

Surface Characteristics of the MSL Candidate Landing Sites from THEMIS-derived Thermal Inertia and HiRISE

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4th MSL Landing Site Workshop
Monrovia, California
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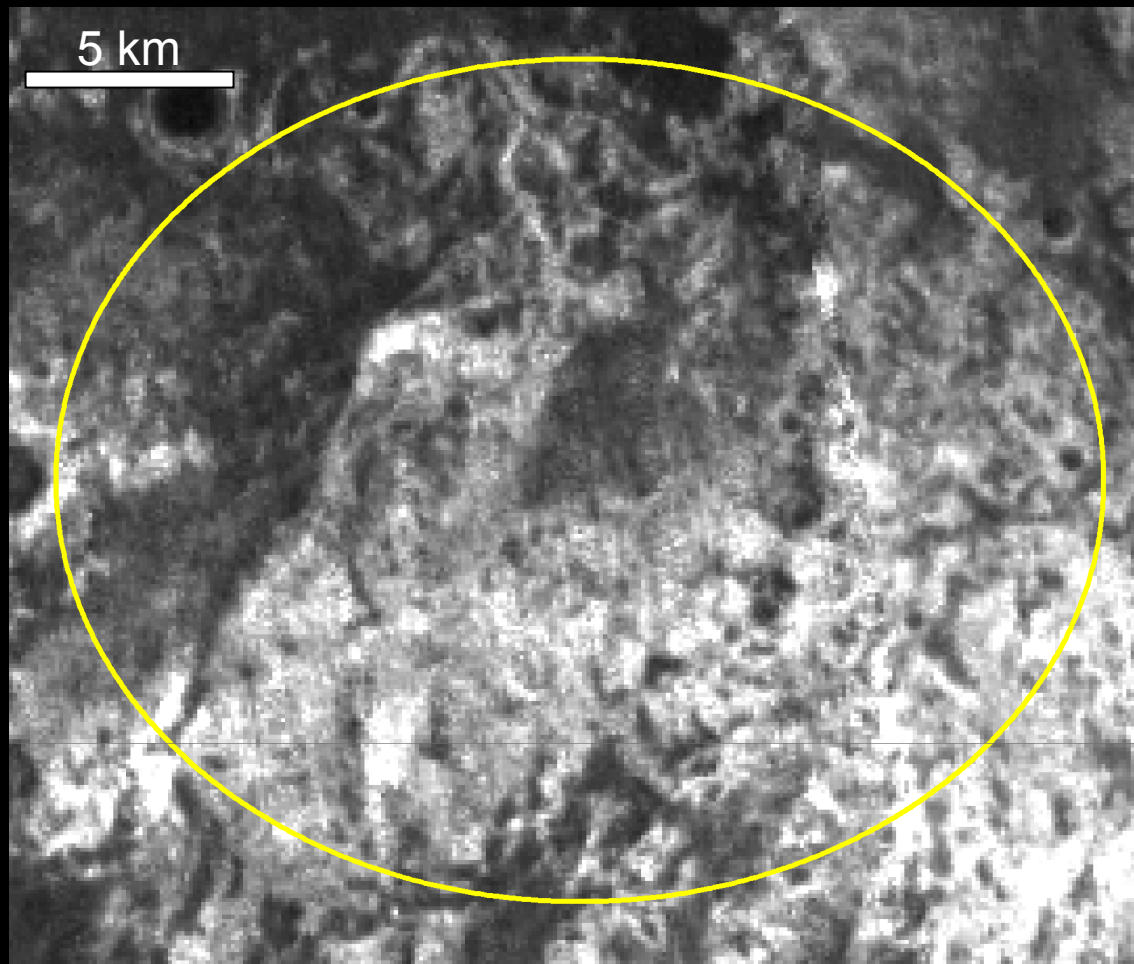
Objectives

- Summarize the general surface characteristics of each candidate landing site
- Indicate areas that may be hazardous to the rover from a landing or drive-ability perspective

Methods and Data Sets

- Compared data in ArcGIS 9.3
 - Interpretation and analysis
- THEMIS-derived thermal inertia values
 - Method of *Ferguson et al.*, 2006
 - Compared results to TES
- HiRISE images (RED filter)
- Slopes from HiRISE DEM
 - *Kirk et al.*; 2010; 4th MSL Landing Site Workshop

Eberswalde Crater

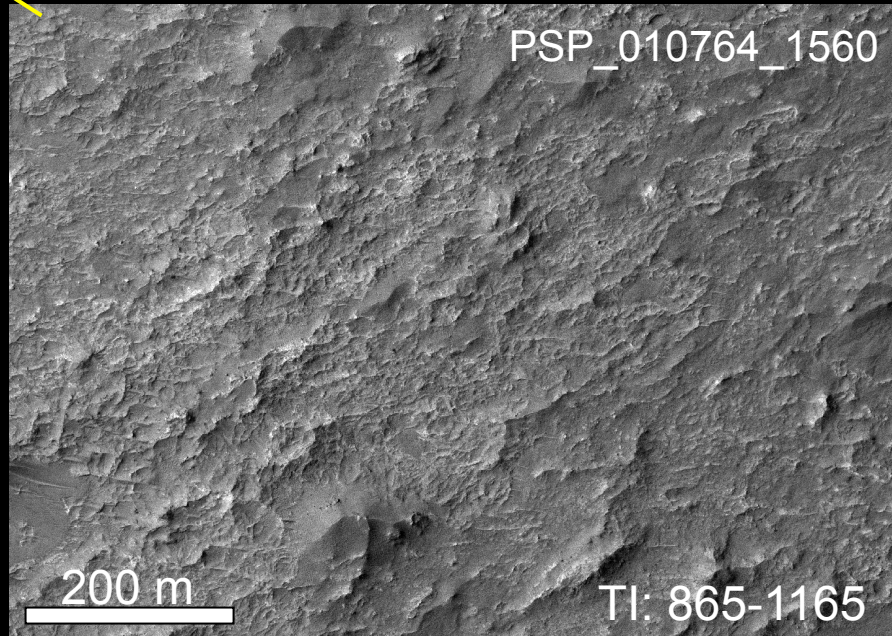
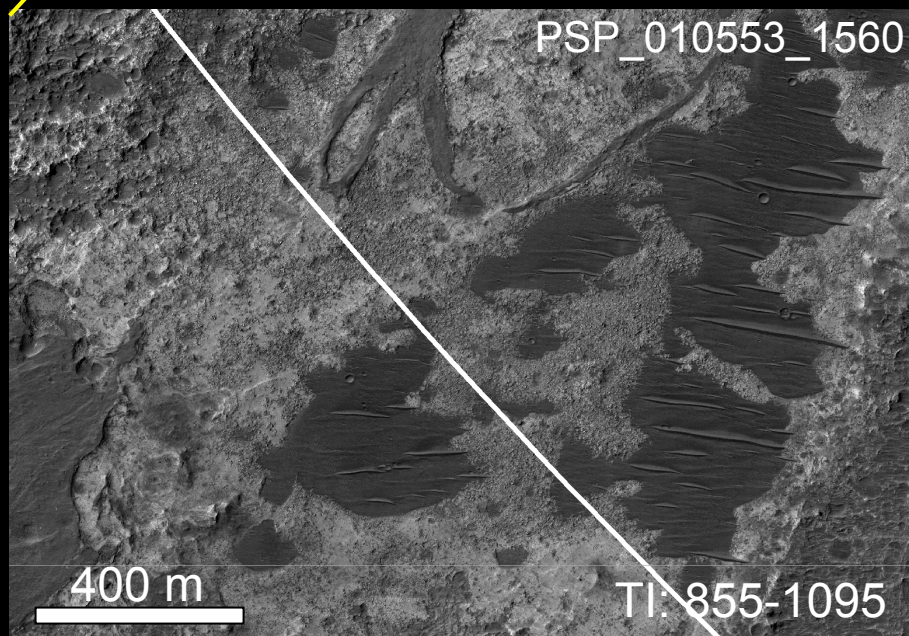
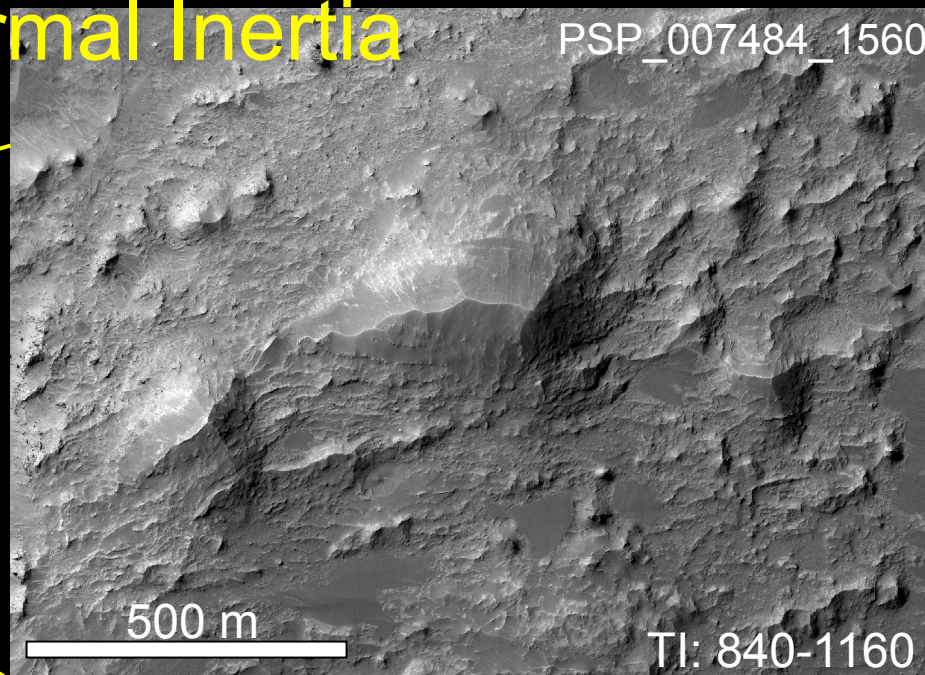
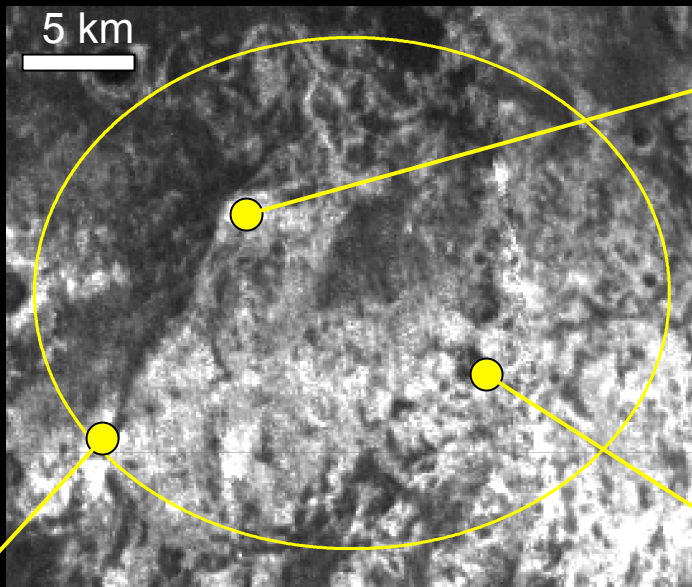


200 1400

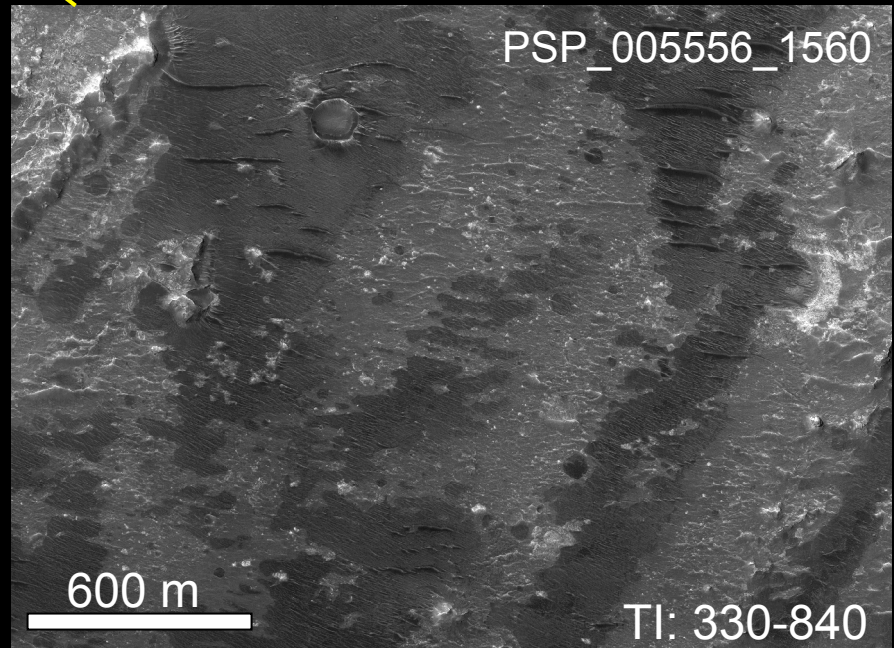
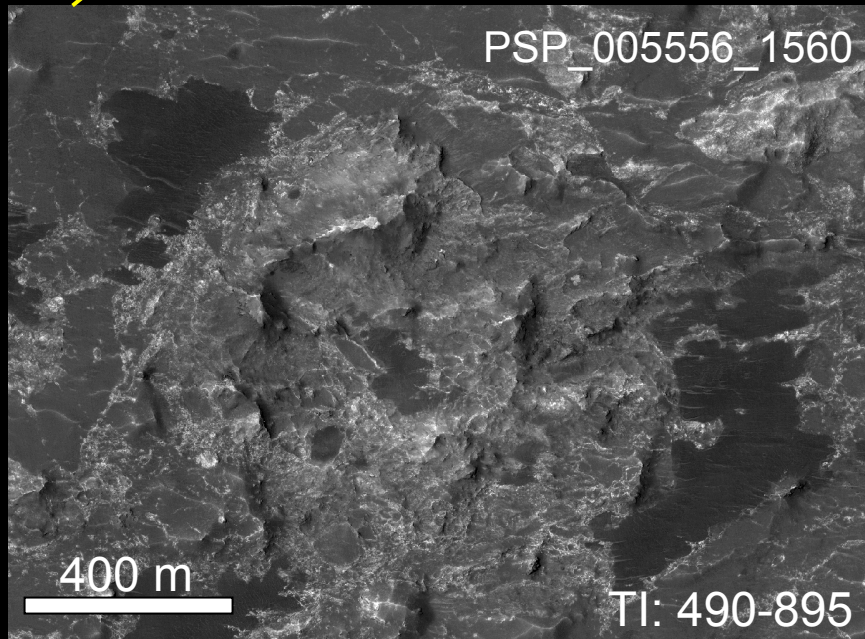
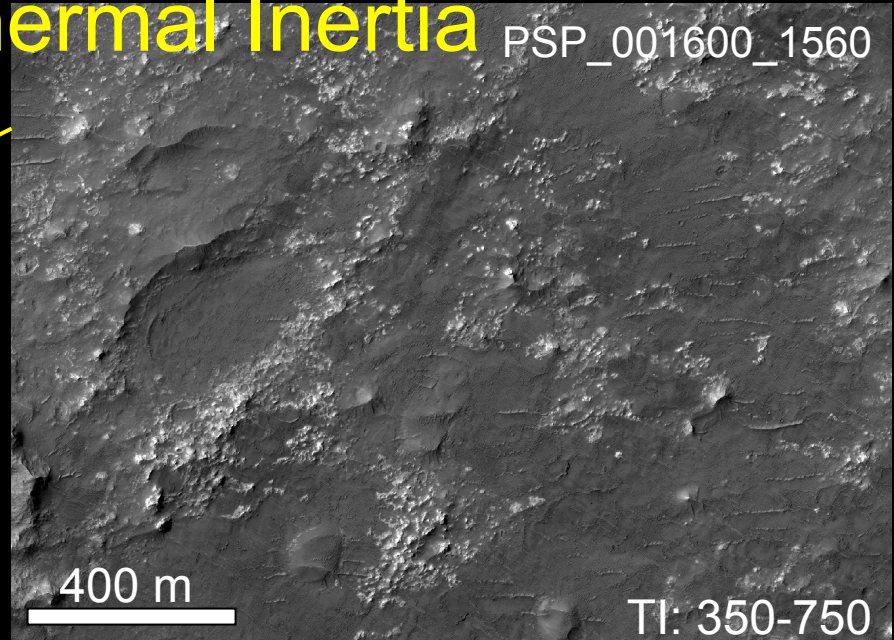
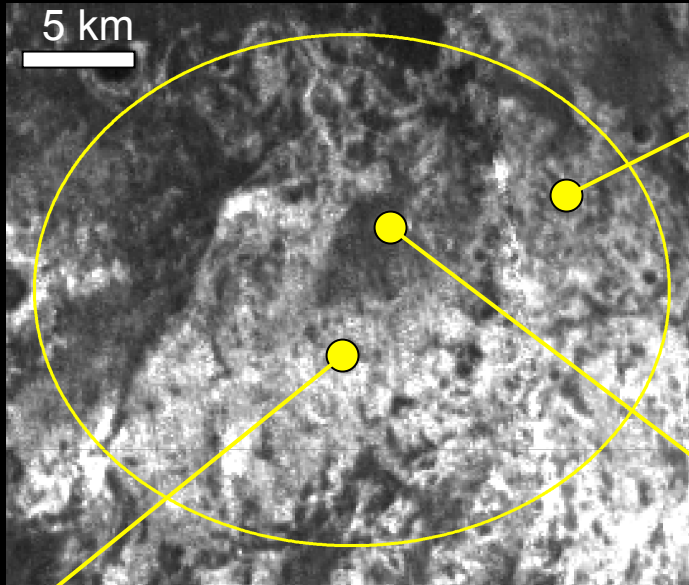
Thermal Inertia
 $\text{J m}^{-2} \text{K}^{-1} \text{s}^{-1/2}$

- Mean TI: 575
- STD: 150
- Dark material vs. exposed bedrock or indurated surface control thermal inertia

Eberswalde Higher Thermal Inertia

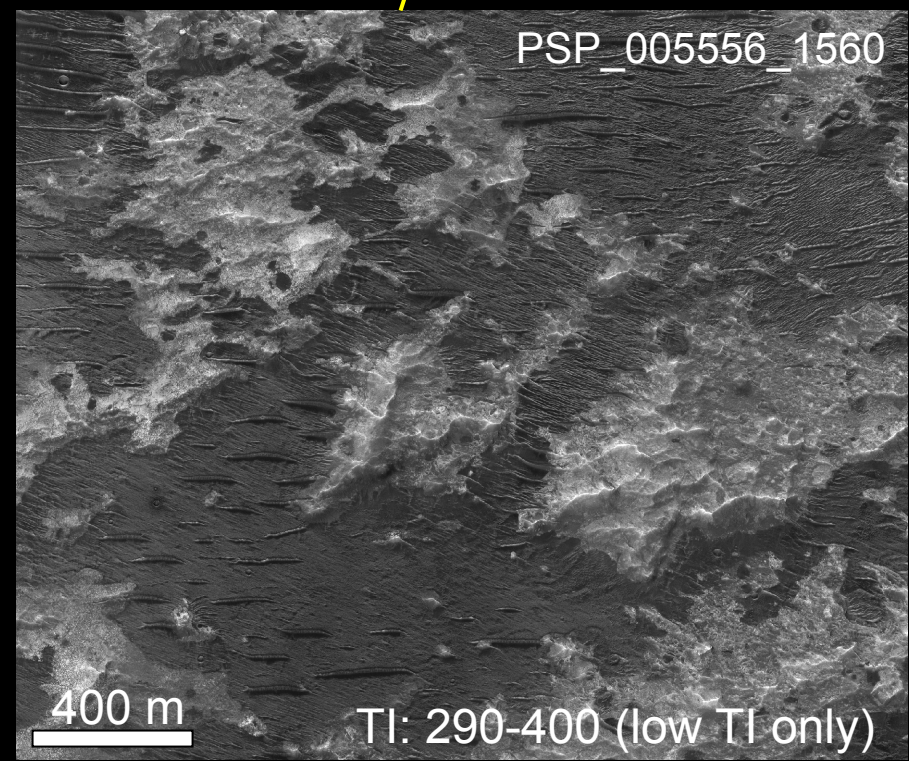
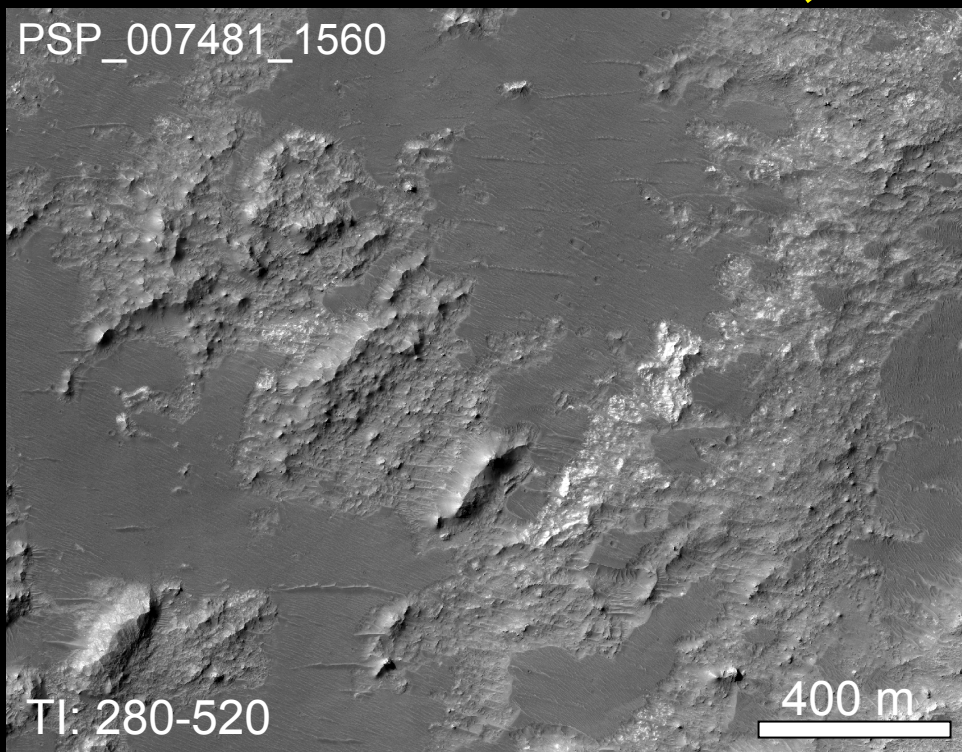
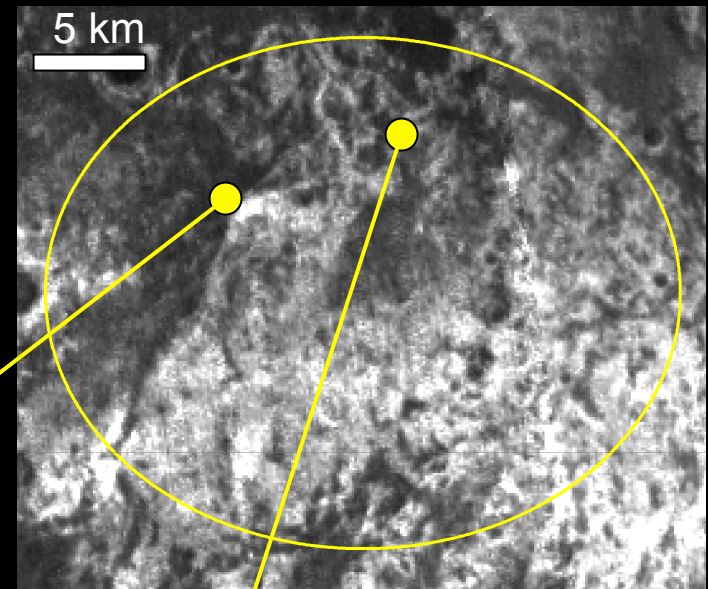


Eberswalde Moderate Thermal Inertia

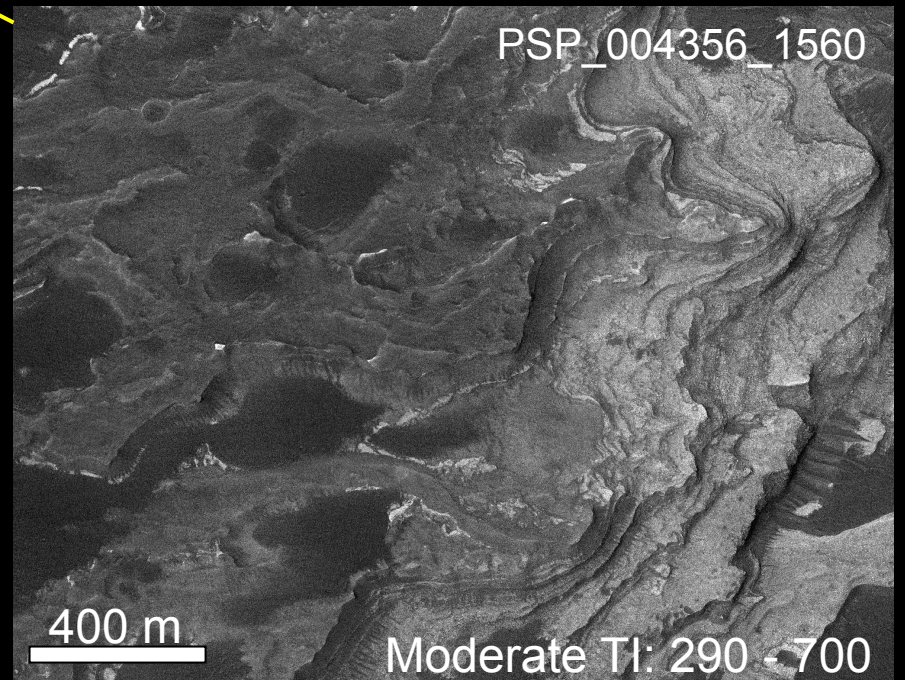
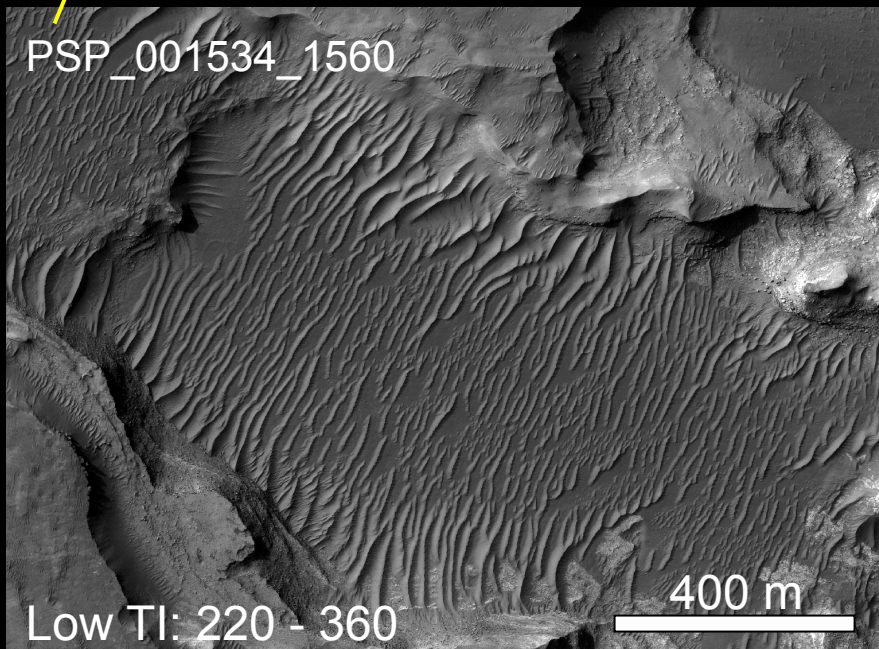
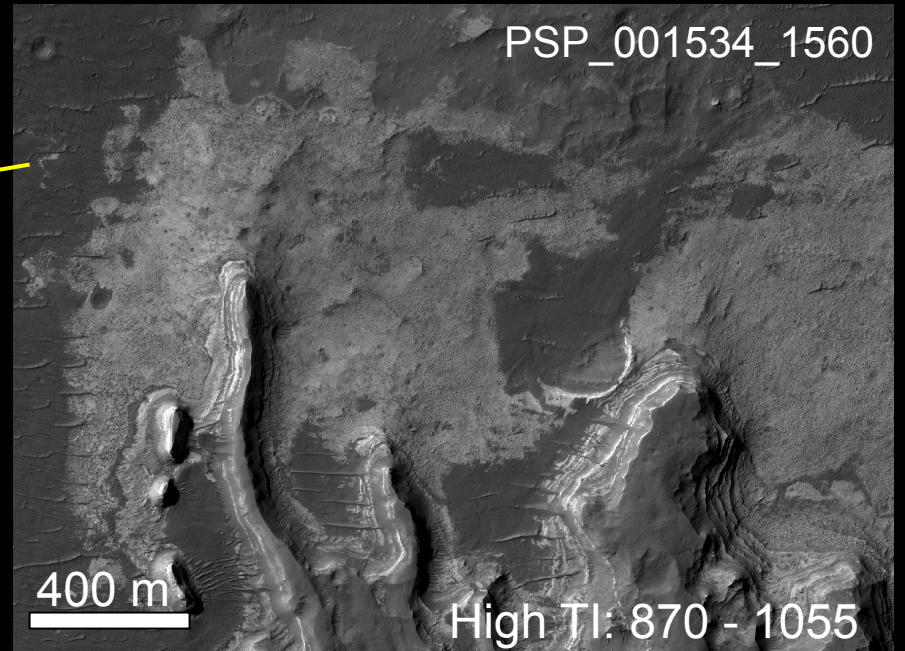
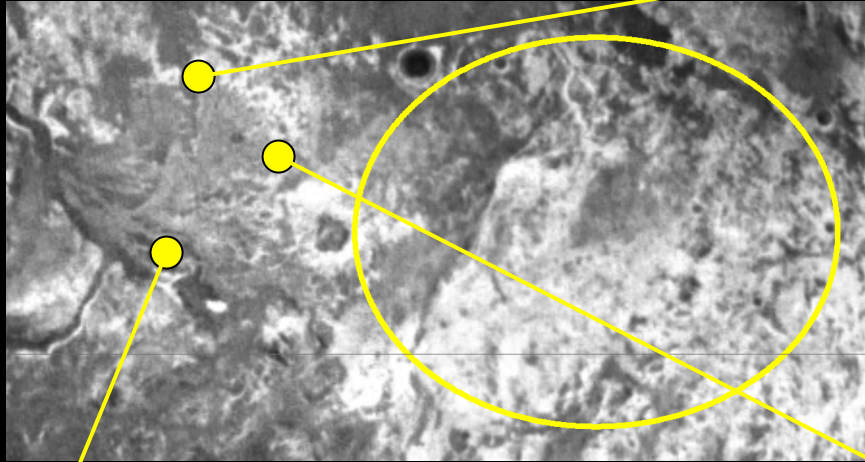


Eberswalde Lower Thermal Inertia

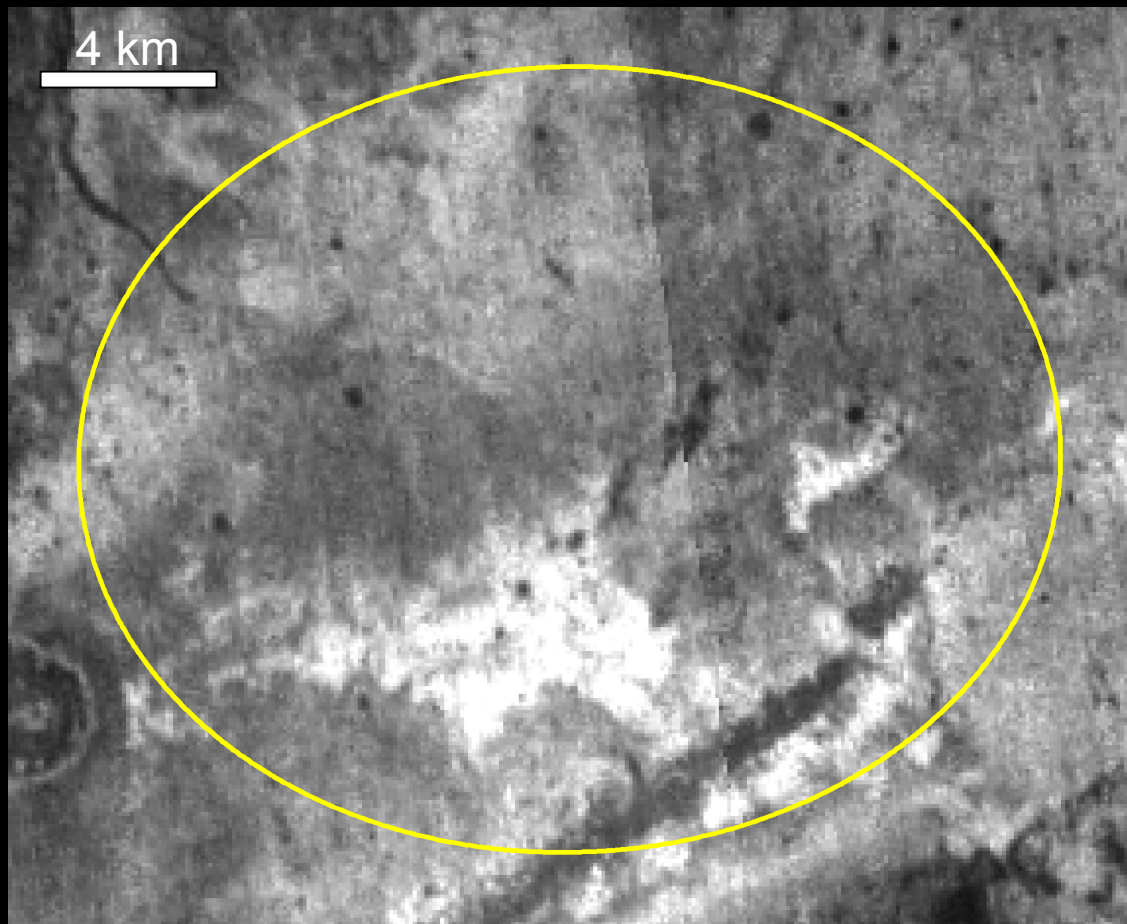
- Dark material
- Bed forms



Eberswalde Delta Front ~15 km from center of ellipse



Gale Crater



205 555

Thermal Inertia

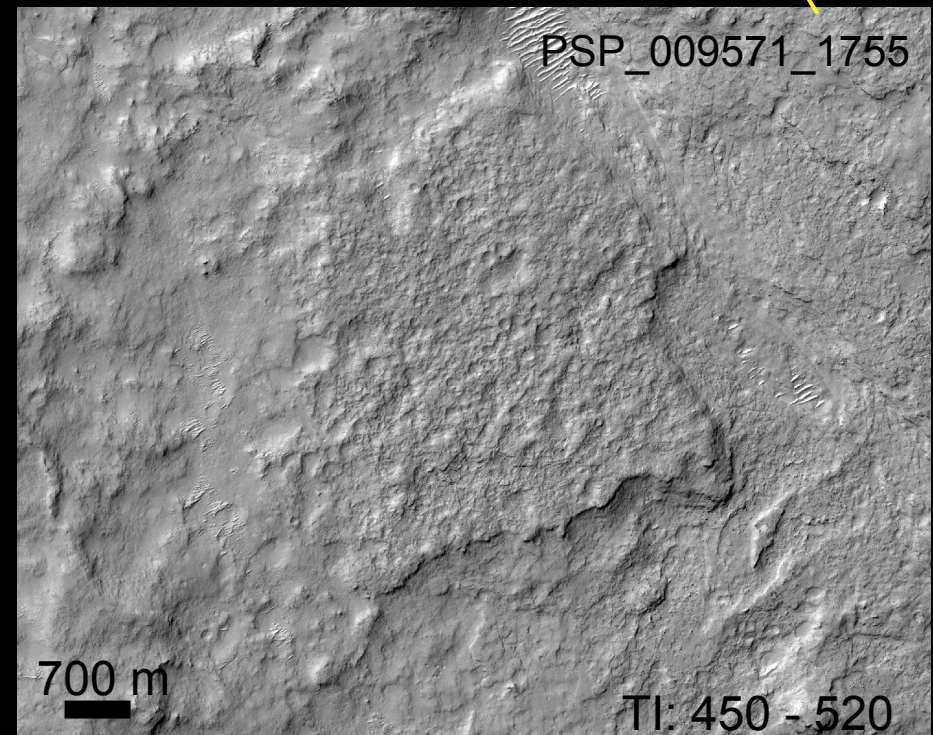
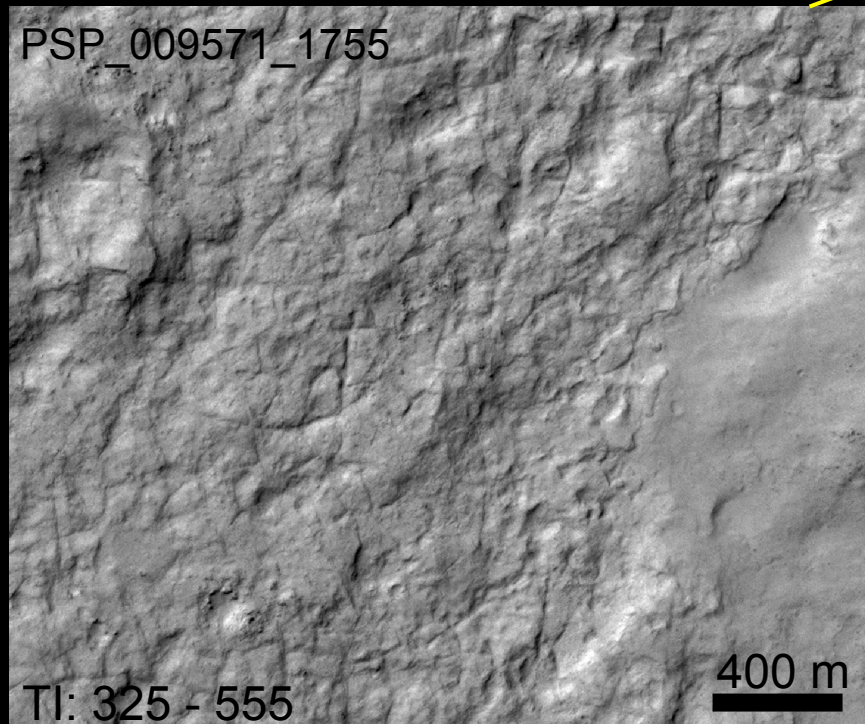
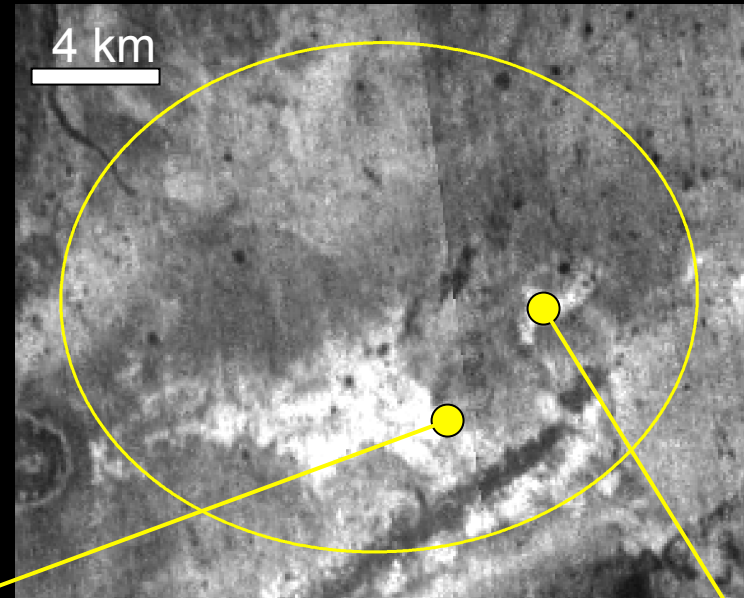
$\text{J m}^{-2} \text{K}^{-1} \text{s}^{-1/2}$

- Mean TI: 365
- STD: 50
- Majority of ellipse surface is likely indurated with some mobile materials present

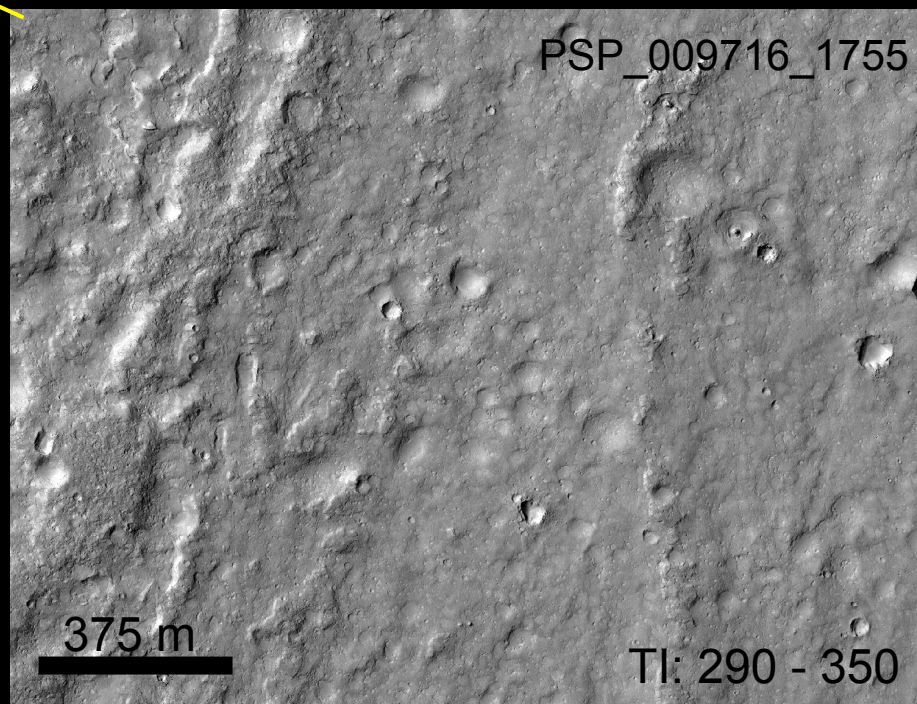
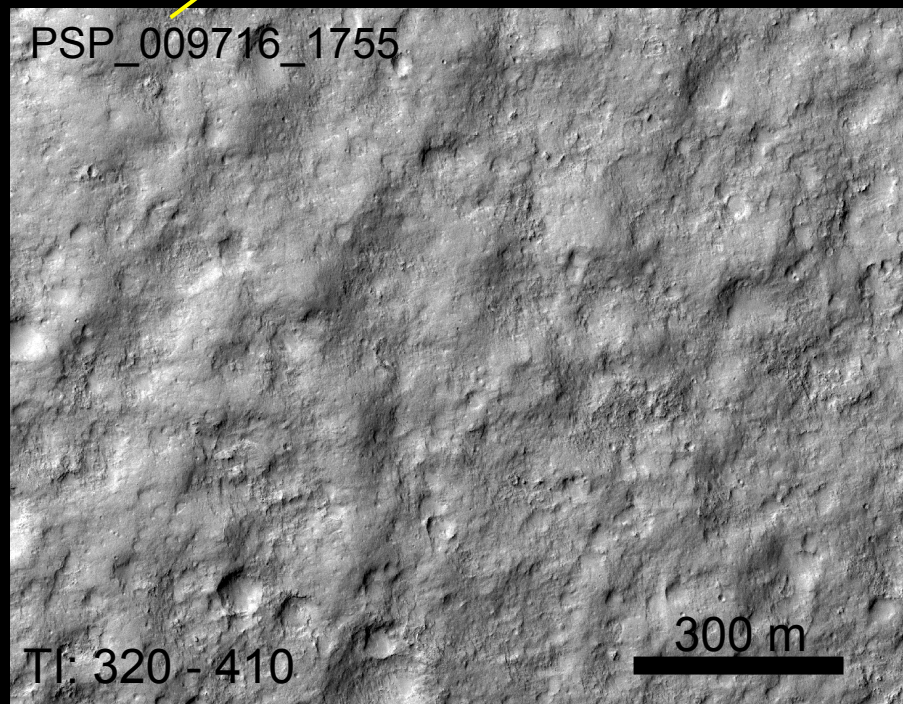
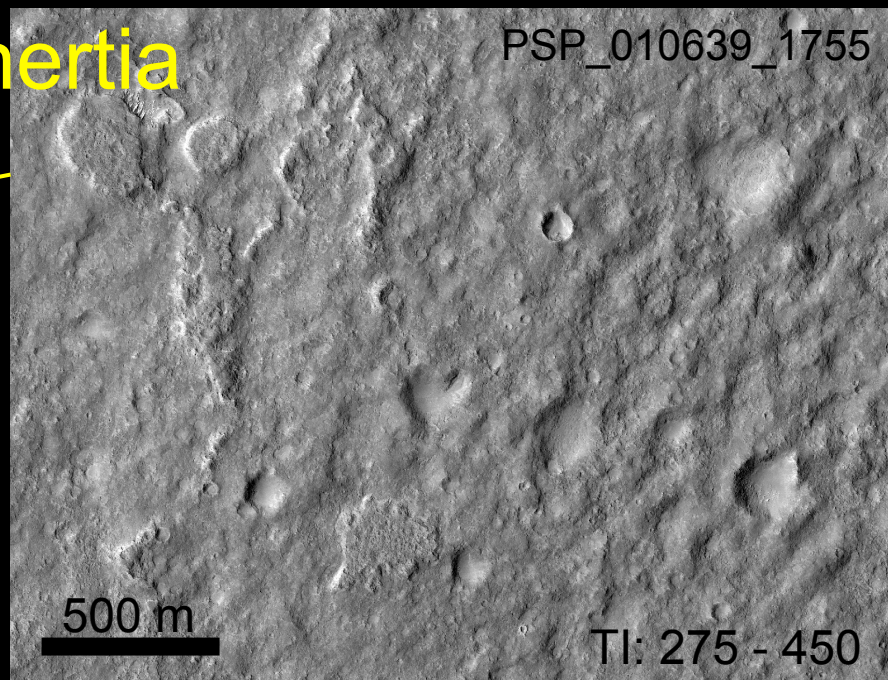
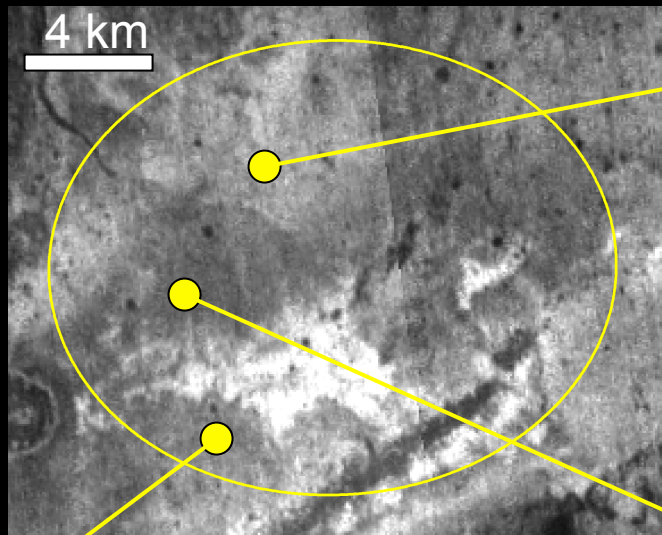
Gale Crater

Higher Thermal Inertia

- Indurated surface with little unconsolidated material
- Scoured surface



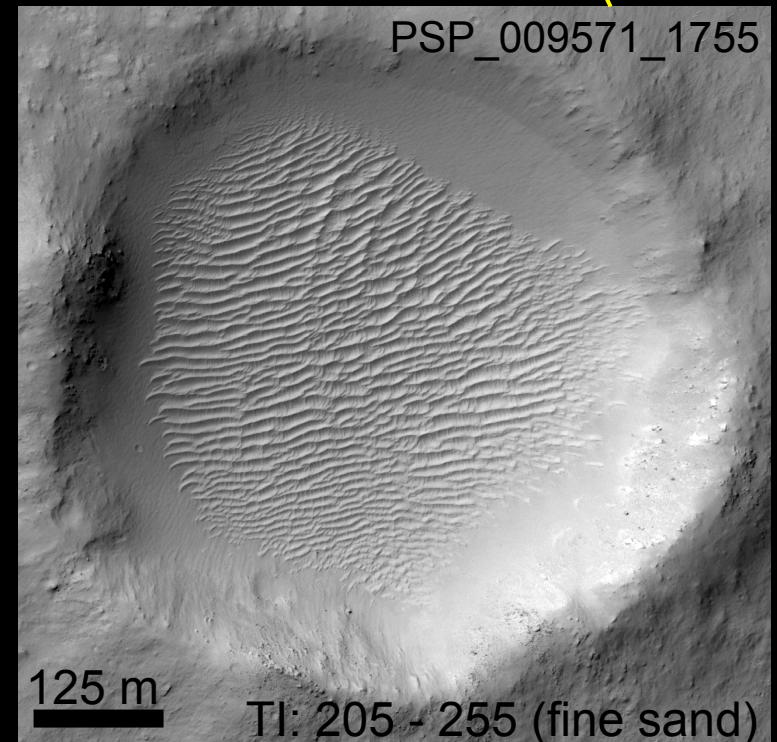
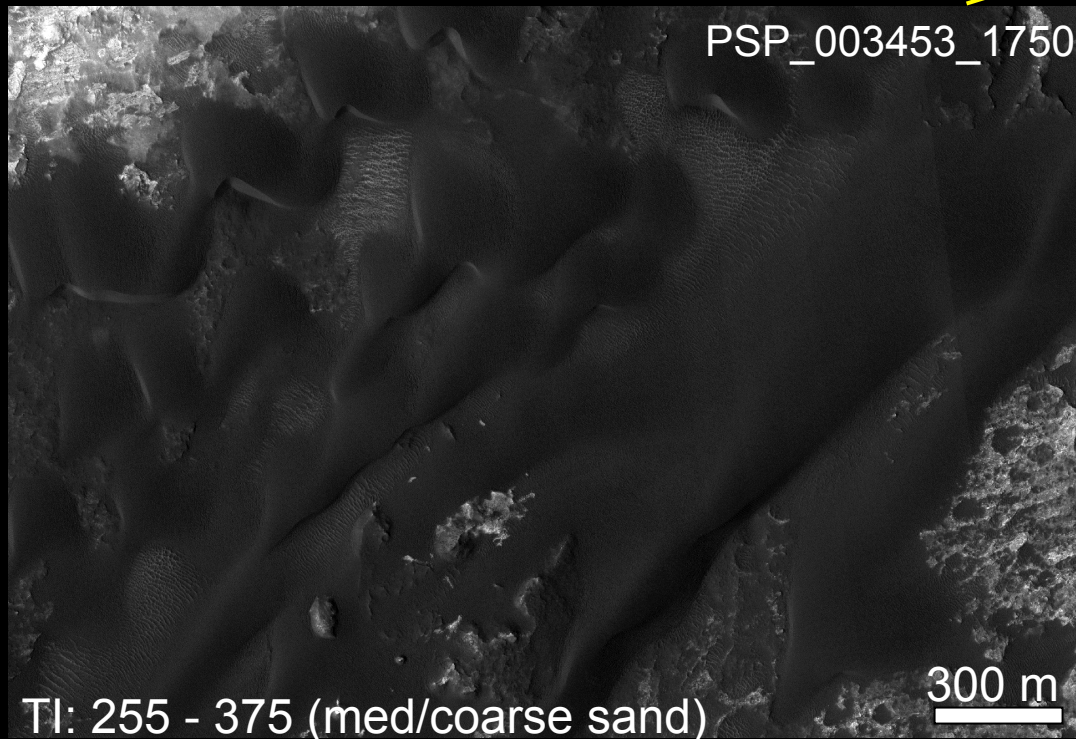
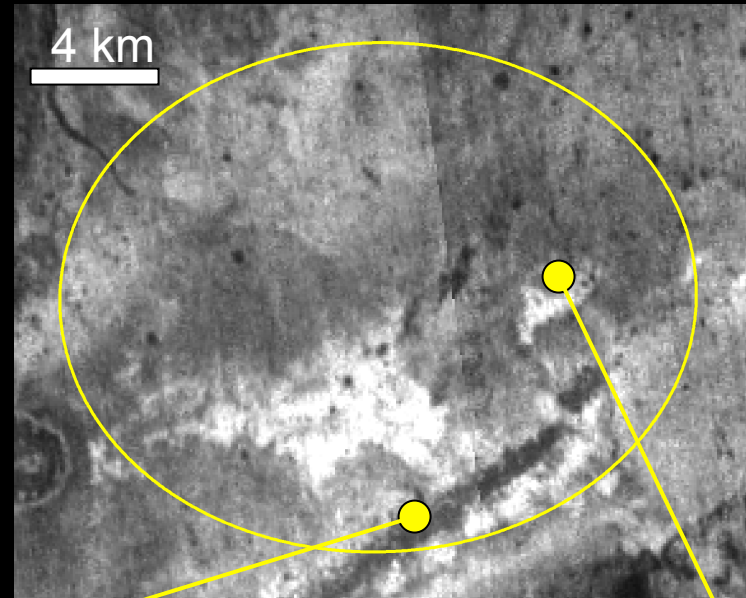
Gale Moderate Thermal Inertia



Gale Crater

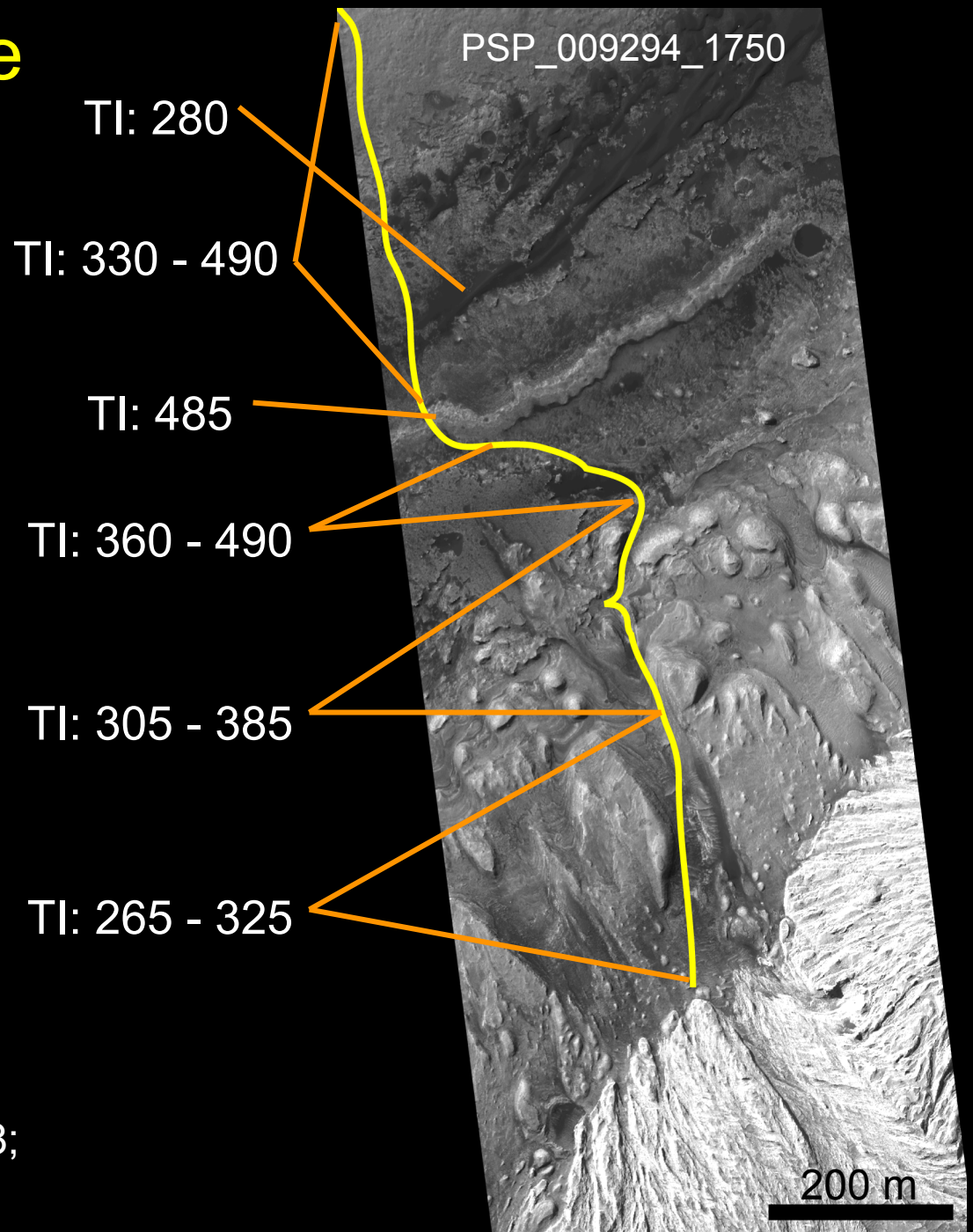
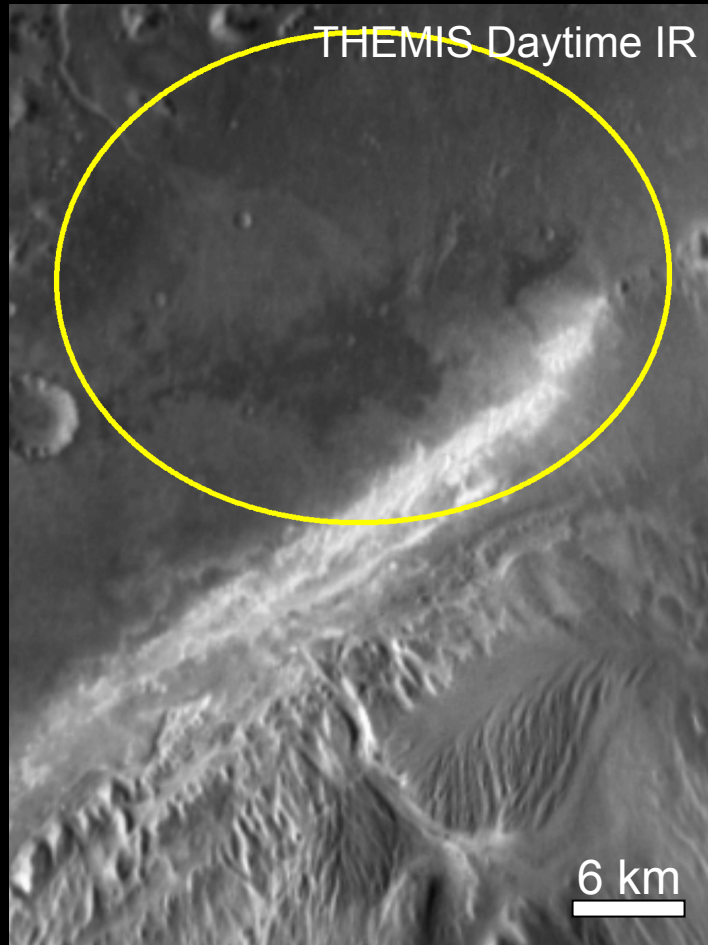
Lower Thermal Inertia

- Bed forming material
 - Infilling small craters
 - On Gale crater floor



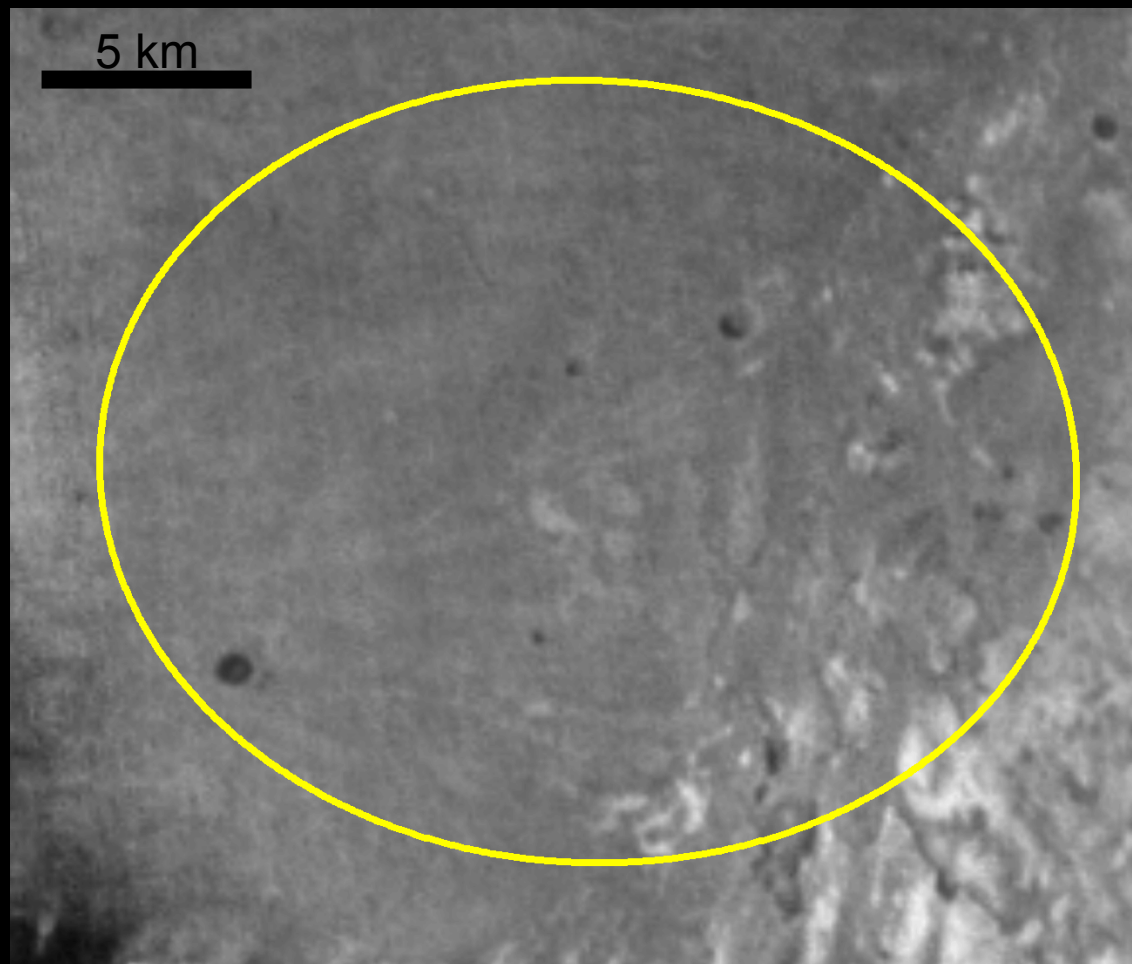
Gale Crater Traverse

~12-20 km from
center of ellipse



Notional traverse [Edgett *et al.*, 2008;
3rd MSL Landing Site Workshop]

Holden Crater

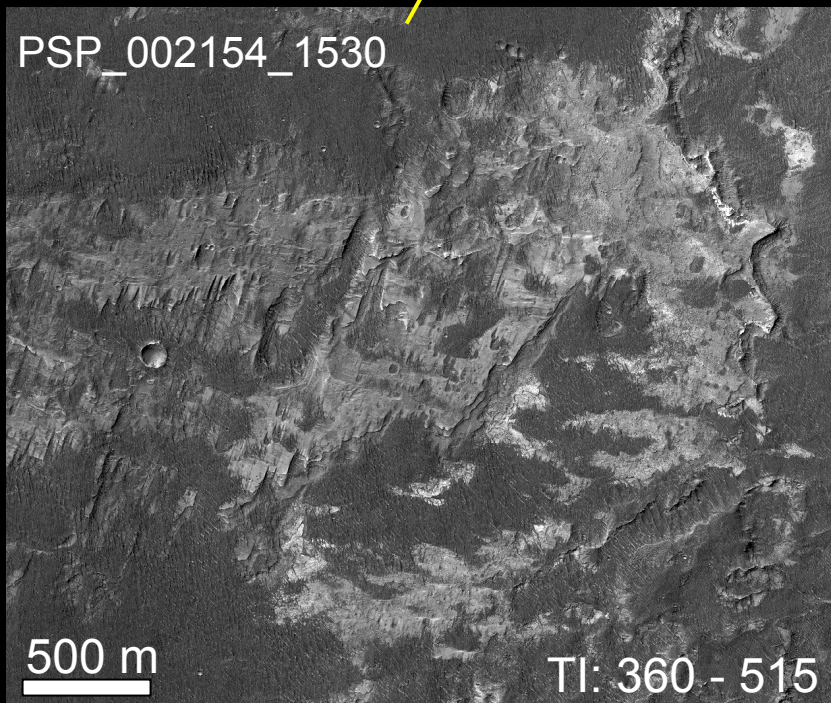
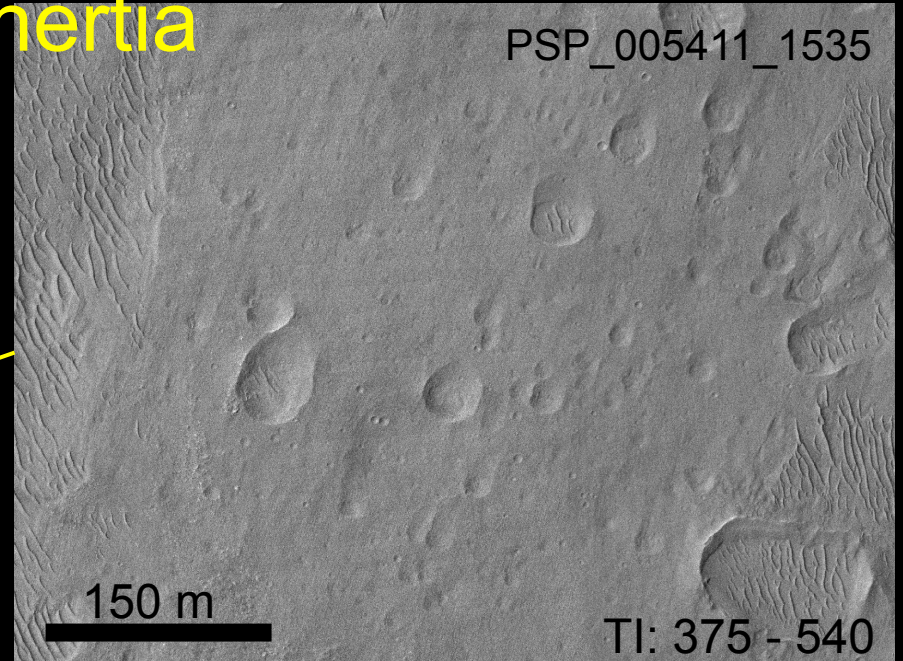
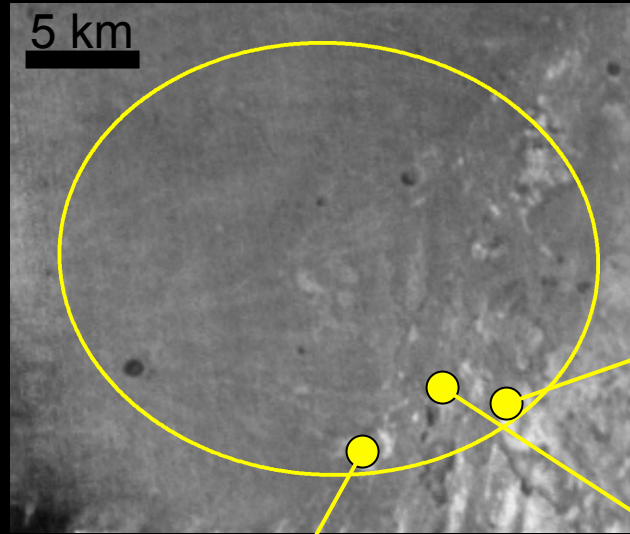


280 550

Thermal Inertia
 $\text{J m}^{-2} \text{K}^{-1} \text{s}^{-1/2}$

- Mean TI: 390
- STD: 25
- Majority of ellipse has a consistent TI and surface material
- Prevalent bed forms with consolidated material intermixed

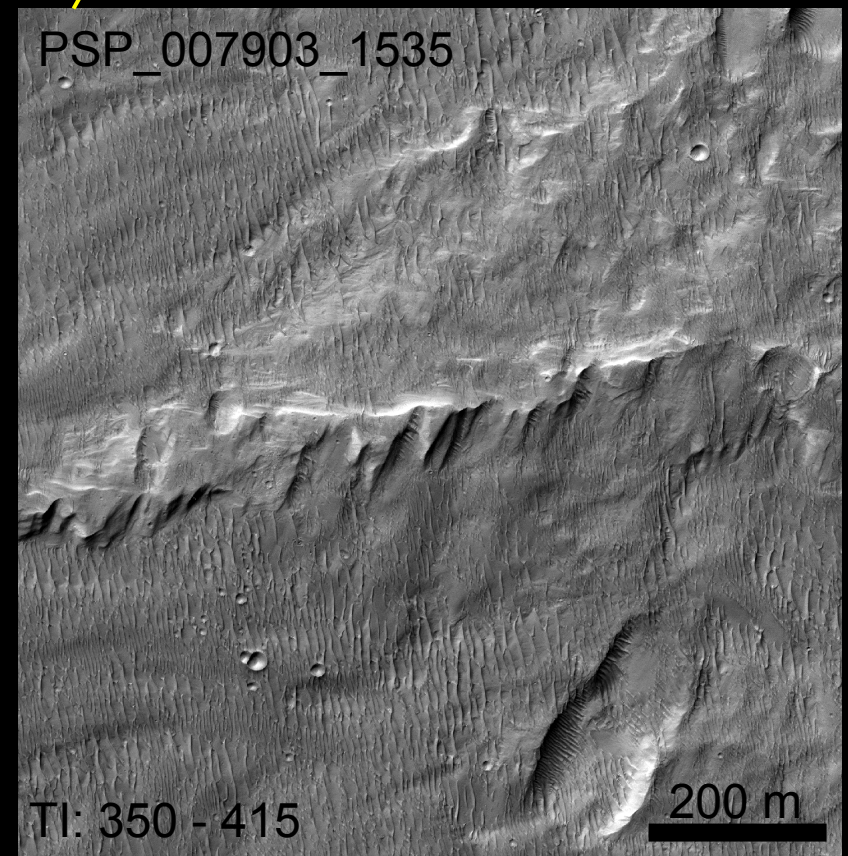
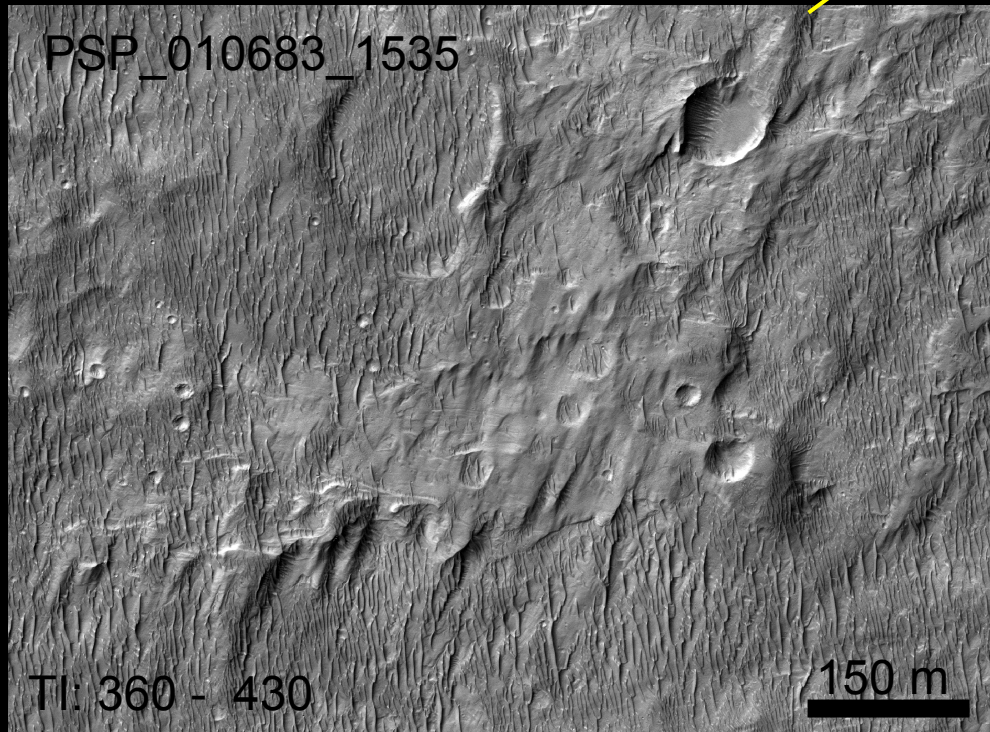
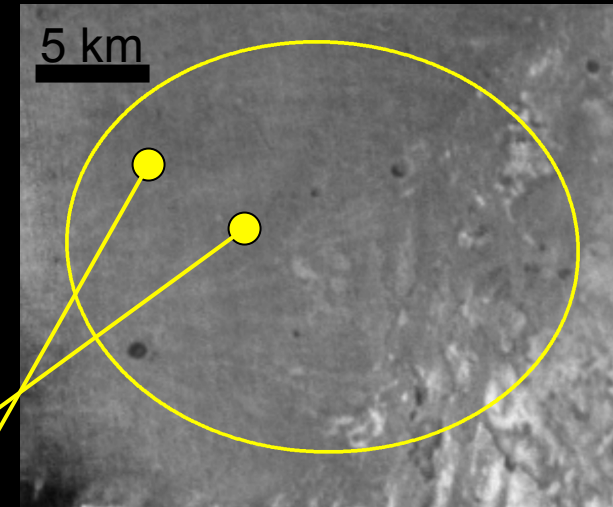
Holden Higher Thermal Inertia



Holden Crater

Moderate Thermal Inertia

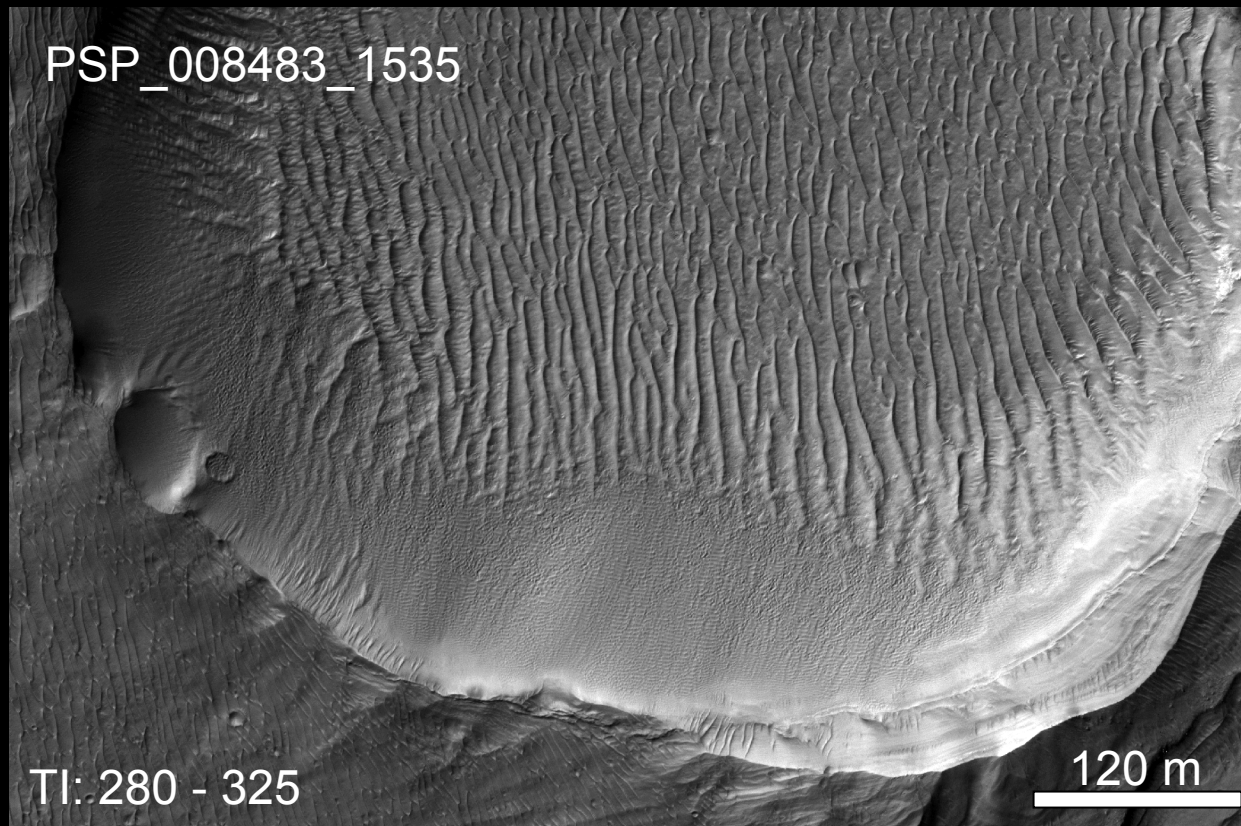
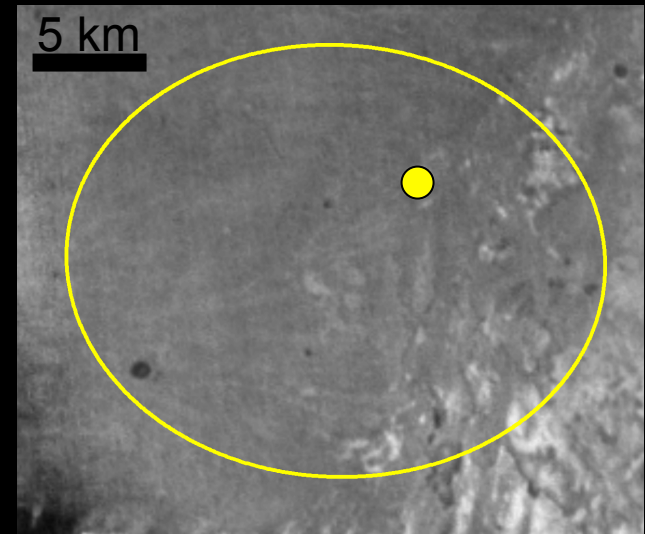
- Typical ellipse surface
- Prevalent bed forms
- Consolidated material exposed



Holden Crater

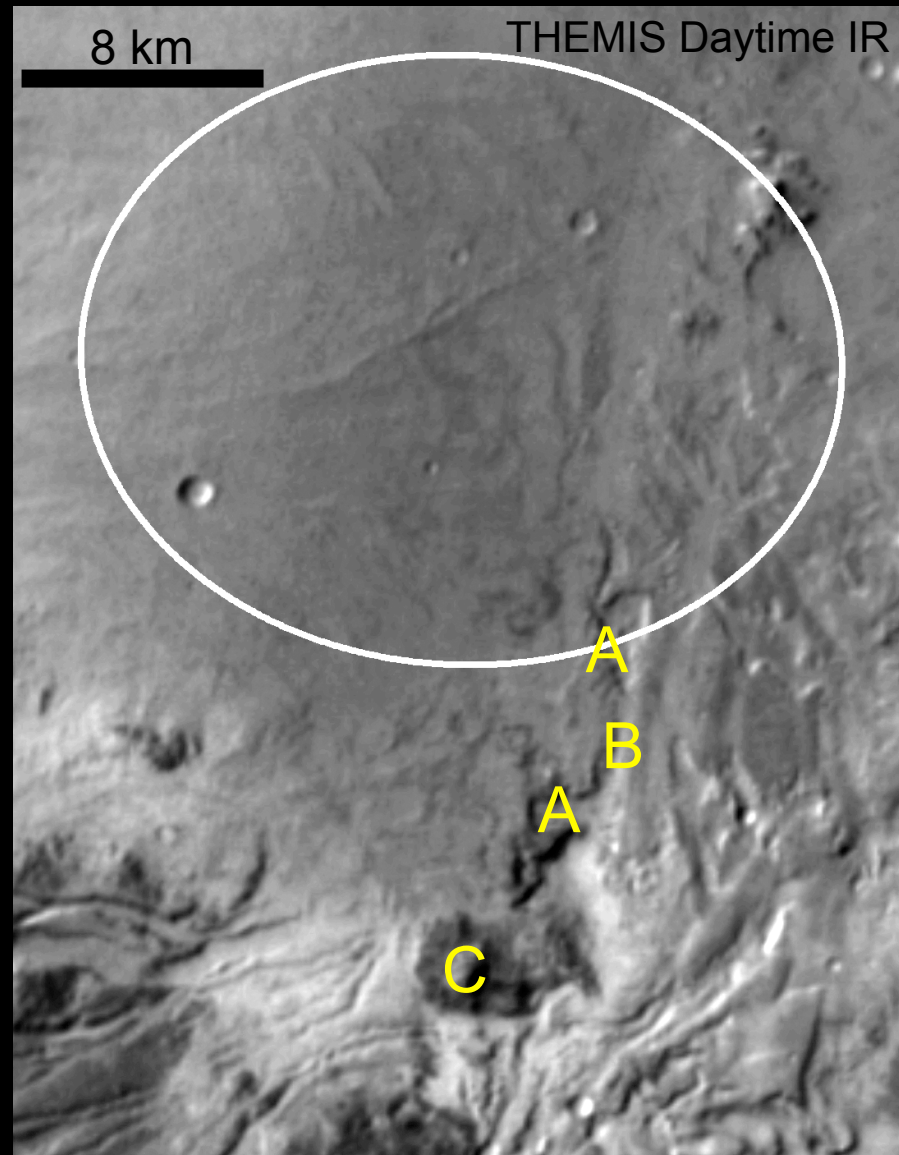
Lower Thermal Inertia

- Limited exposures
- Interior of craters
- Thicker bed form material



Holden Crater Potential Traverses

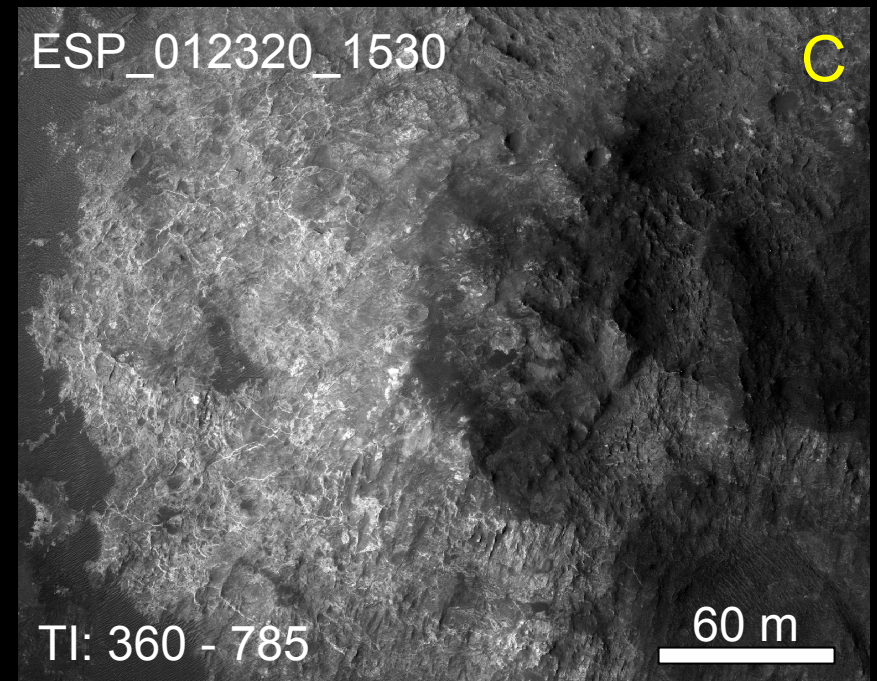
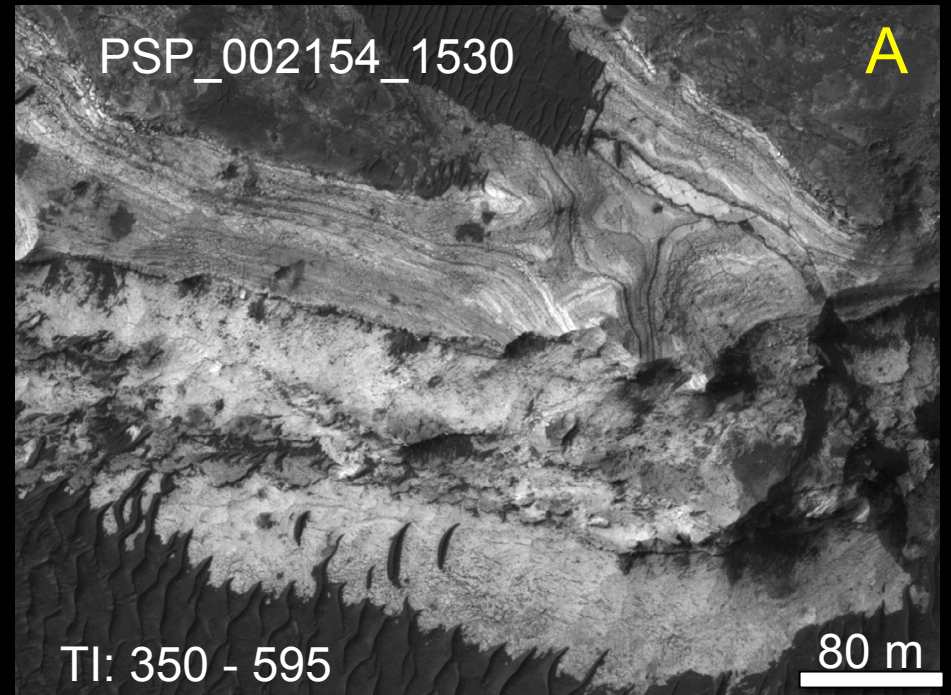
- A: Light-toned layered deposits (10 km)
 - ~13 km in length
- B: Uzboi flood deposits (13 km)
- C: Bedrock outcrop (18 km)
 - *Irwin, 2008; 3rd MSL Landing Site Workshop*



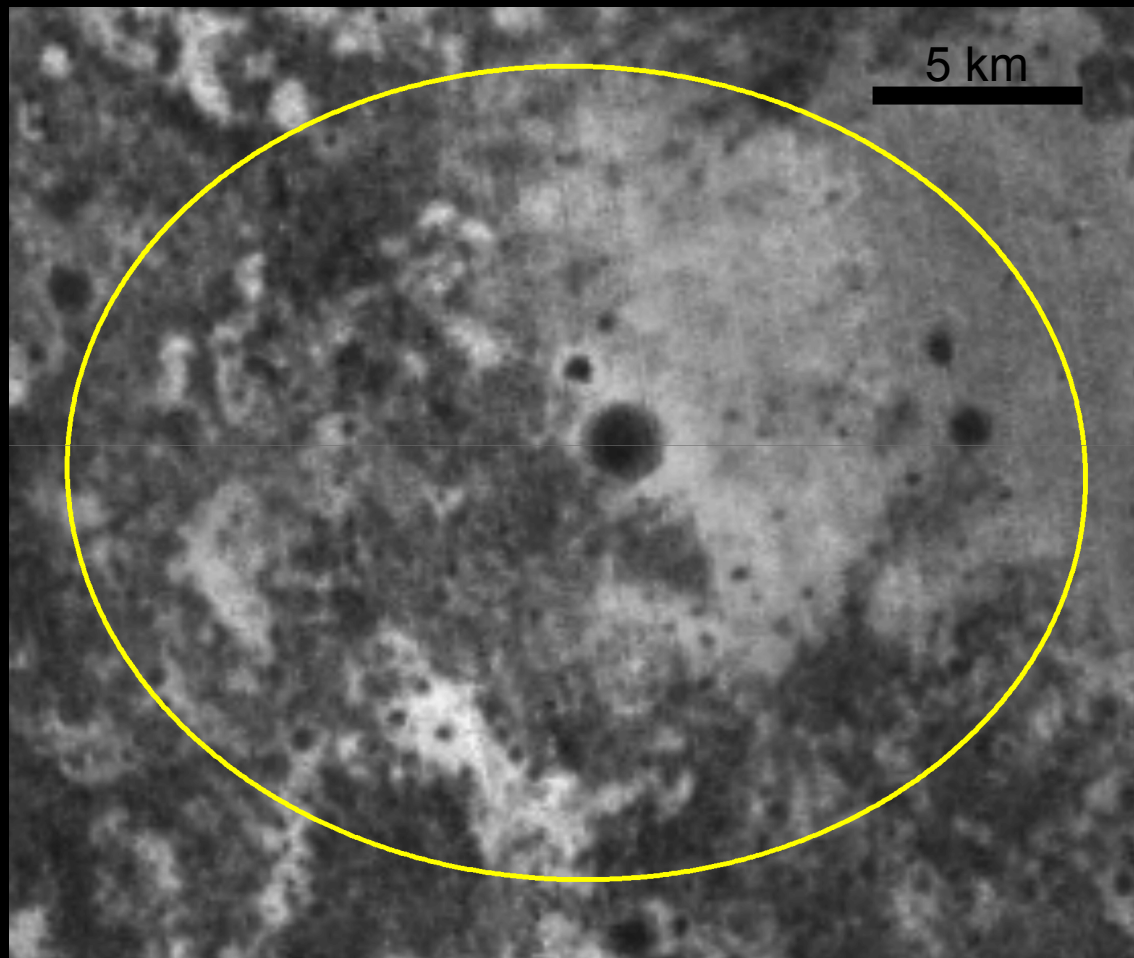
Holden Crater

Potential Traverses

- A: Light-toned layered deposits (10 km)
- B: Uzboi flood deposits (13 km)
- C: Bedrock outcrop (18 km)



Mawrth Vallis

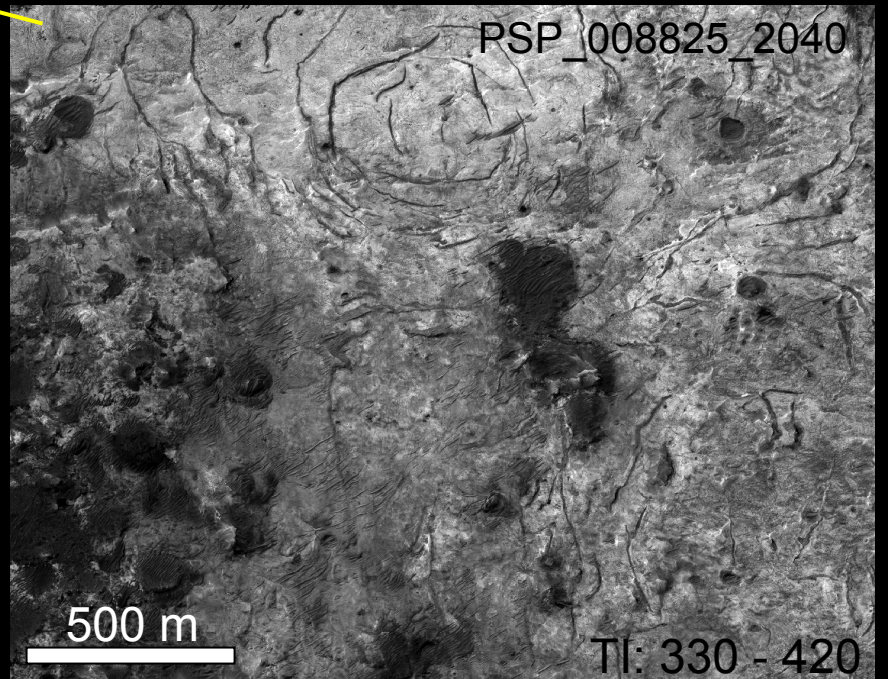
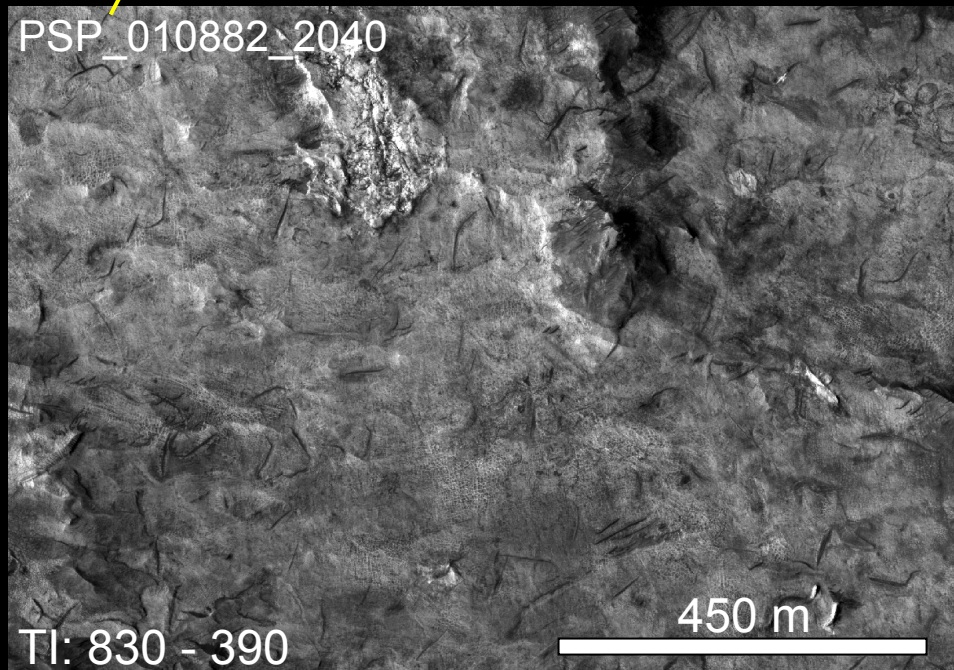
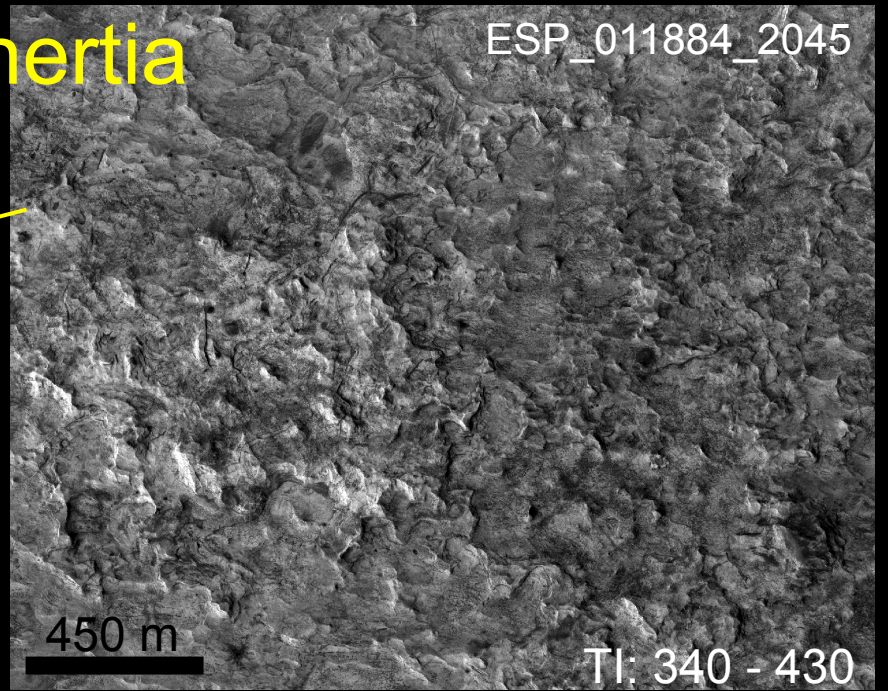
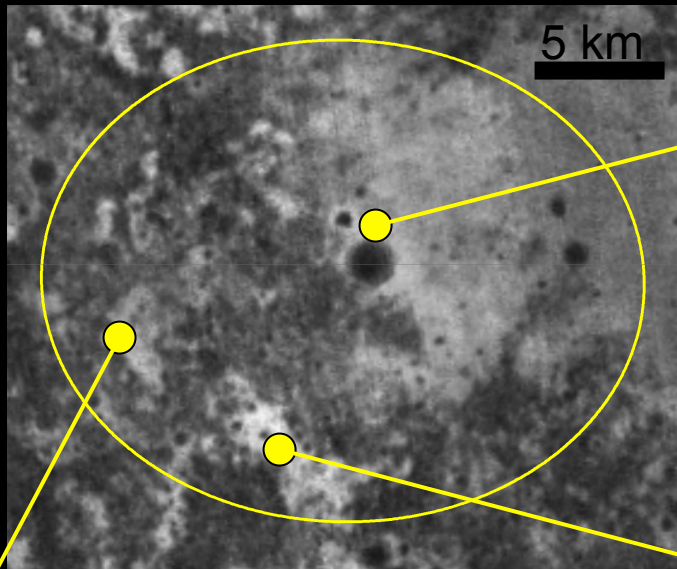


140 530

Thermal Inertia
 $\text{J m}^{-2} \text{K}^{-1} \text{s}^{-1/2}$

- Mean TI: 310
- STD: 55
- More surface texture and feature variety within the ellipse than other landing sites

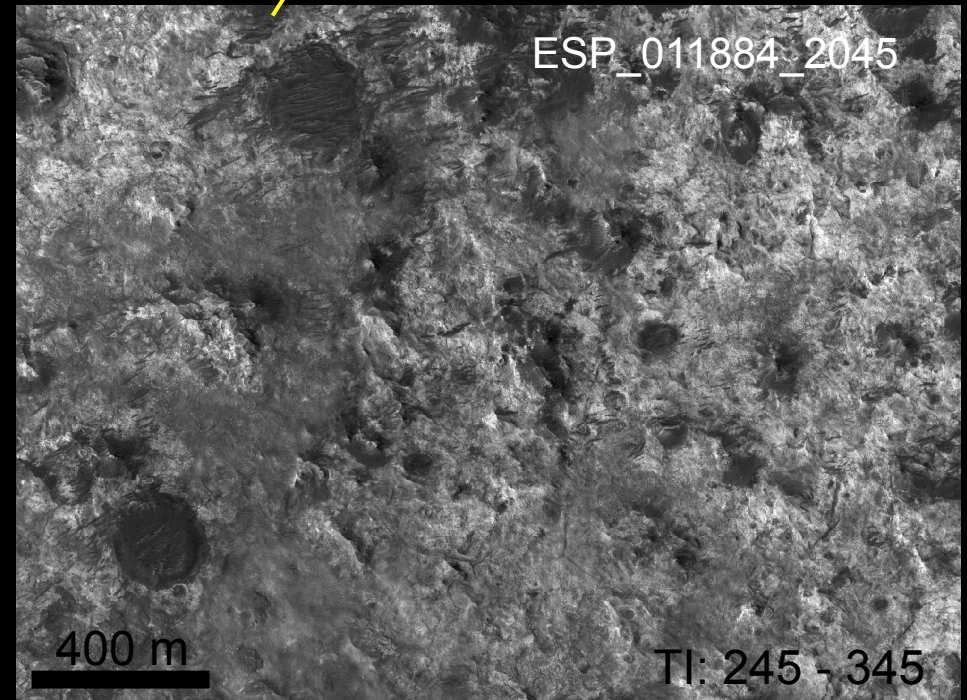
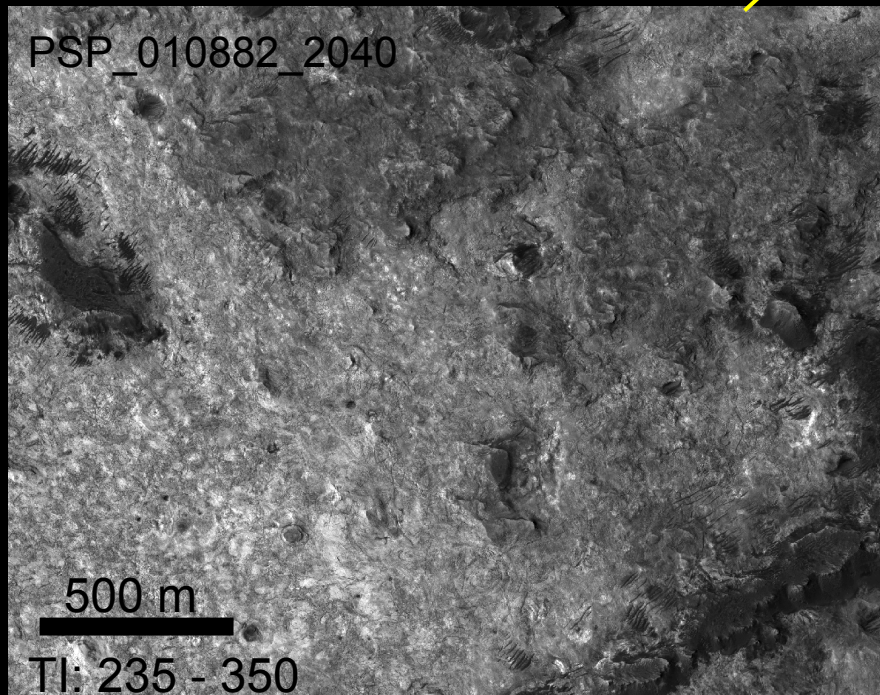
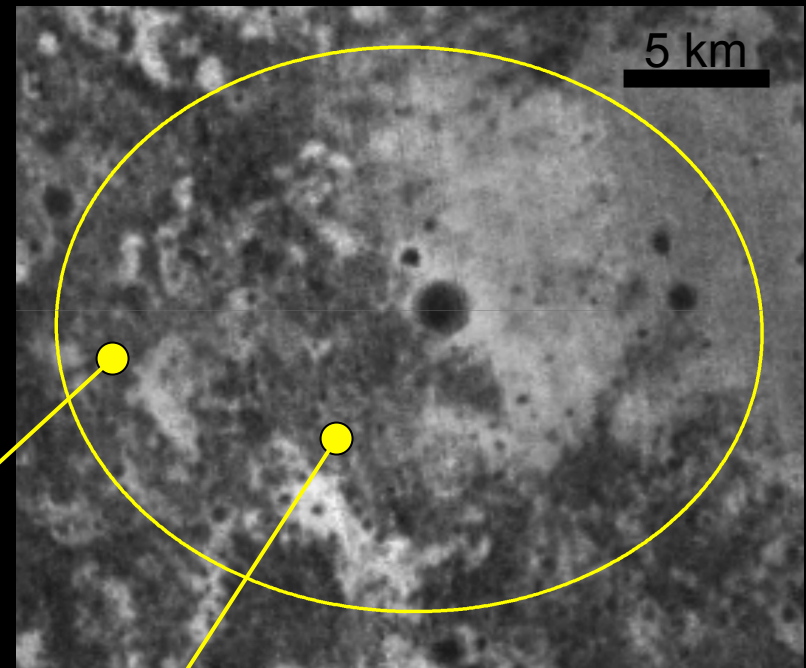
Mawrth Higher Thermal Inertia



Mawrth Vallis

Moderate Thermal Inertia

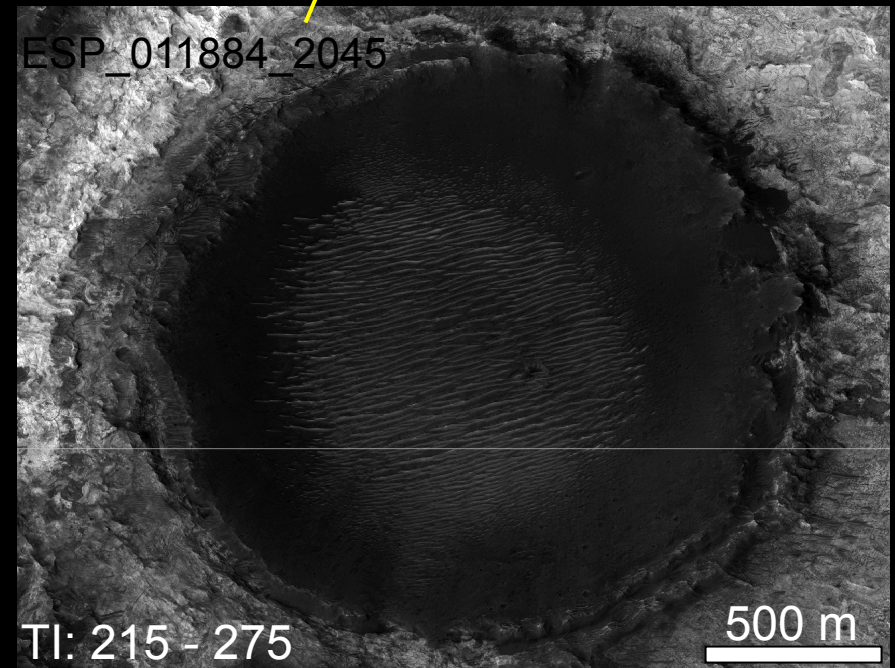
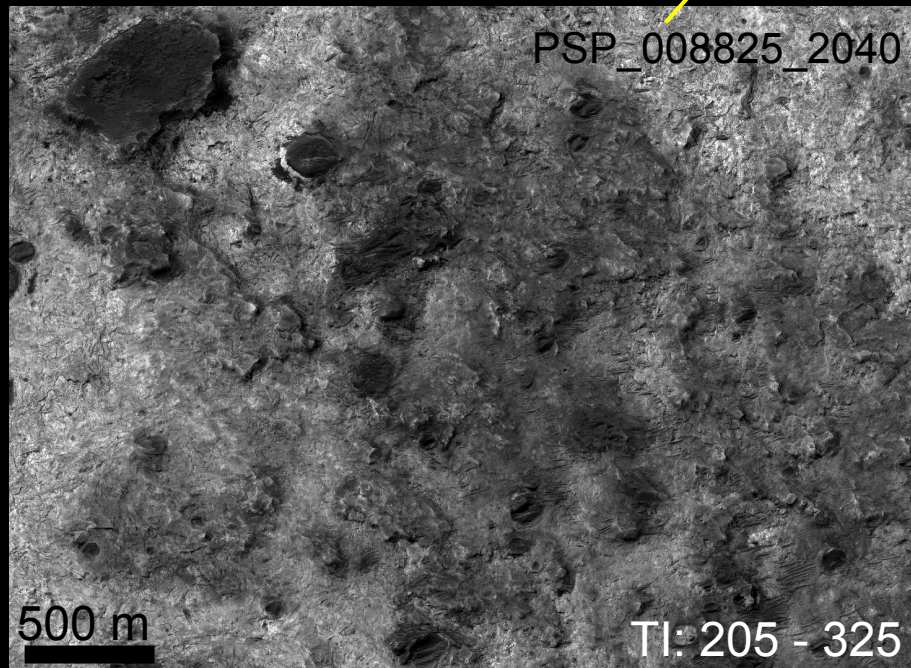
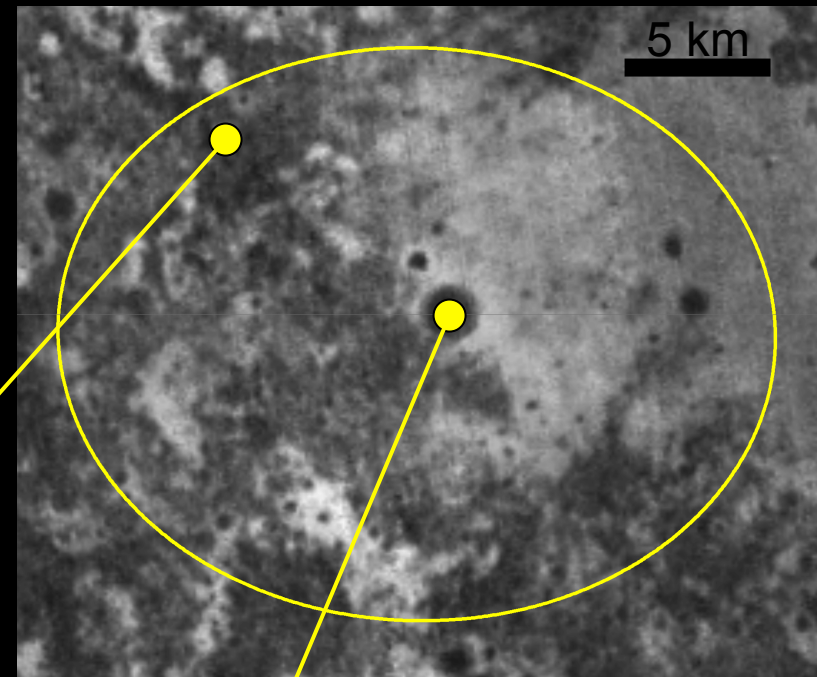
- Mixture of materials
 - Bedrock
 - Indurated surfaces
 - Bedforms
 - Unconsolidated fines



Mawrth Vallis

Lower Thermal Inertia

- Craters filled with unconsolidated fines
- Indurated surfaces



Summary

Eberswalde crater

- Primarily a 2 component system
 - More fines, the lower the thermal inertia
- Layers are well indurated

Gale crater

- Majority of the ellipse is a moderate TI (250-410)
 - Lیکley indurated
 - Possilby altered
 - Unconsolidated material present
- Difference between higher and moderate TI surfaces is likely due to amount of unconsolidated material
- Surface is likely very degraded

Summary

Holden crater

- Majority of ellipse has a consistent TI and surface material
 - Bedrock, indurated
 - Bed forms
- Higher TI surface is associated with layered material
 - Altered bedrock may also be present

Mawrth Vallis

- Most thermophysical variety of any site
- High/Moderate TI surface
 - Indurated material
 - Altered rock
 - Mixed with unconsolidated material