

TES and THEMIS Compositional Analyses of MSL Landing Sites

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Data products include for each site:

- THEMIS spectral unit maps
- TES and THEMIS surface emissivity spectra
- Mineralogical analysis of surface emissivity with TES data
- Dust cover and other index maps

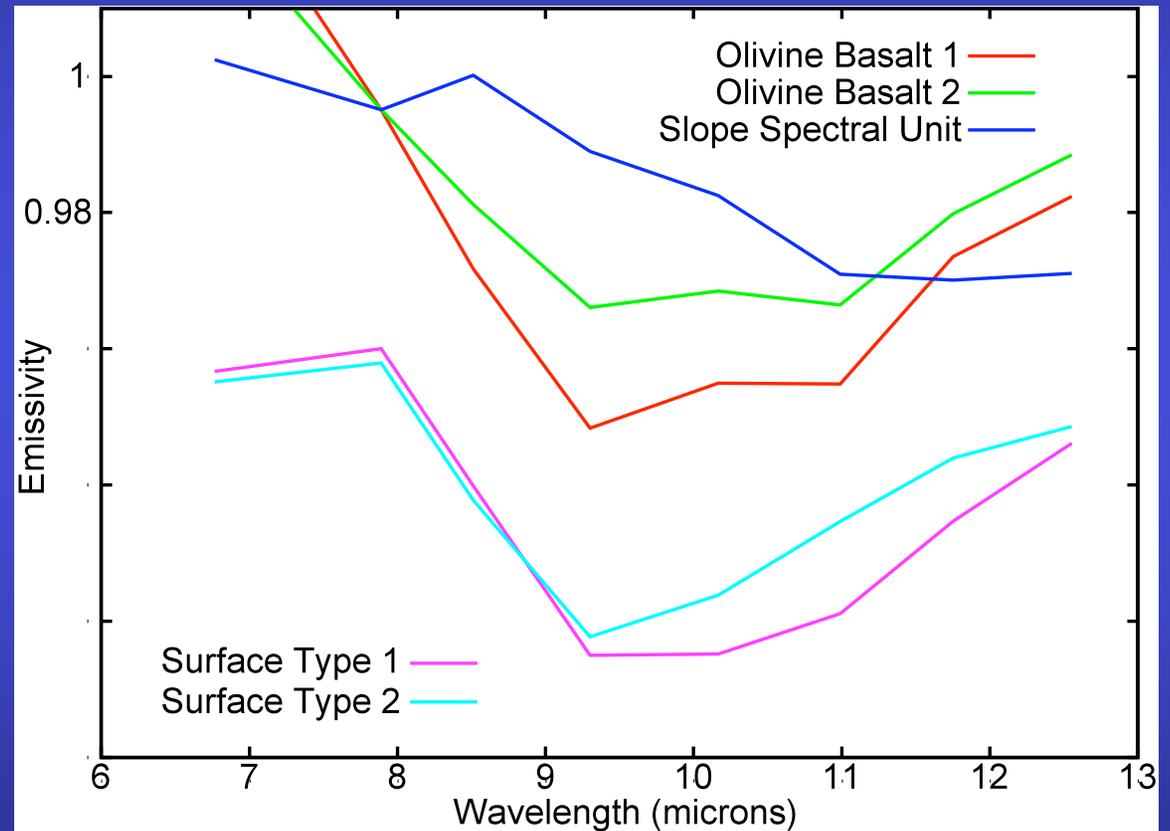
Summaries and data files are located at:

<http://faculty.washington.edu/joshband/cdp>

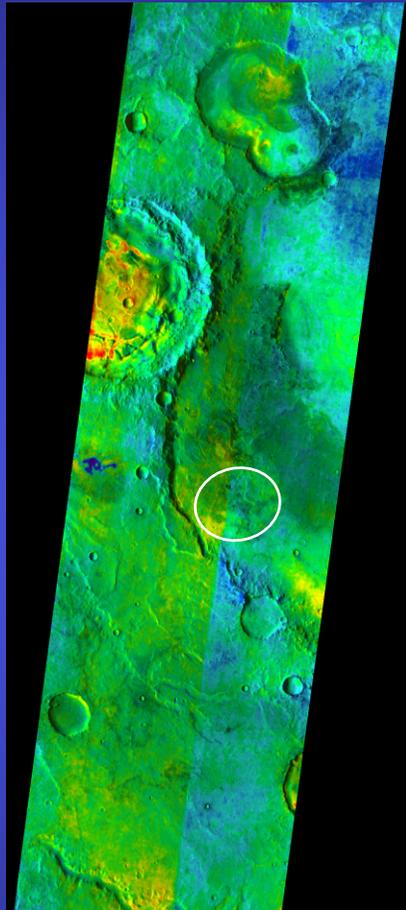
Funded under the JPL Critical Data Products Initiative

Miyamoto THEMIS spectral endmembers

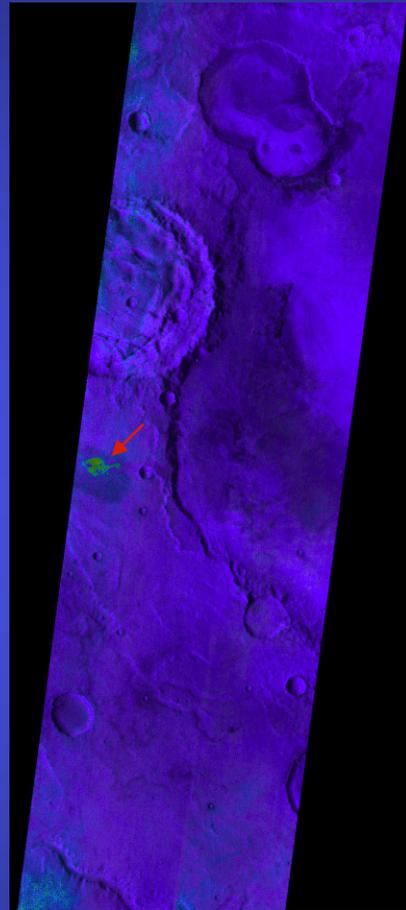
- Two slightly different basaltic composition units are present in the data
 - The two units are combined in the unit maps because they are not cleanly separated
- The slope spectral unit has similar spectral, morphological, and thermophysical properties as the putative chlorides of *Osterloo et al., 2008*



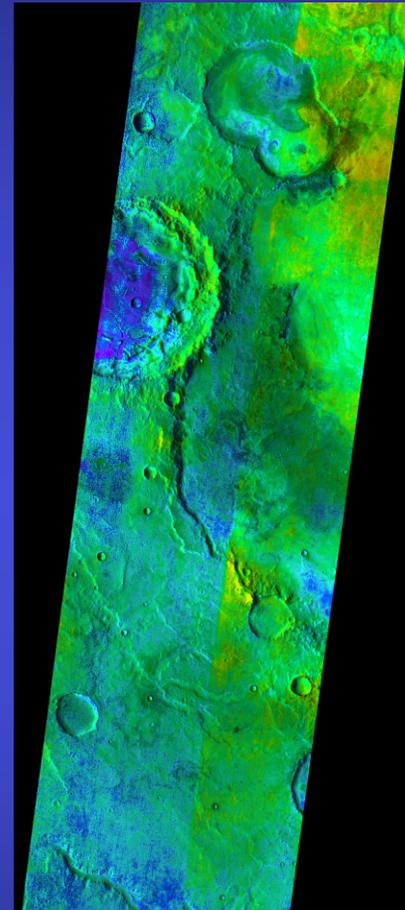
THEMIS spectral unit mosaics



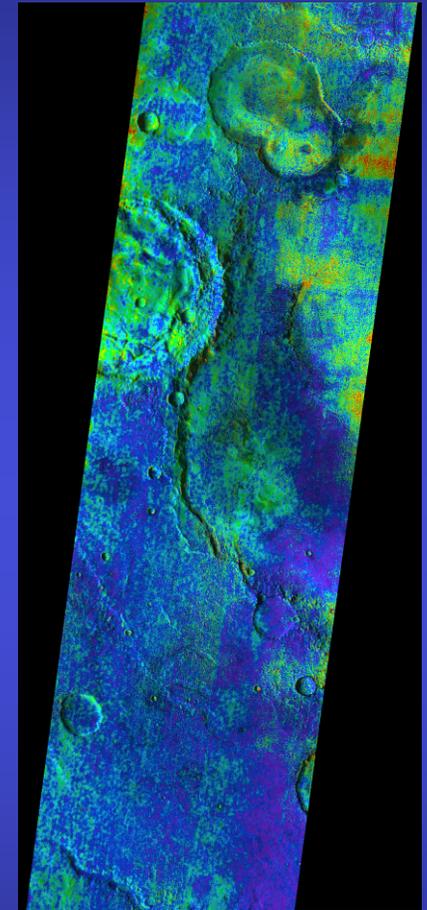
Olivine Basalt
(0-2)



Sloped Spectrum
(0-1.5)



Blackbody
(-1 1)



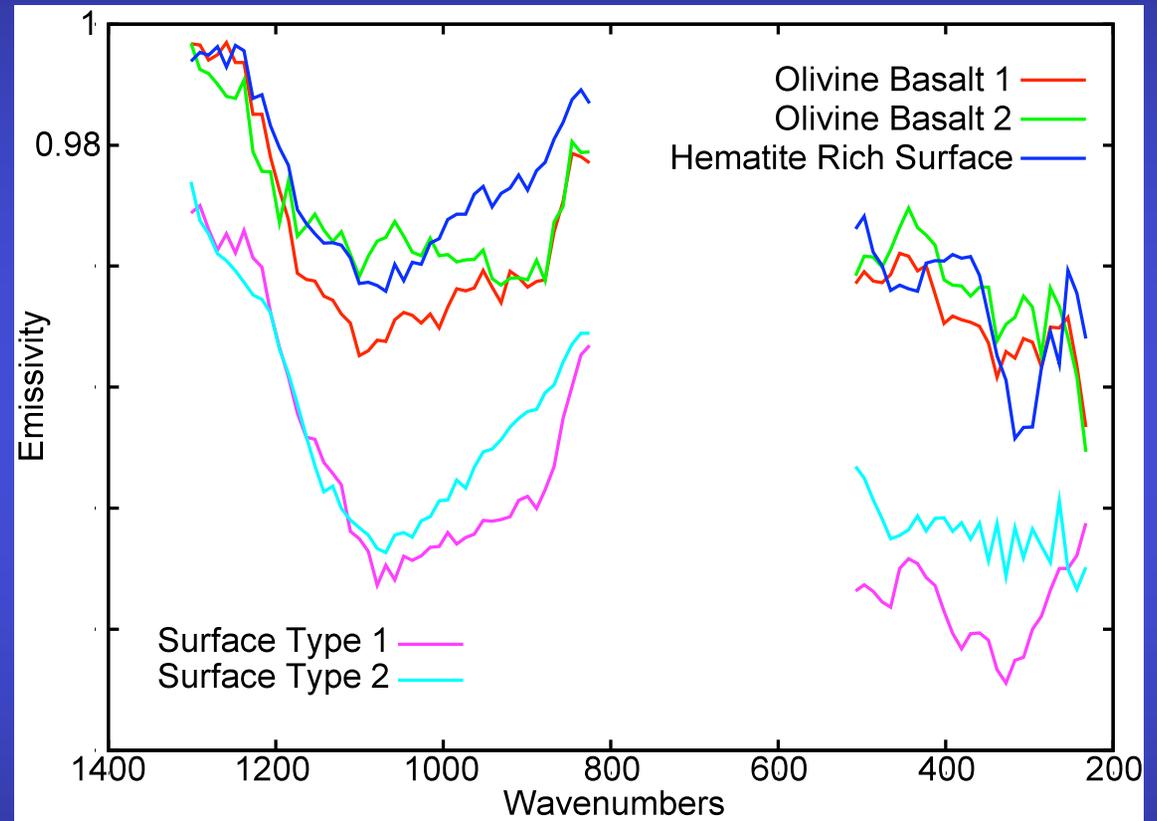
RMS Error
(0-0.005)



Miyamoto crater

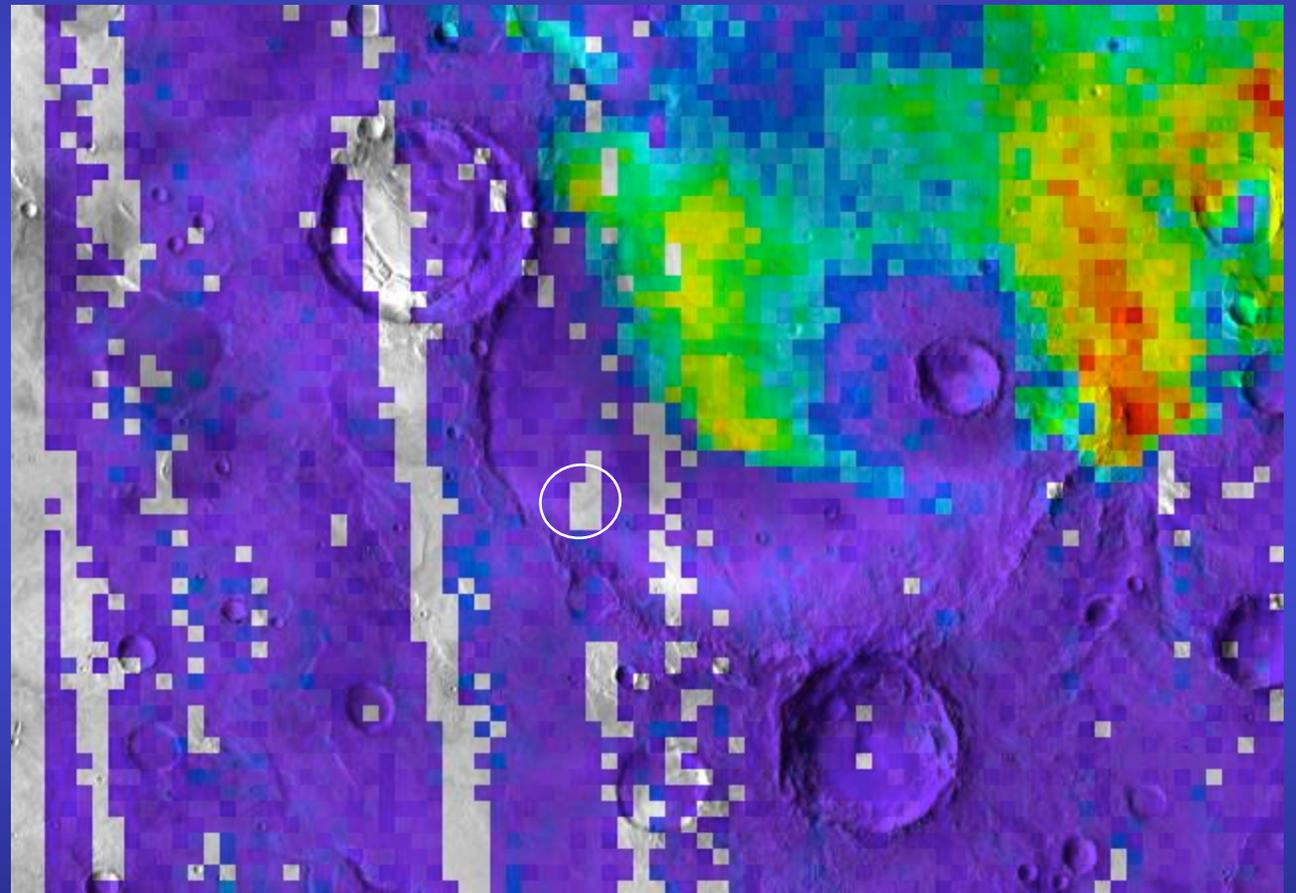
TES analysis of THEMIS spectral units

- All surfaces have significant plagioclase and pyroxene (~20-40%)
- Olivine and sulfates/high-silica phases are inversely correlated
 - Consistent with variable aqueous alteration (under low pH, water-limited conditions)?
 - Sulfate detection is questionable, but not unreasonable
 - Landing ellipse is similar to Olivine Basalt 1 (Plagioclase, pyroxene, olivine, sulfates, high-Si phases)



Hematite Concentrations

- Significant hematite concentrations are ~20-30 km to the northeast of the landing ellipse
- Hematite absorptions are outside the THEMIS spectral range



0 0.5 Concentration (relative to strongest signal)

Summary

- Two separate units with compositions similar to olivine basalt are present within the Miyamoto landing site region
 - Difference between units is subtle and not well mapped in THEMIS data
 - Variable mafic/silica/sulfate phases may be indicative of aqueous alteration
- Hematite concentrations are located ~20-30 km to the northeast of the landing ellipse
- Spectral slope unit is ~40 km to the west of the landing ellipse
 - Consistent with putative chlorides of *Osterloo et al.* (2008)
- Dust is not significant throughout most of the region



TES analysis of THEMIS spectral units

Modeled abundances

Olivine Basalt 1

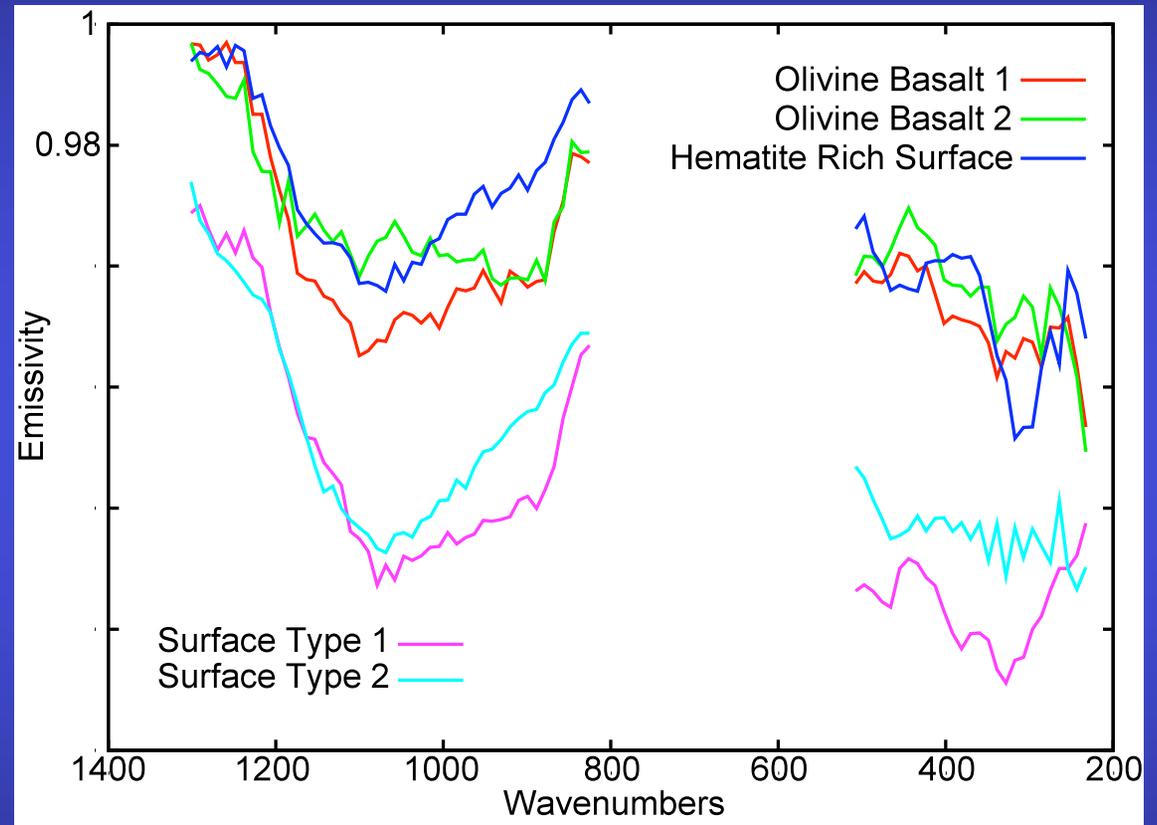
Feldspar	22 +/- 3 %
Pyroxene	34 +/- 5
Olivine	12 +/- 7
High-silica*	14 +/- 8
Sulfate	14 +/- 4
Other**	4

Olivine Basalt 2

Feldspar	38 +/- 11%
Pyroxene	22 +/- 11
Olivine	22 +/- 8
Other**	18

Hematite Rich Unit

Feldspar	17 +/- 4 %
Pyroxene	24 +/- 4
High-silica*	23 +/- 8
Sulfate	12 +/- 2
Hematite	17 +/- 1
Other**	4



*High-silica phases: silica glass, opal, zeolite, clay
(cannot reliably distinguish these)

**Other: carbonate, hematite, amphibole, quartz
(individually modeled at 0-9%, below det. limits)

Miyamoto crater