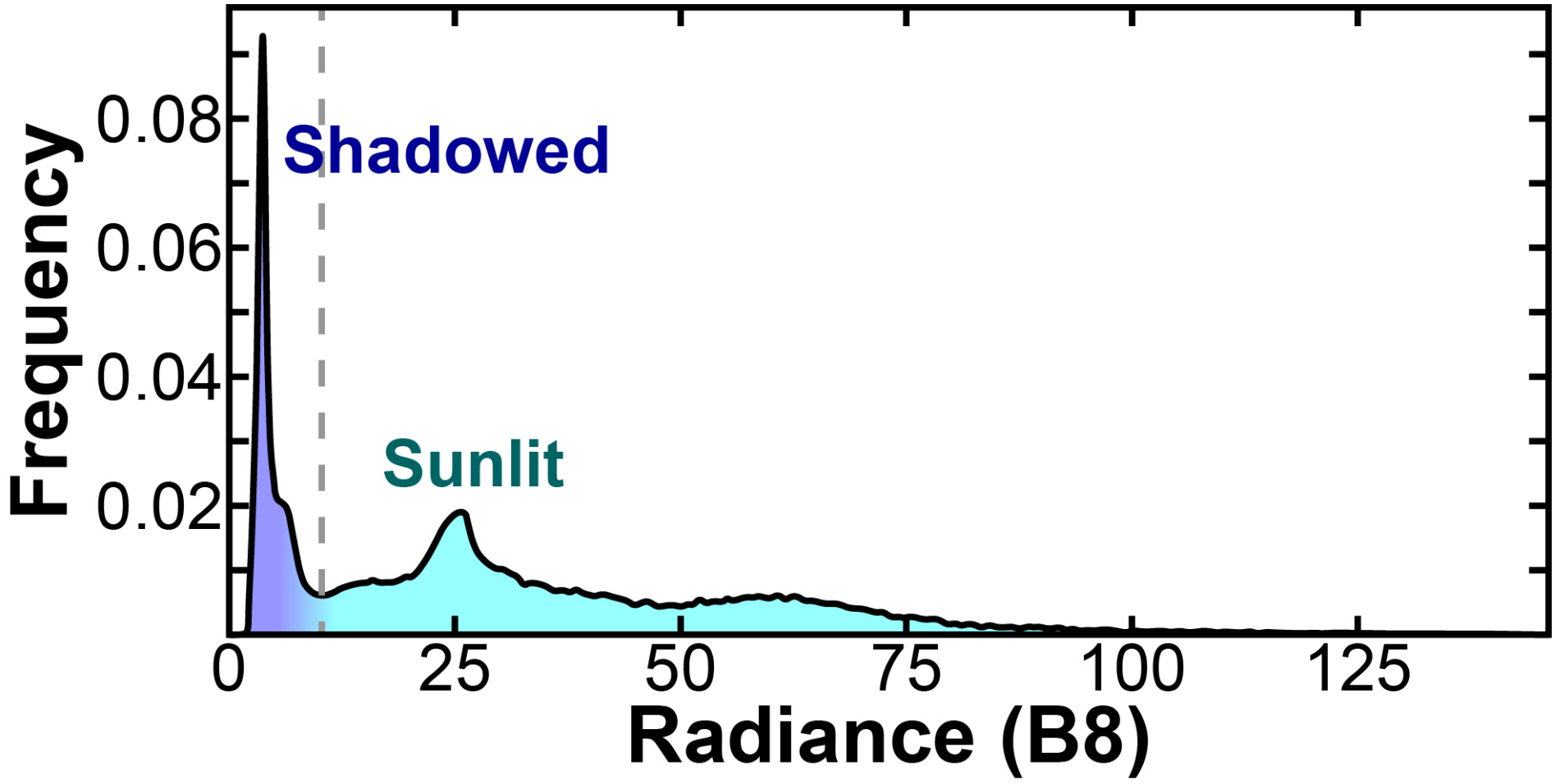
Spectral Separability



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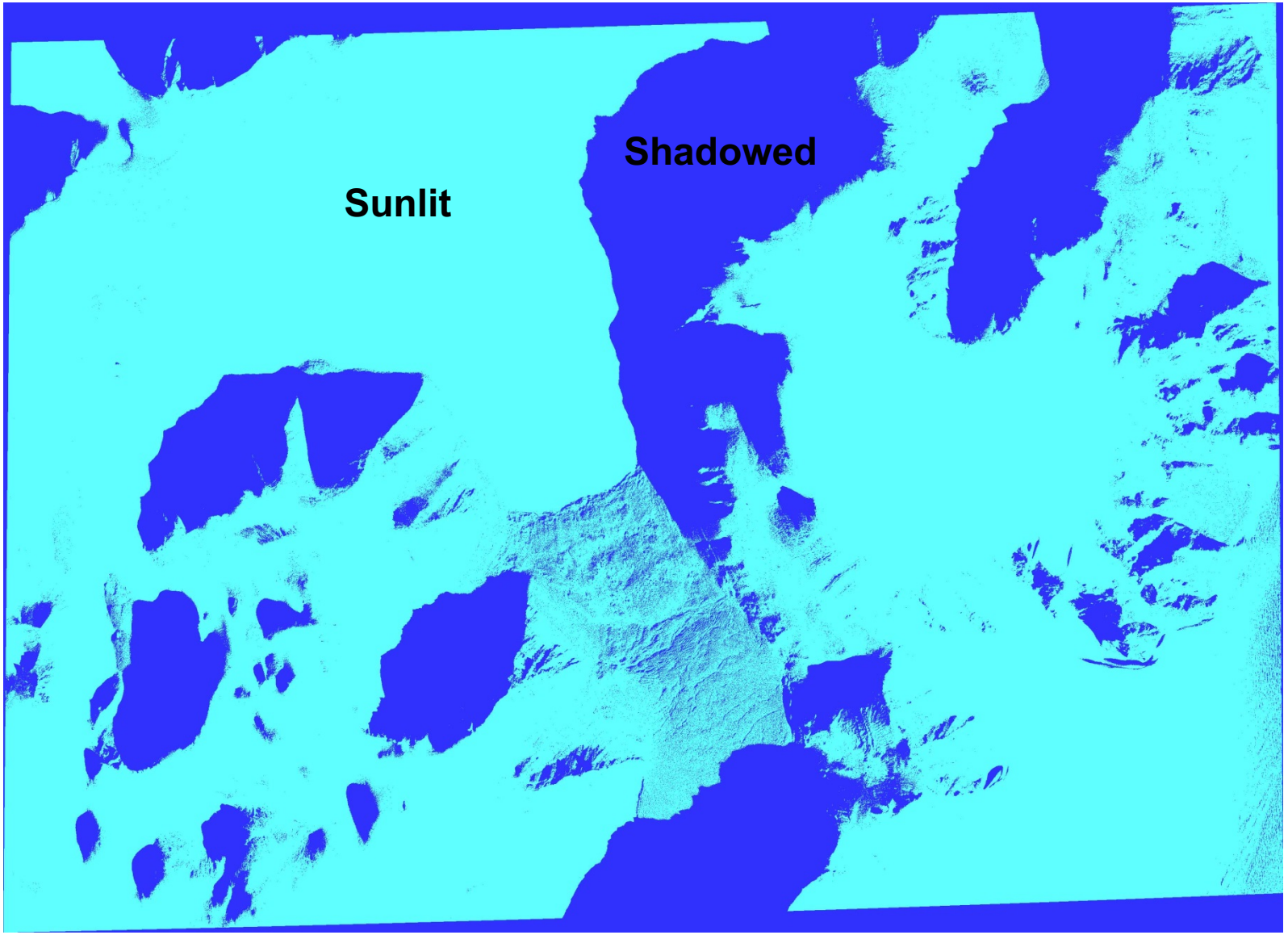

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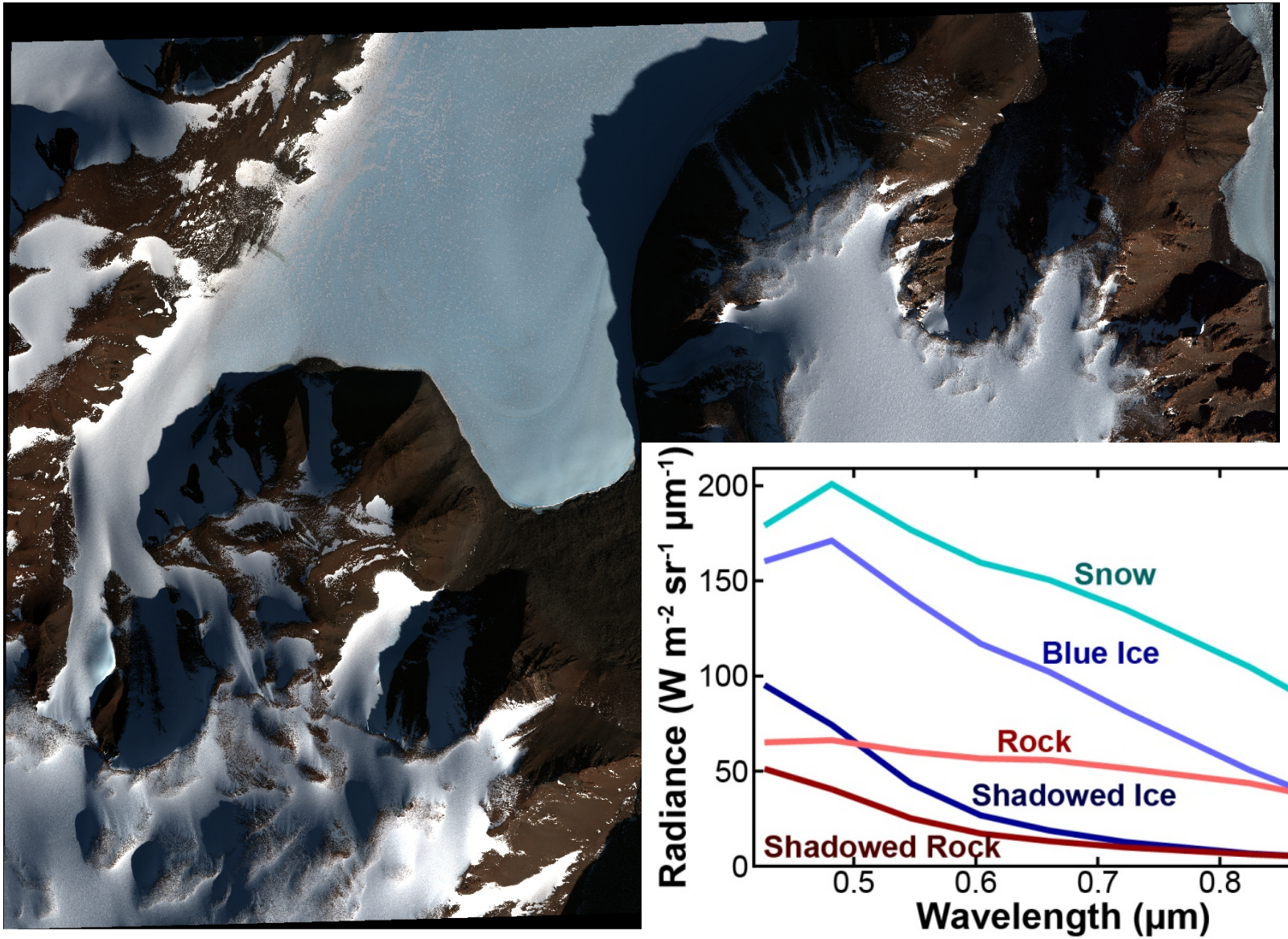

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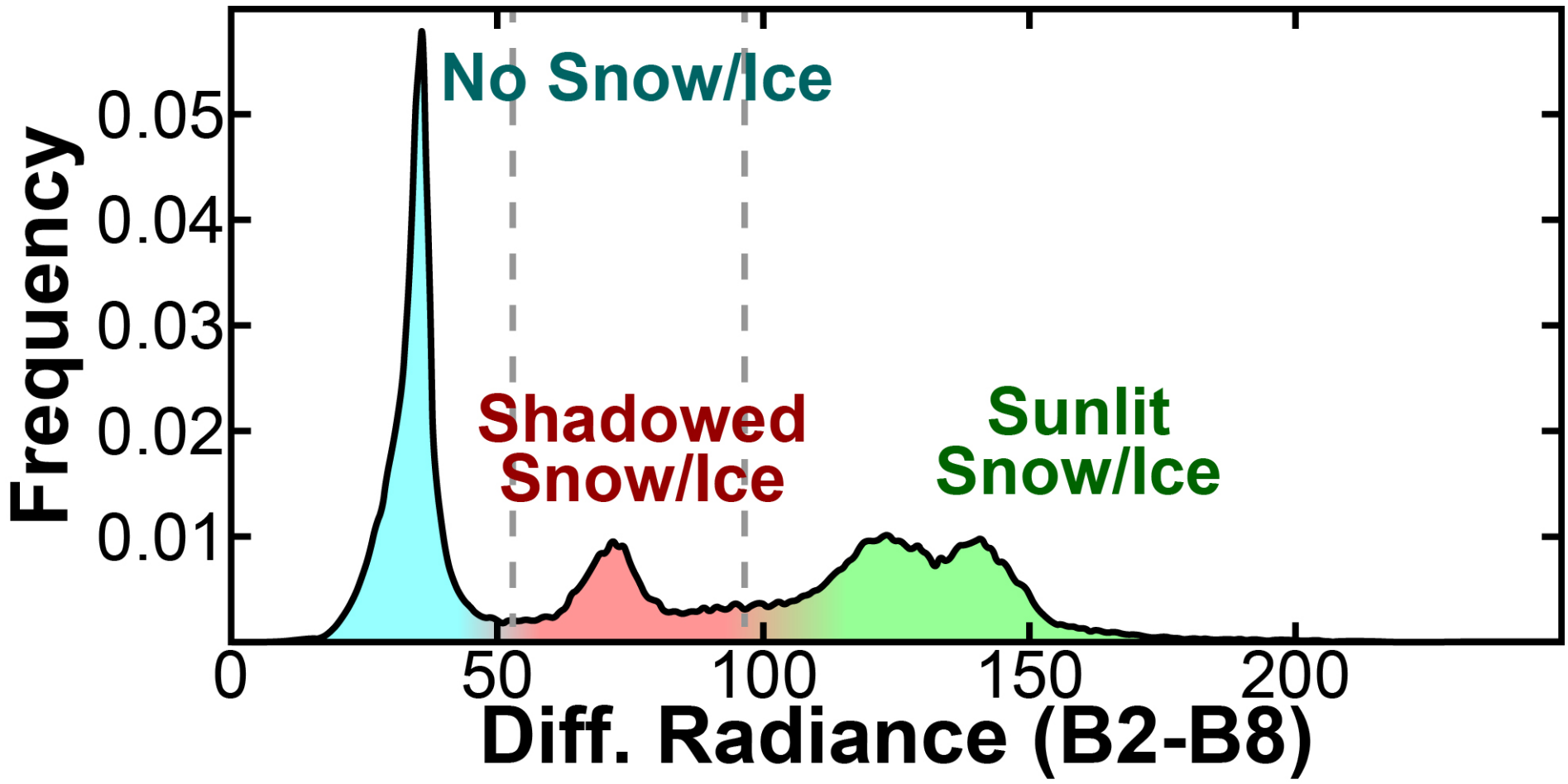

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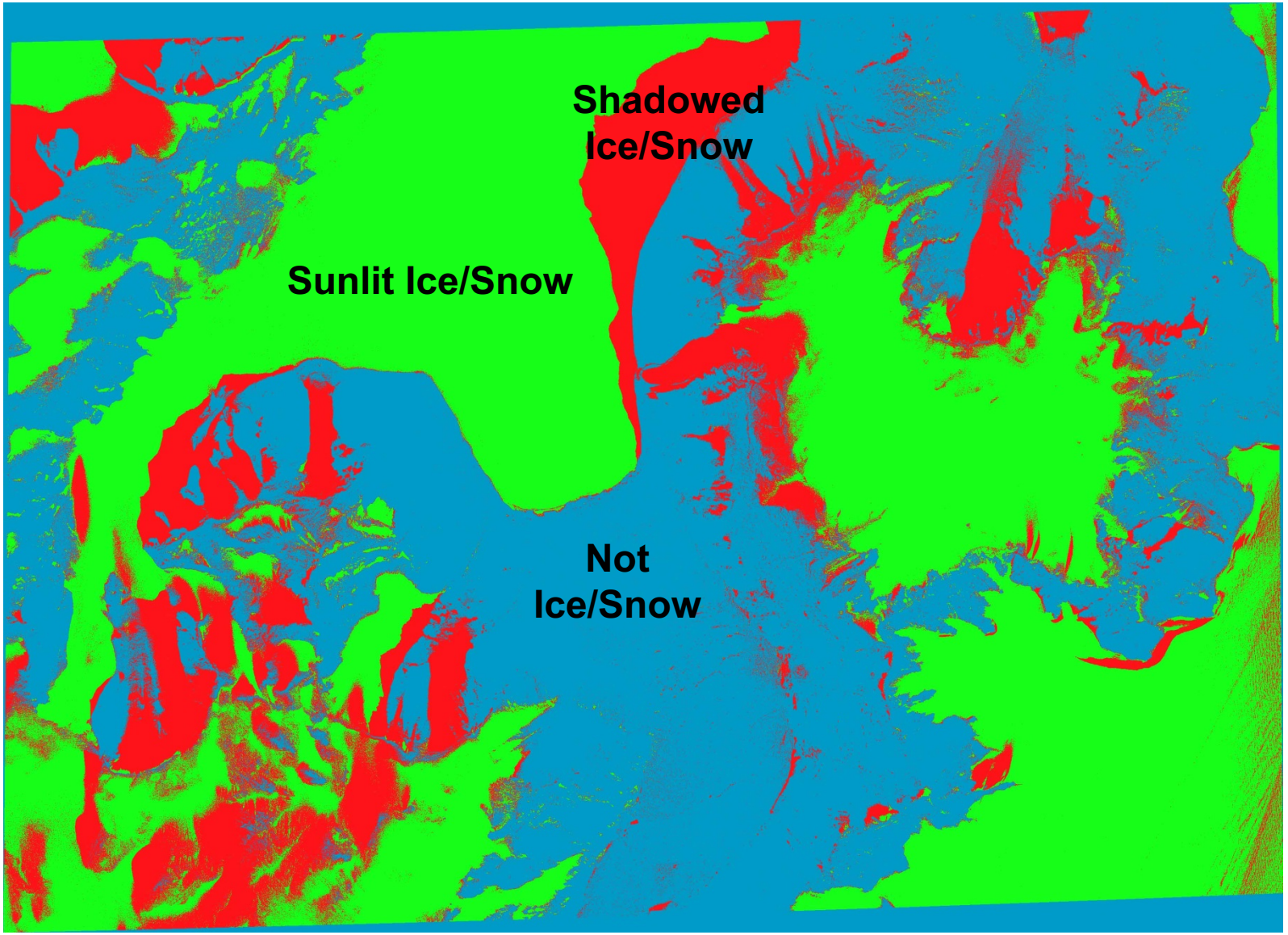

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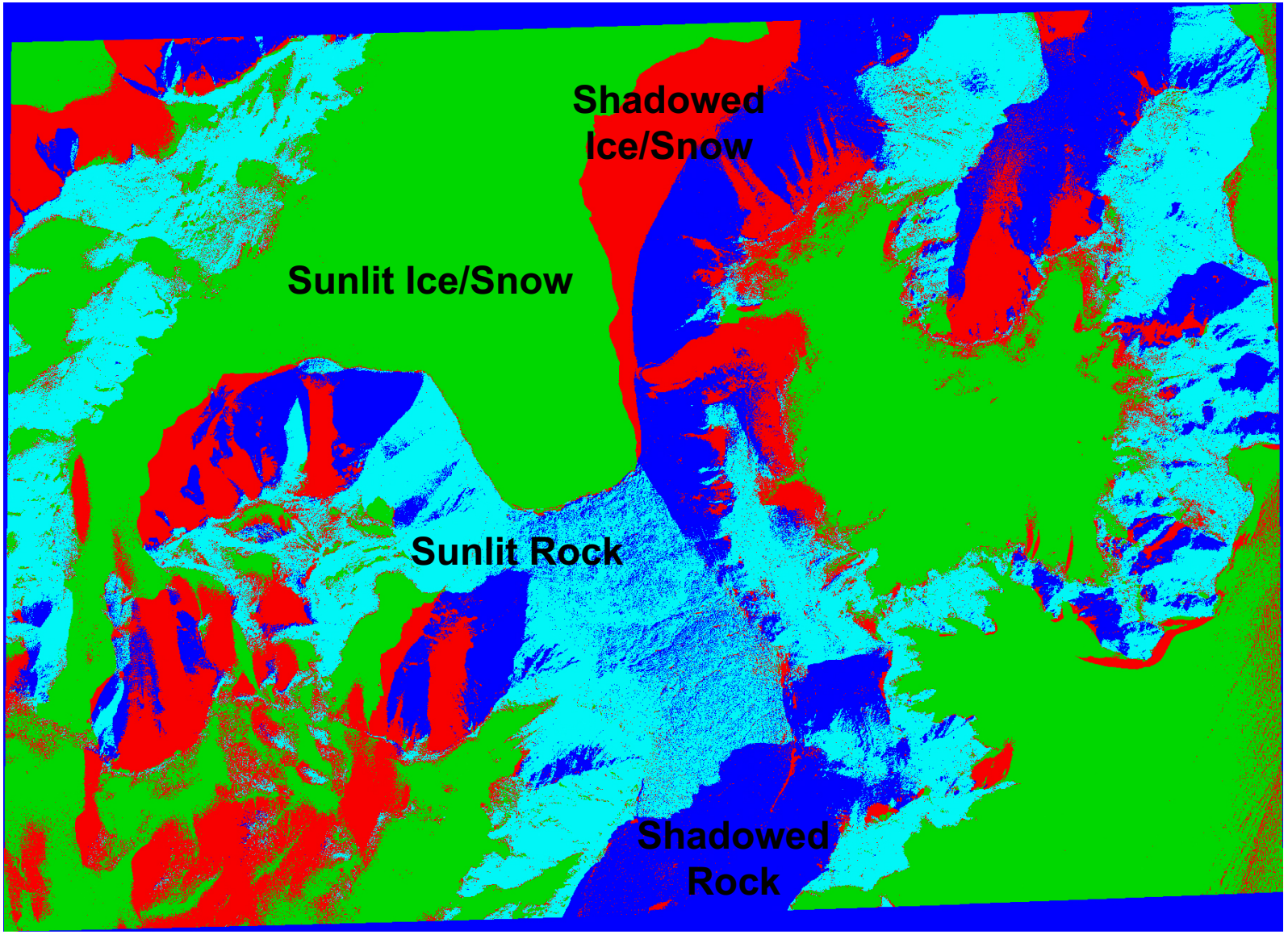

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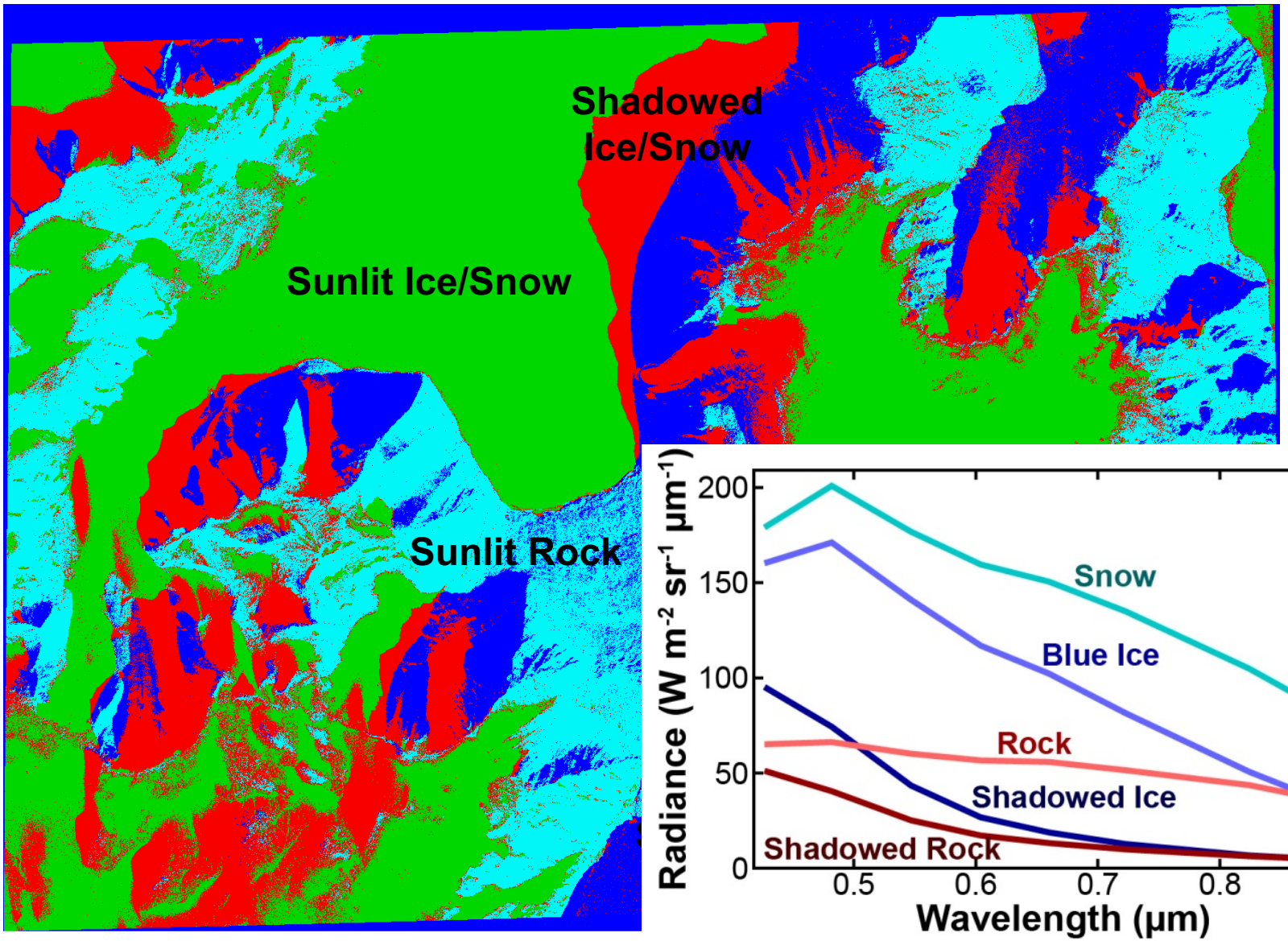

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Goals

- **Start with:** Raw DN data from the PGC (georeferenced tiffs)
  - Convert **raw DN data** to **top-of-atmosphere radiance**
    - **Can be easily automated – uses only image metadata**
  - Utilize shadowed landscapes to derive the **spectral signature of atmosphere**
    - **I *think* will be difficult to automate – will likely require human validation**
  - Remove **snow/ice/water** using spectral ratios and parameters
    - **Automation may be possible – will depend on required "level of certainty"**
  - Remove **shadows** using spectral ratios and parameters
    - **Automation may be possible – will depend on required "level of certainty"**
  - Convert **top-of-atmosphere radiance** to **surface radiance**
    - **Can be easily automated – subtraction of atmospheric spectrum from each pixel in image**
  - Remove **topographic influences** using PGC-derived **digital elevation models**
    - **Can likely be automated – will depend on accuracy of georeferencing and percentage of gaps in DEMs**
  - Convert **surface radiance** to **surface reflectance**
    - **Can be easily automated – uses image metadata and solar irradiance standards**
  - Derive **spectral parameters** to isolate different types of **surfaces** and **lithologies**
    - **Can be automated after derived by hand**
  - Apply spectral parameters and explore ***parameter space*** to identify unique clusters
    - **Identifying clusters can be easily automated, if present**
  - **Define boundaries** to unique clusters and **assign different surface types**
    - **Will be difficult to both determine and automate – spectral separability of different rock types known to be difficult**
- **End with:** Land surface characterization, first attempt at automatically identifying surfaces based on spectral properties