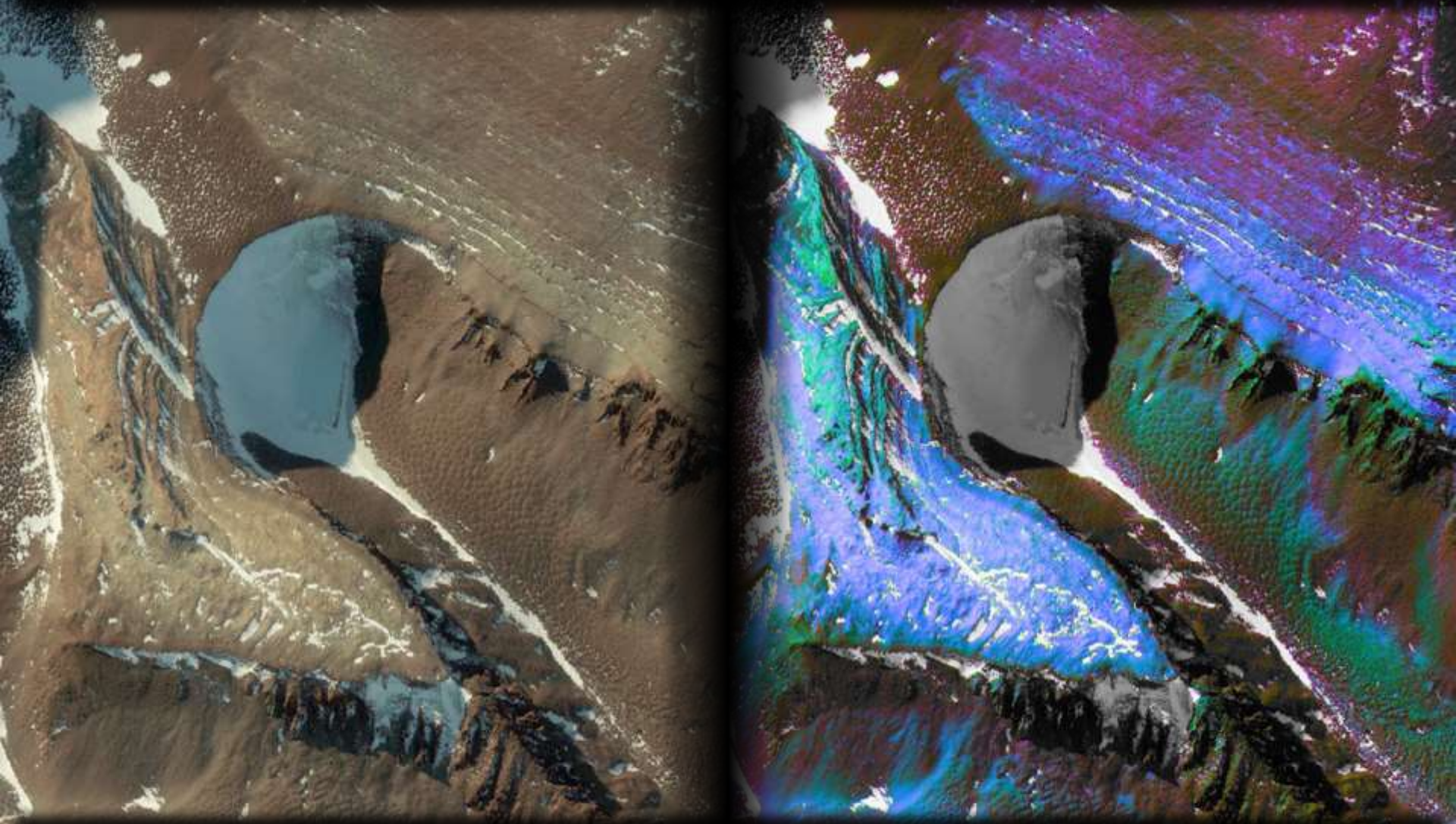
Multispectral Mapping of the Transantarctic Mountains:

Key Geological & Biological Insights to Augment Traditional Field Investigations



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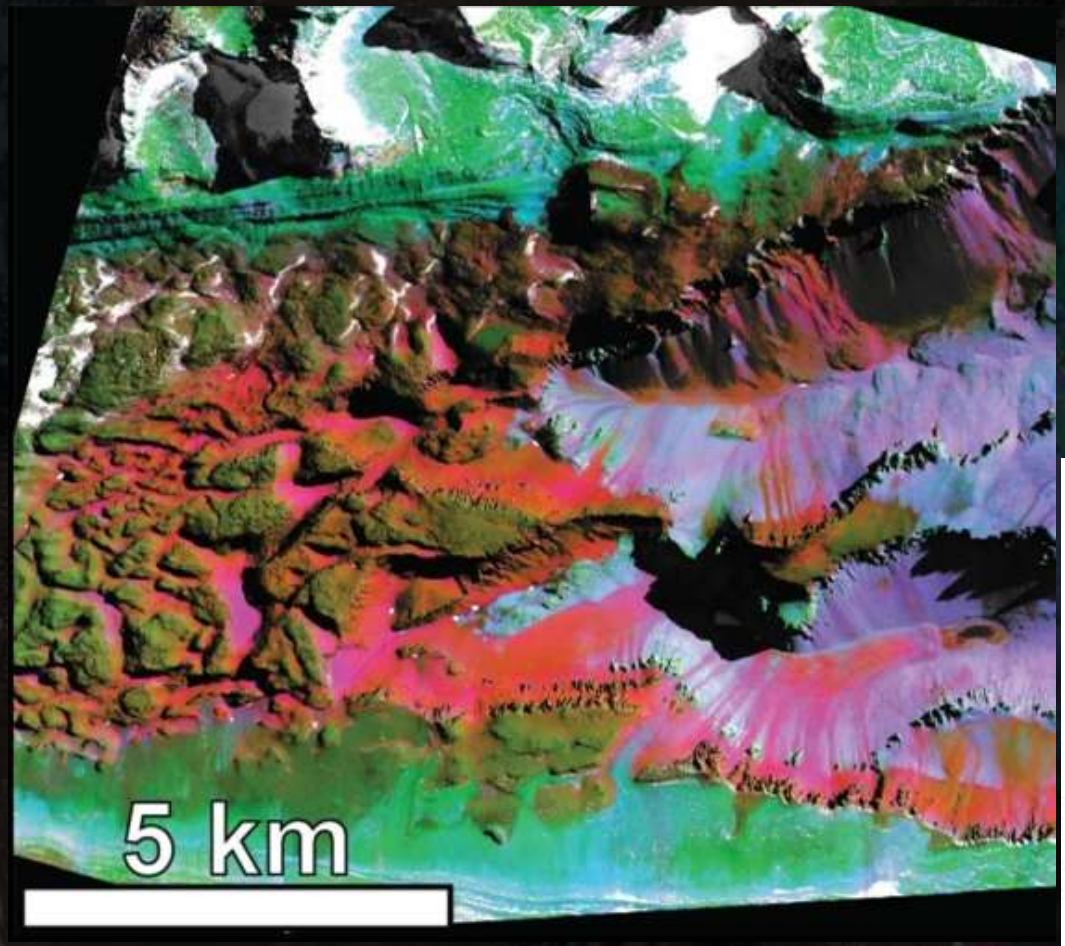
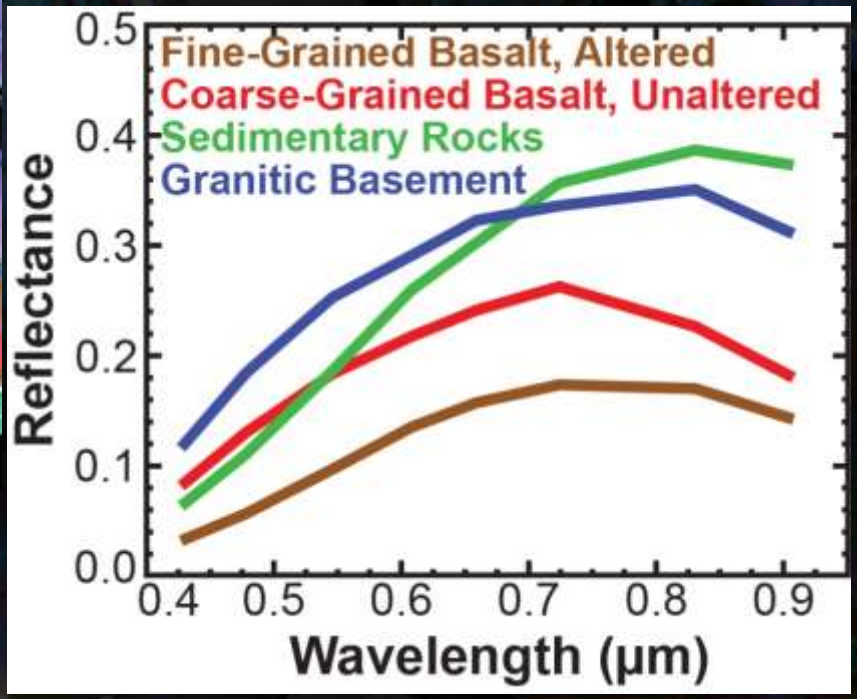
Remote Sensing of *Remote* Locations



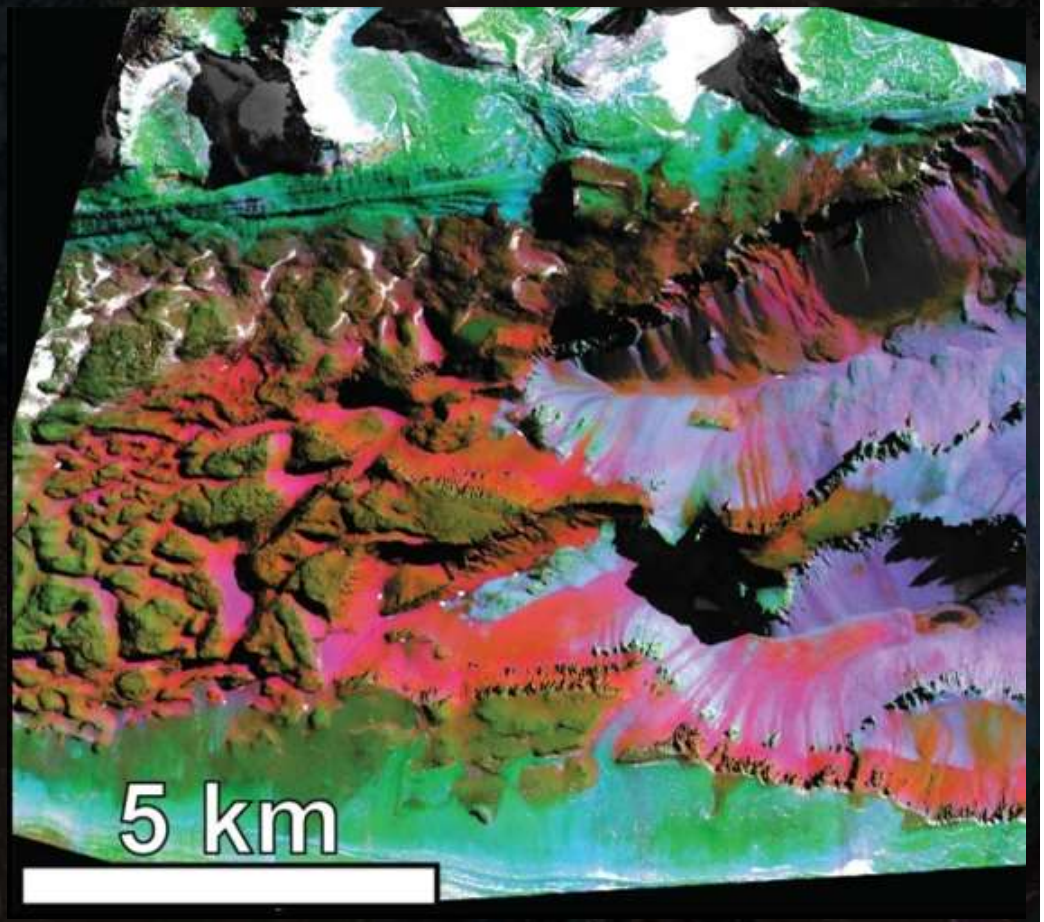
Salvatore (2015)

Transantarctic Mountains

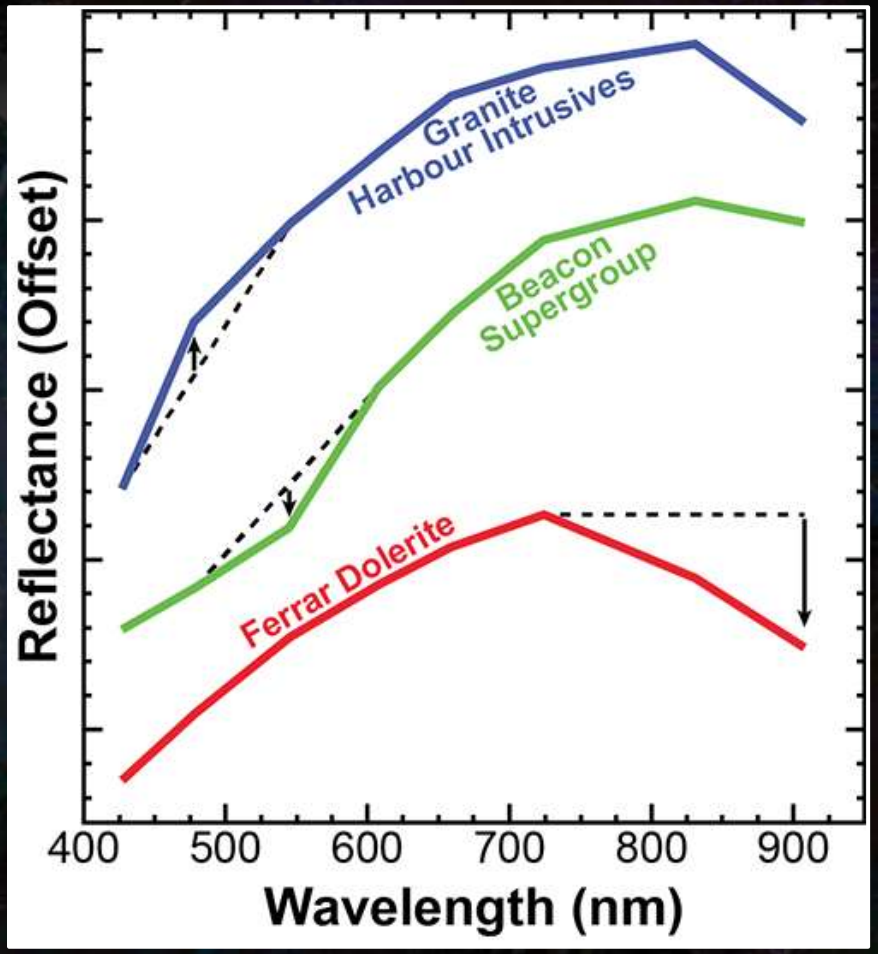
- Difficult to access
- Supplements traditional geologic investigations
- *Ground truthing* is possible through field studies and the use of archived samples



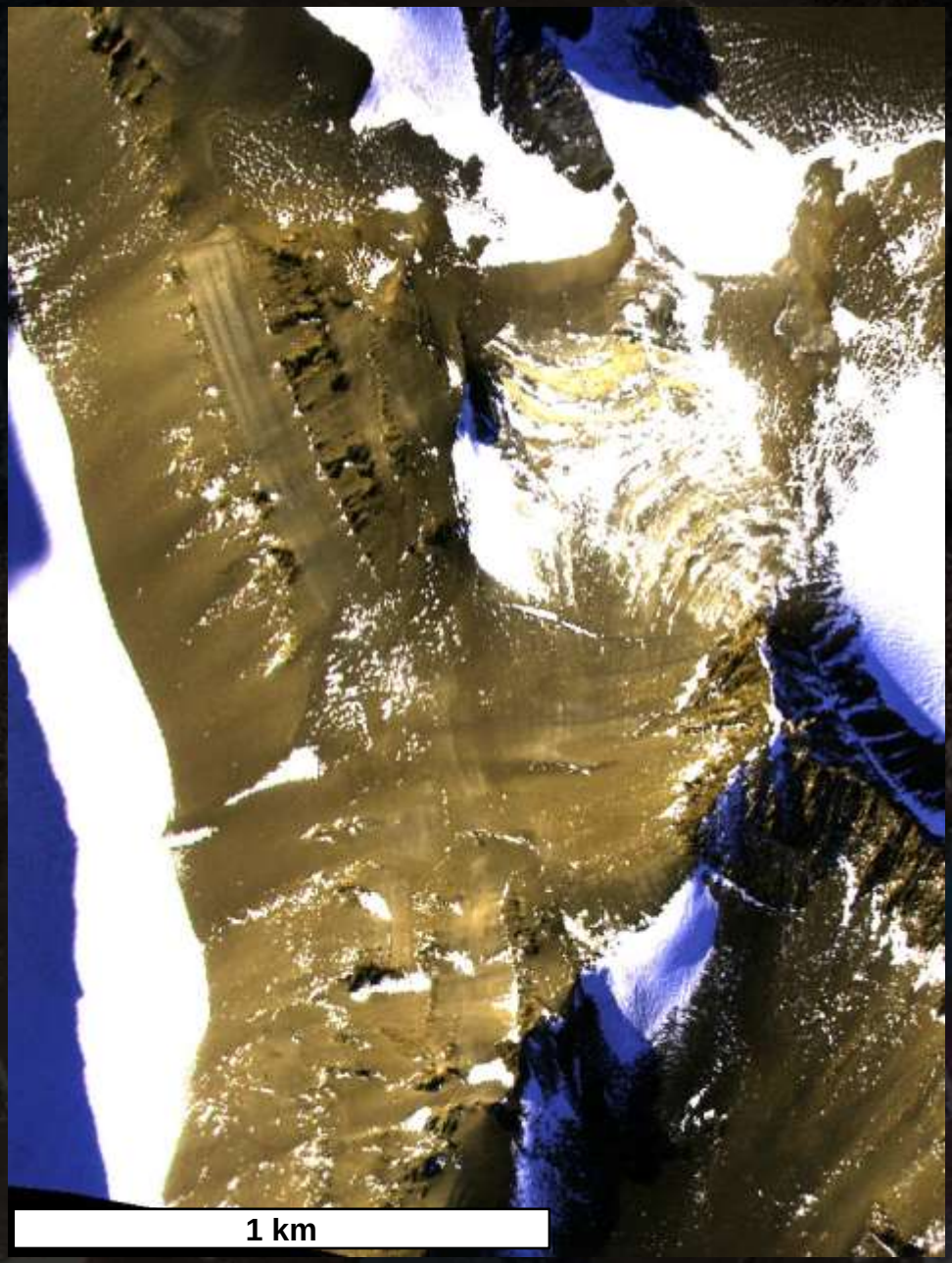
Mapping the Transantarctic Mountains

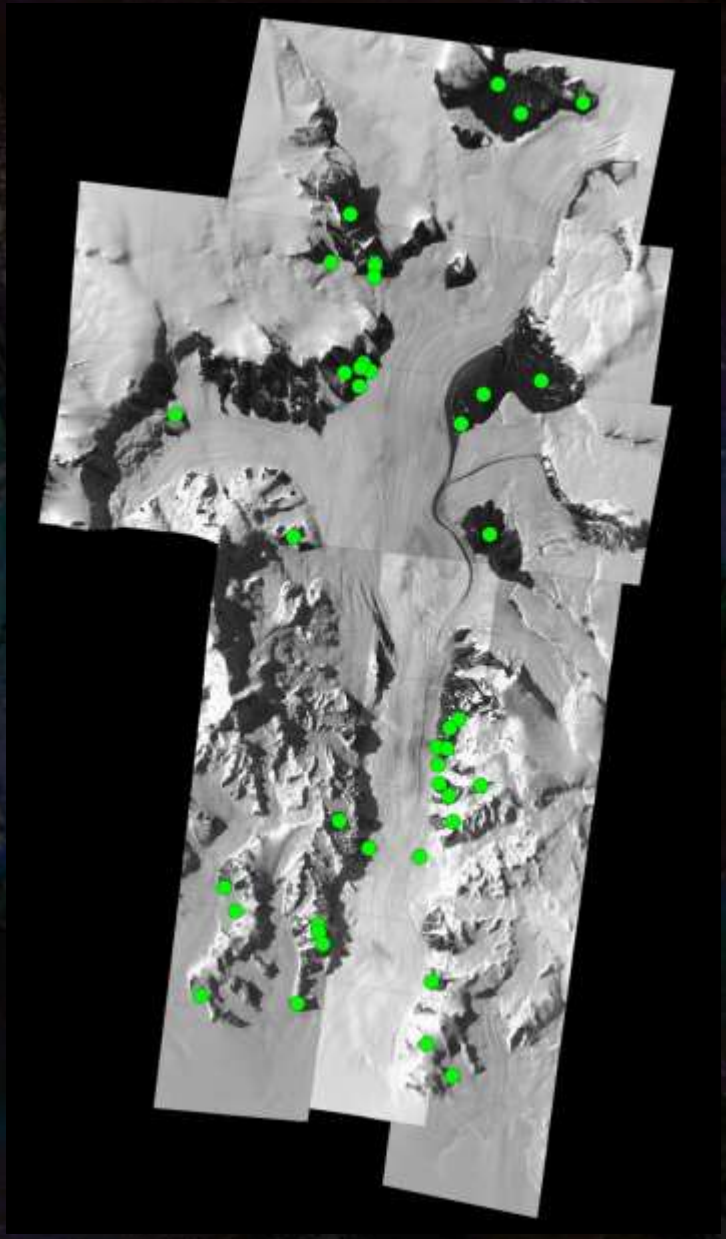


Salvatore (2015)



Mapping the Transantarctic Mountains





Cumulus Hills, Central Transantarctic Mountains
Approximate True Color

Mapping the Transantarctic Mountains

Unoxidized Sedimentary Lithologies

Mixed Lithology Scree Slope

Dolerite Sills

Cumulus Hills, Central Transantarctic Mountains
SpecMap Product

Mapping the Transantarctic Mountains

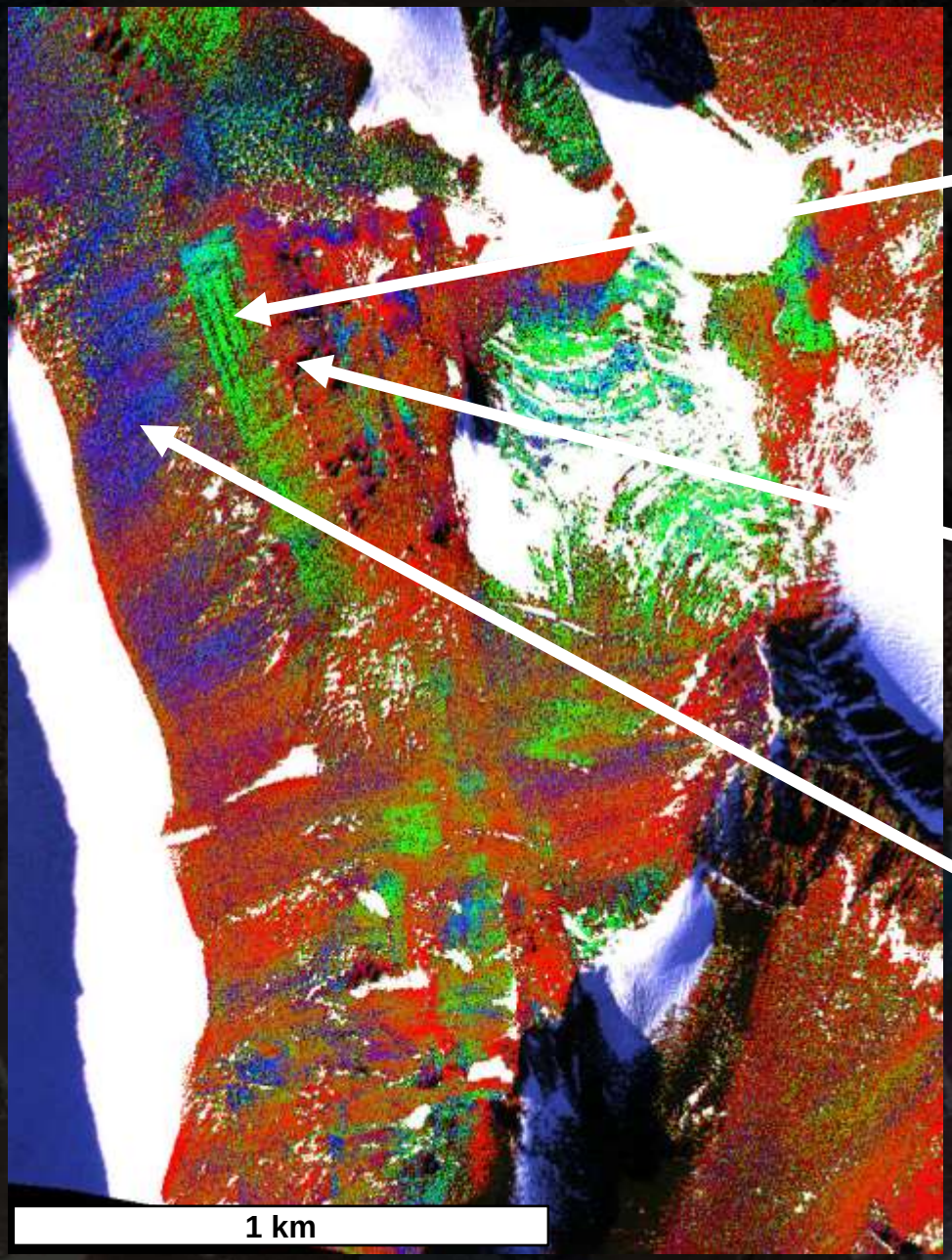
Average Ferrar Dolerite

PRR-38349 (Sandstone)

PRR-38346 (Sandstone)

Cumulus Hills, Central Transantarctic Mountains
Linear Unmixing Using Laboratory Endmembers

Mapping the Transantarctic Mountains



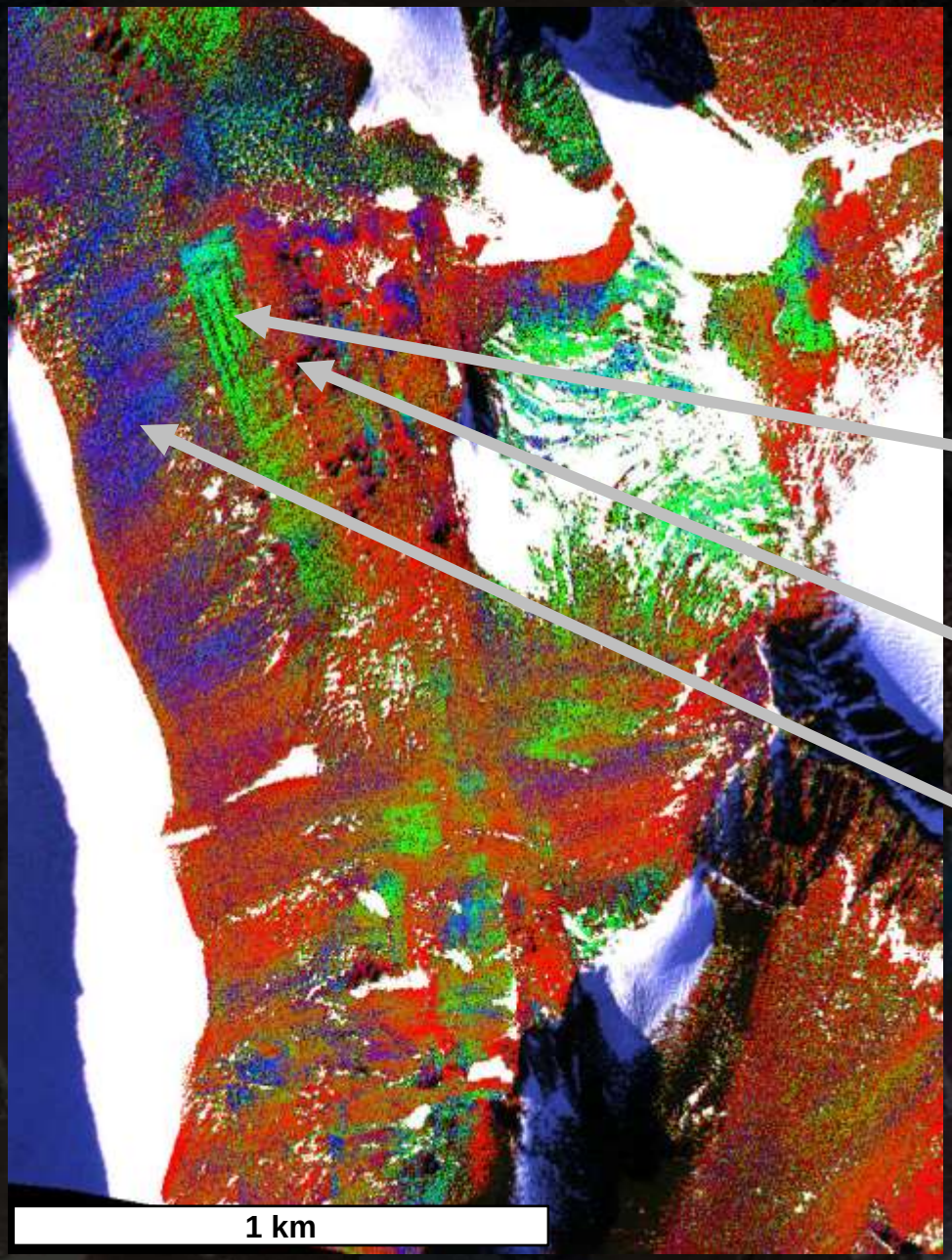
42.8% Dolerite
6.9% Conglomerate
19.7% Unoxidized Sandstone
30.6% Oxidized Sandstone

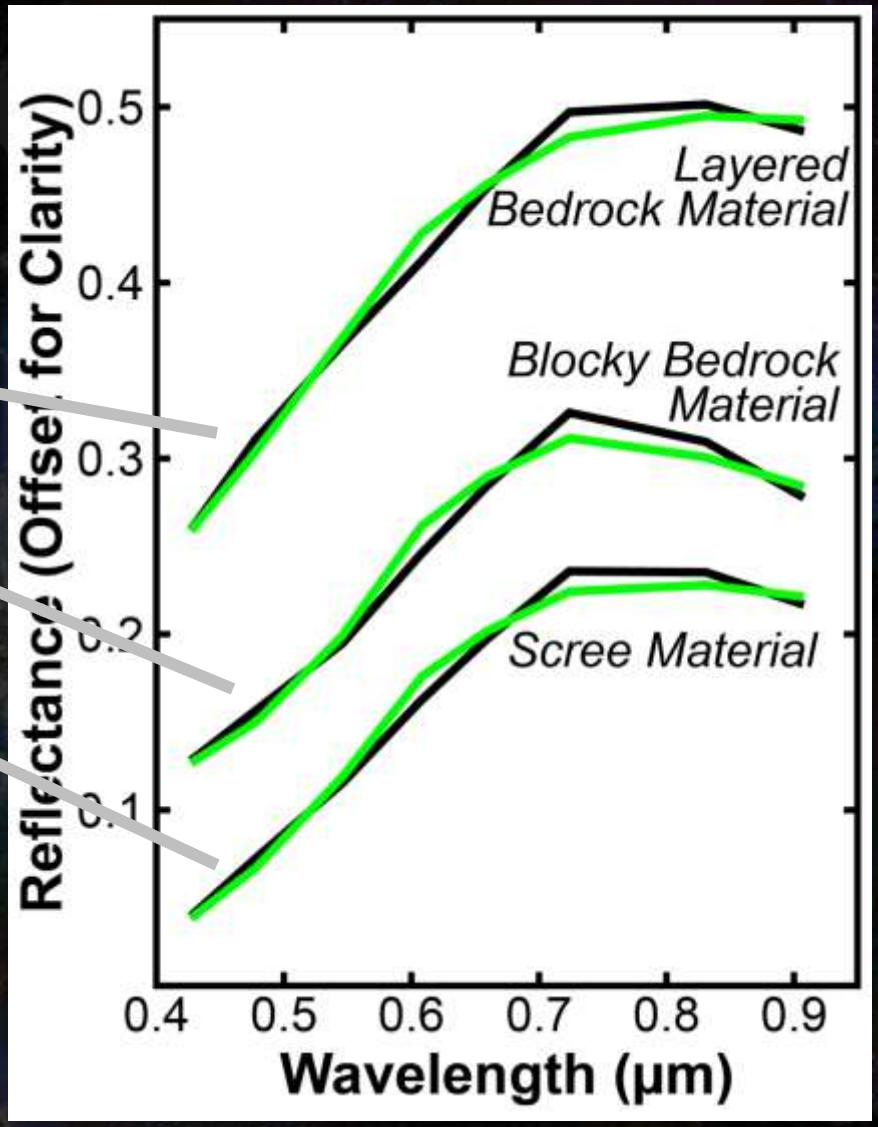
91.3% Dolerite
0.6% Conglomerate
2.9% Unoxidized Sandstone
5.1% Oxidized Sandstone

69.8% Dolerite
5.2% Conglomerate
4.3% Unoxidized Sandstone
20.6% Oxidized Sandstone

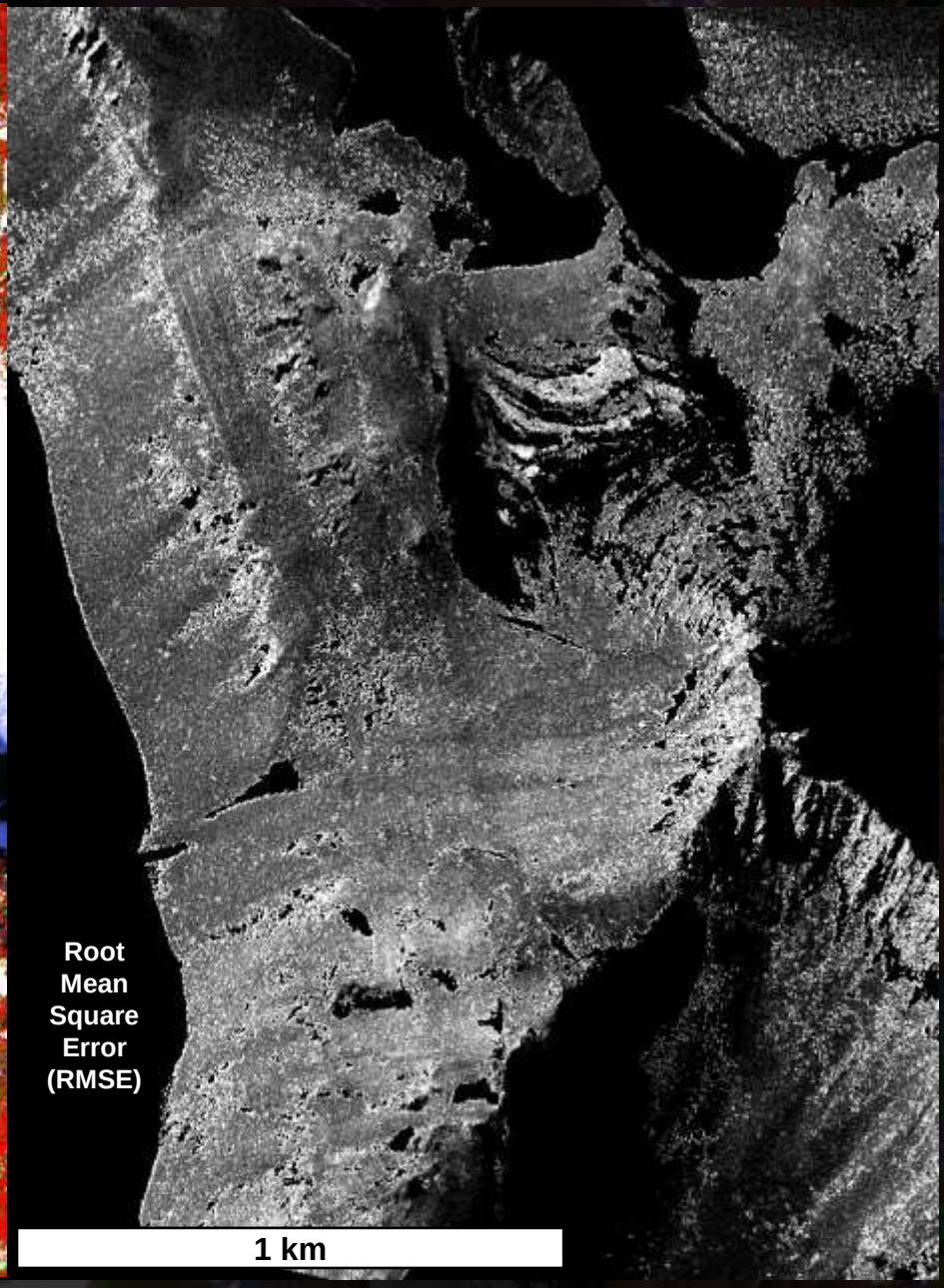
Cumulus Hills, Central Transantarctic Mountains
Linear Unmixing Using Laboratory Endmembers

Mapping the Transantarctic Mountains



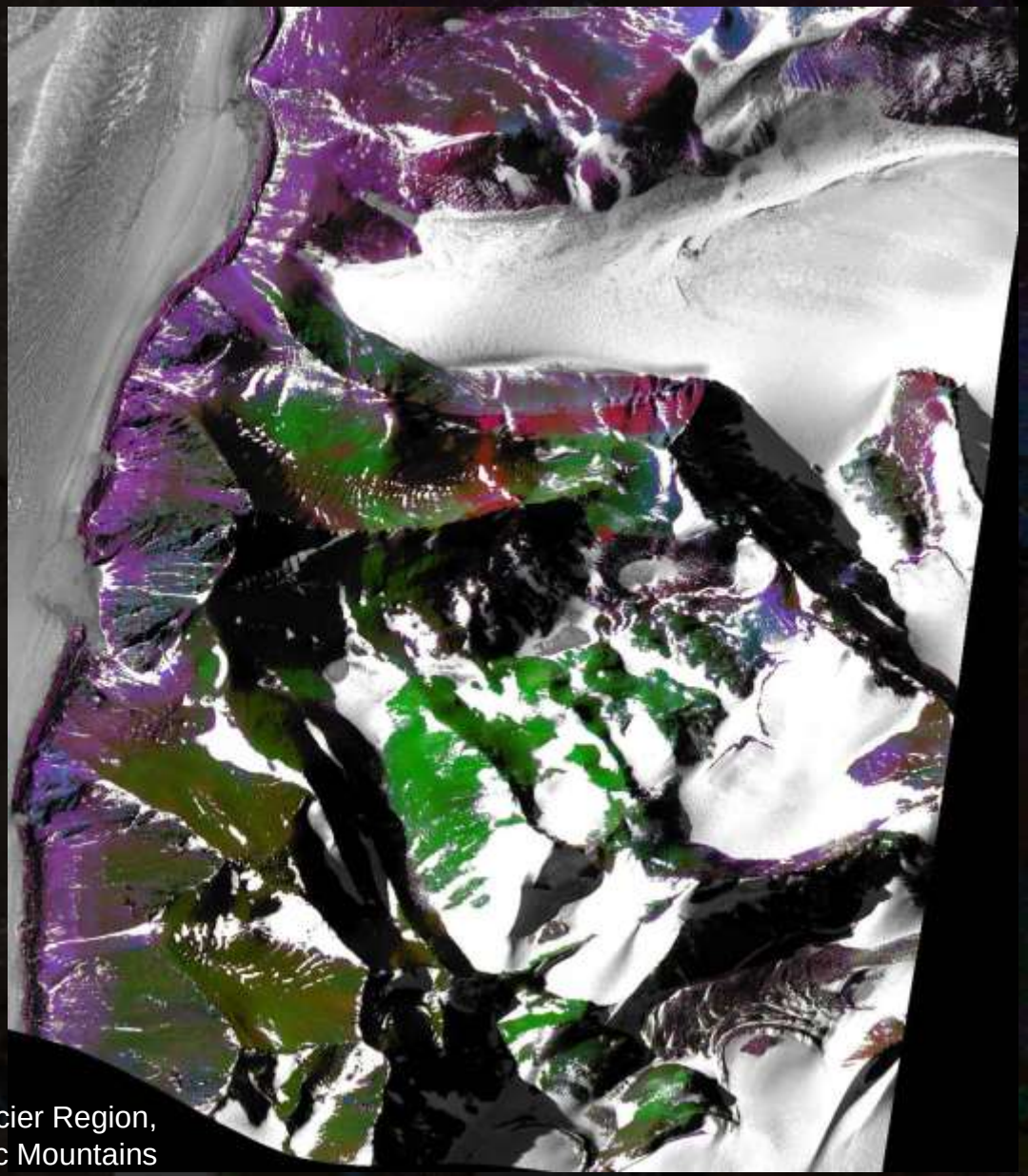


Mapping the Transantarctic Mountains



Summary & Conclusions

- **High-resolution multi-spectral data can be used to supplement existing geologic investigations**
  - Maximize efficiency in the field
  - Inferring field observations over large spatial extents
- **Data are sensitive to many different surface properties beyond primary geology**
  - Complex lithologic mixtures, secondary alteration, photosynthetic materials, etc.
- **Utility is *limited* without additional field validation**
  - Data are sometimes non-unique

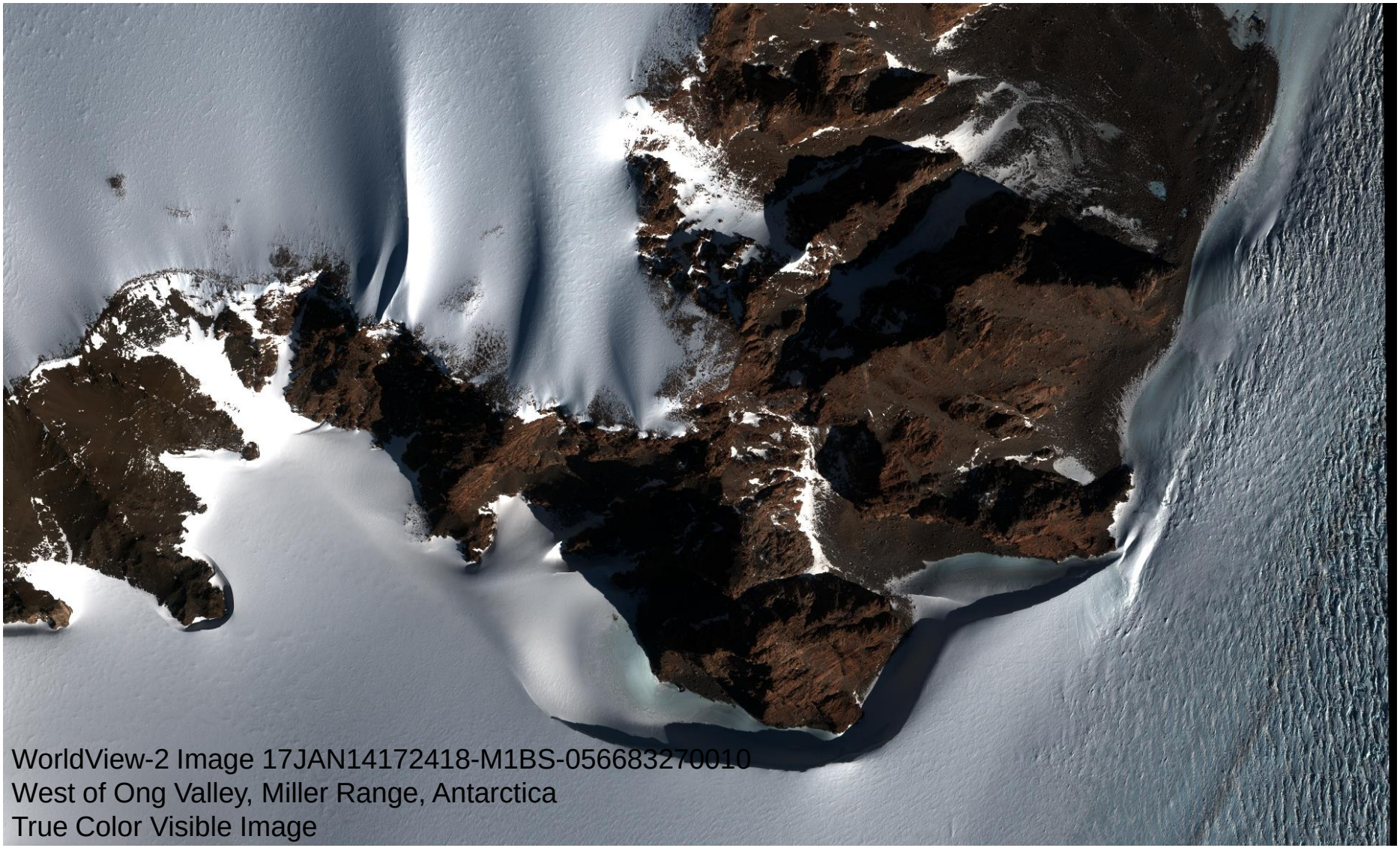


Shackleton Glacier Region,
Central Transantarctic Mountains

Combatting Shadows

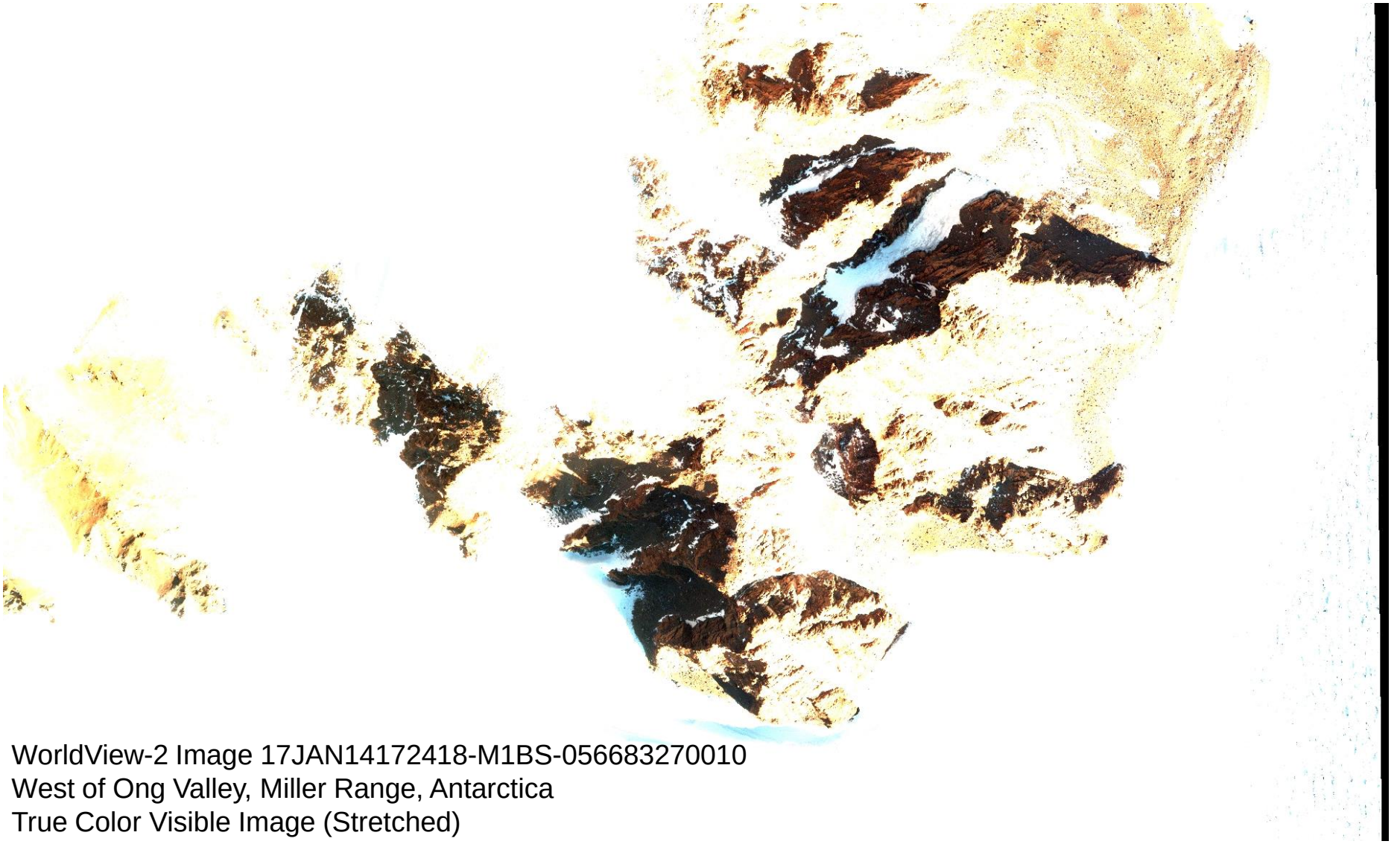
Mark Salvatore
Northern Arizona University
12/22/2017

Demonstration of Problematic Shadows



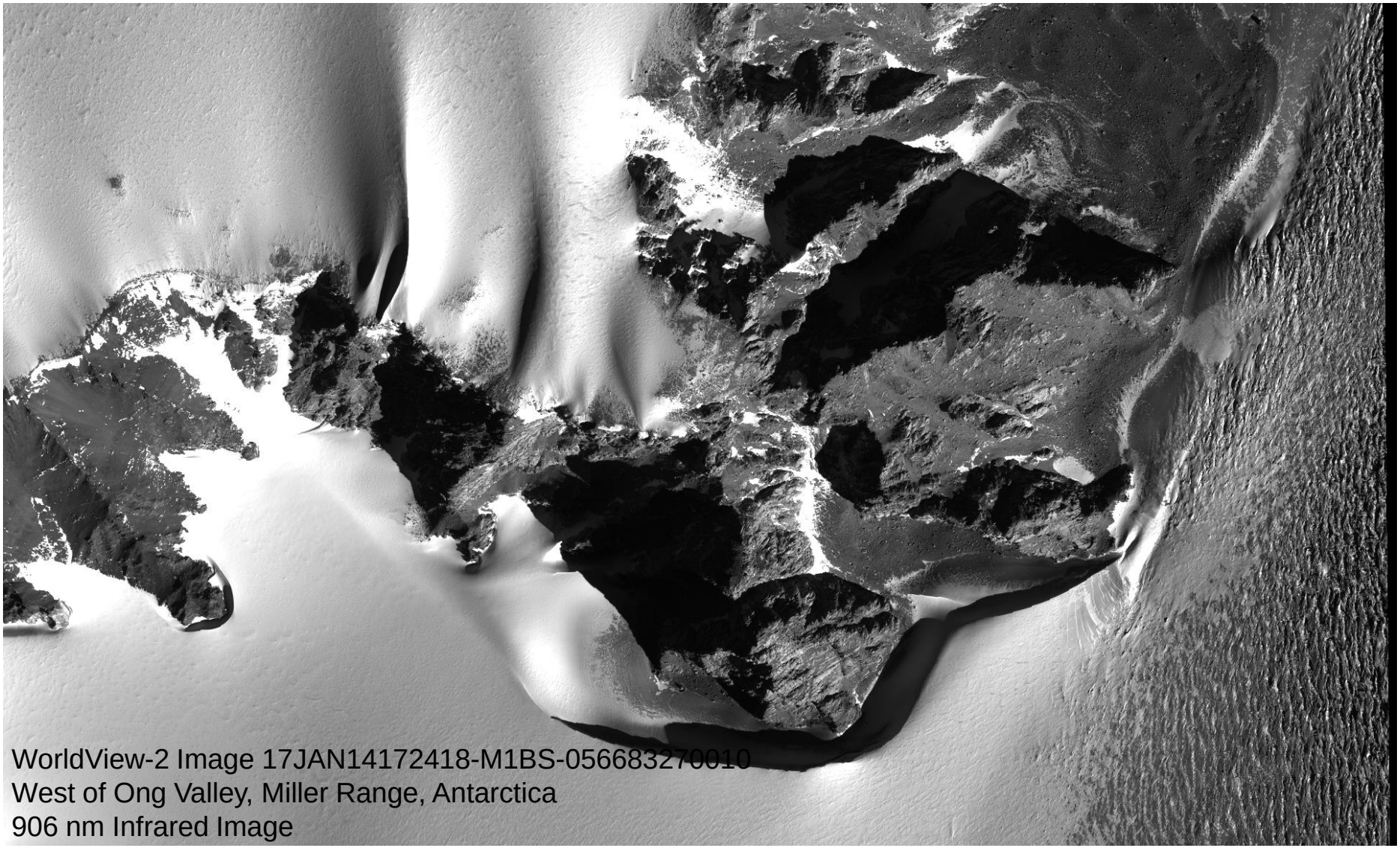
WorldView-2 Image 17JAN14172418-M1BS-056683270010
West of Ong Valley, Miller Range, Antarctica
True Color Visible Image

Demonstration of Problematic Shadows



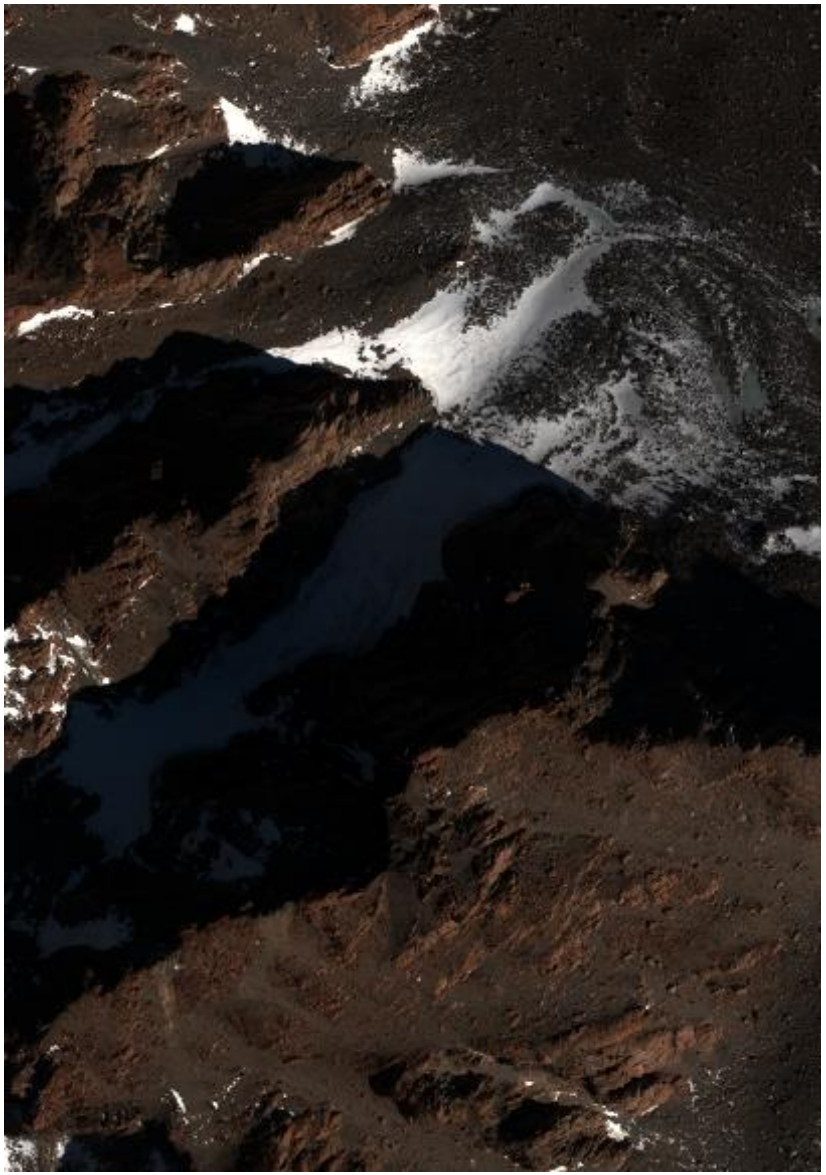
WorldView-2 Image 17JAN14172418-M1BS-056683270010
West of Ong Valley, Miller Range, Antarctica
True Color Visible Image (Stretched)

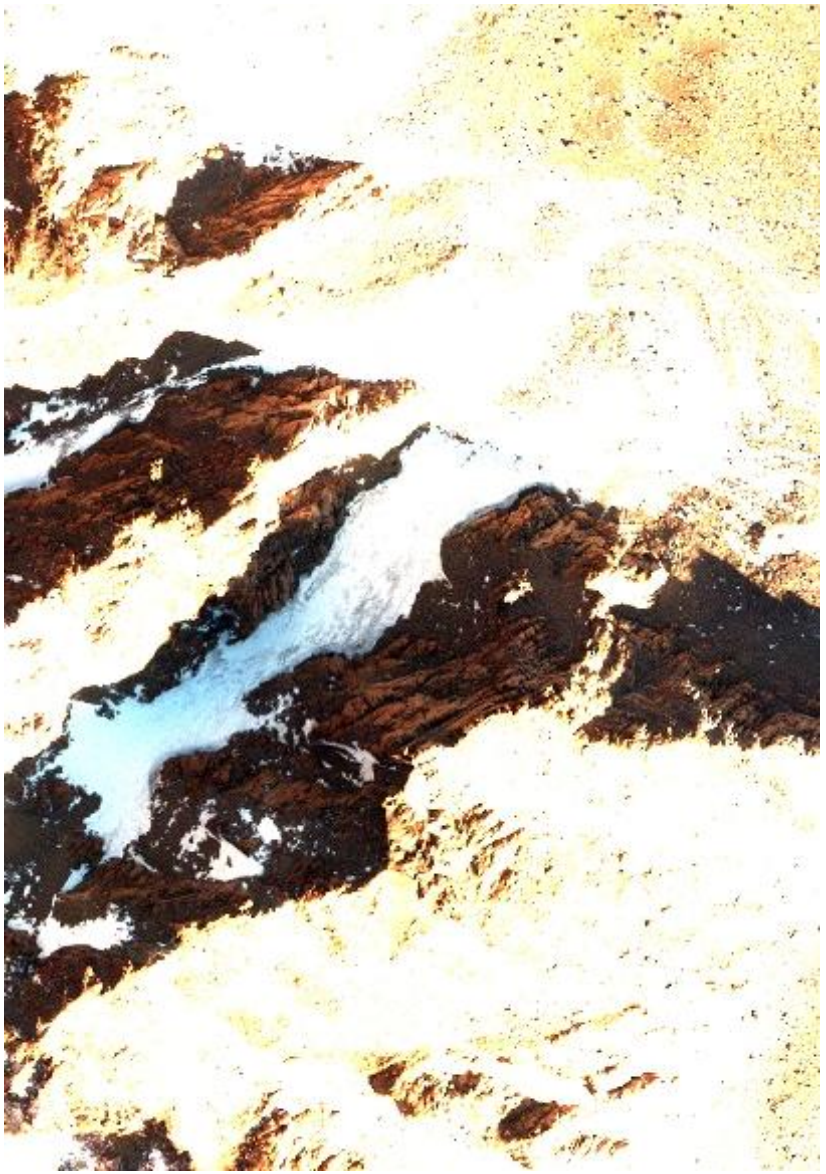
Demonstration of Problematic Shadows



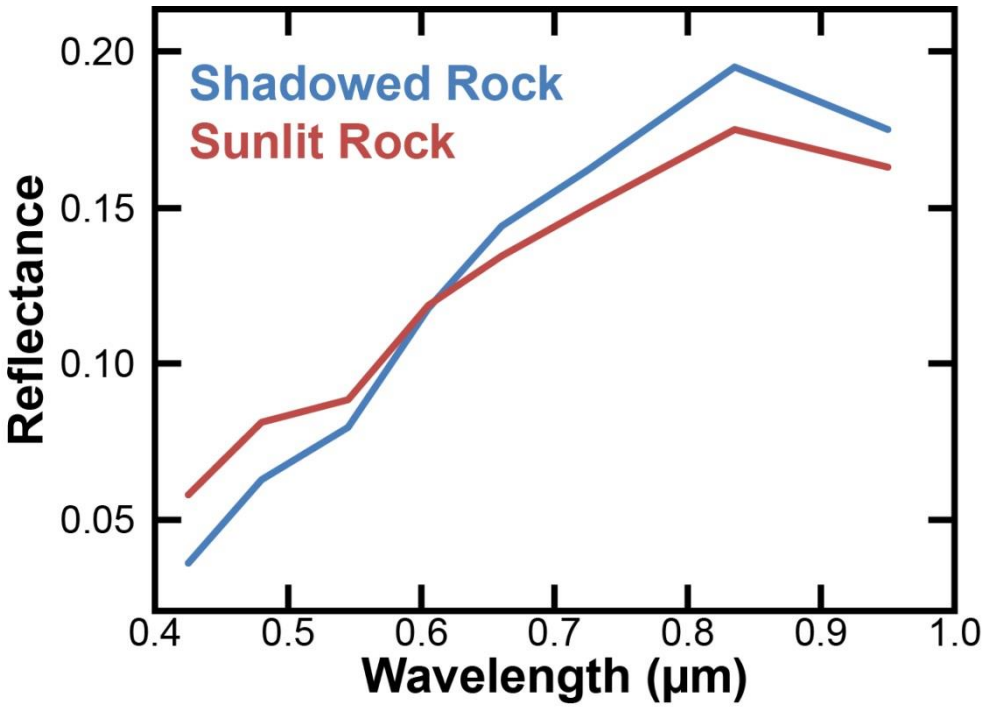
WorldView-2 Image 17JAN14172418-M1BS-056683270010
West of Ong Valley, Miller Range, Antarctica
906 nm Infrared Image

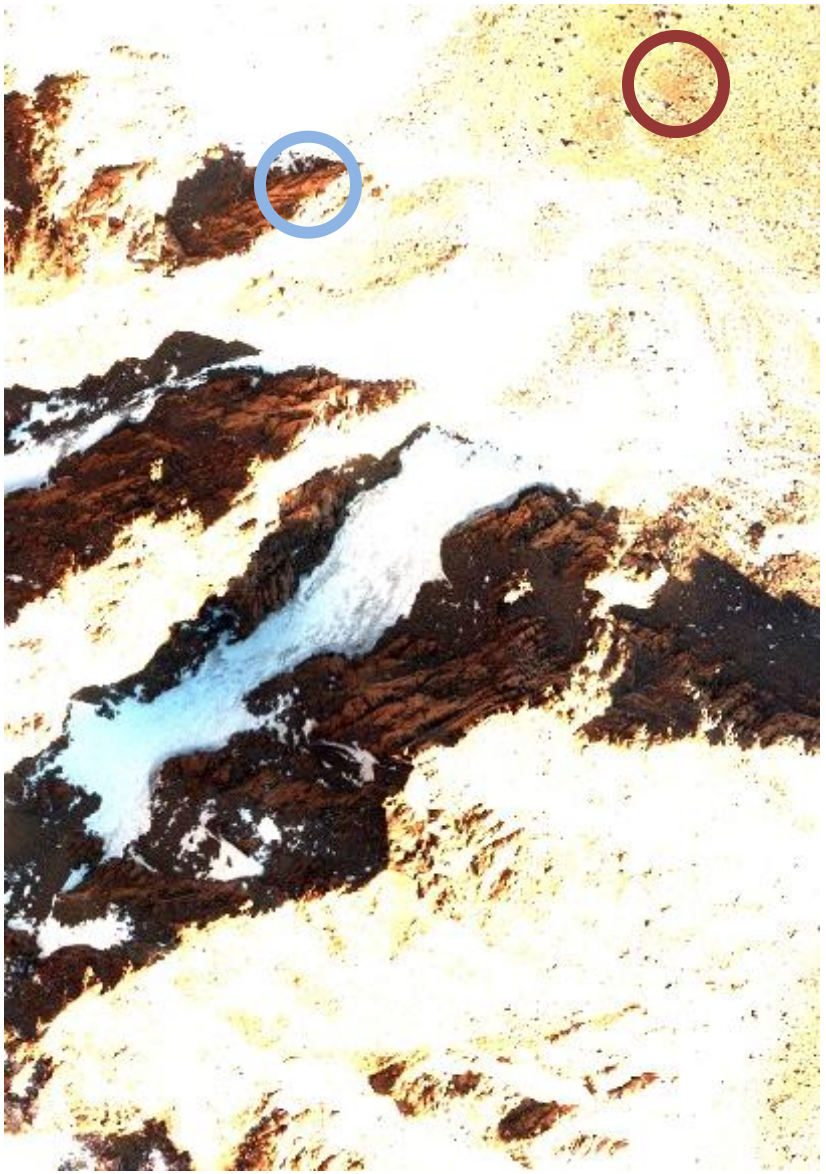
Demonstration of Problematic Shadows





Demonstration of Problematic Shadows





Possible Solutions

- **Continue to use spectral parameters and live with potential problems**
  - Exercise caution, potentially eliminating dark sunlit surfaces?
  - A more liberal approach, potentially incorporating shadows into the analyses?

- **Incorporate DEMs into the shadow removal procedure?**
  - Model shadows using topography and image metadata (solar azimuth + elevation)