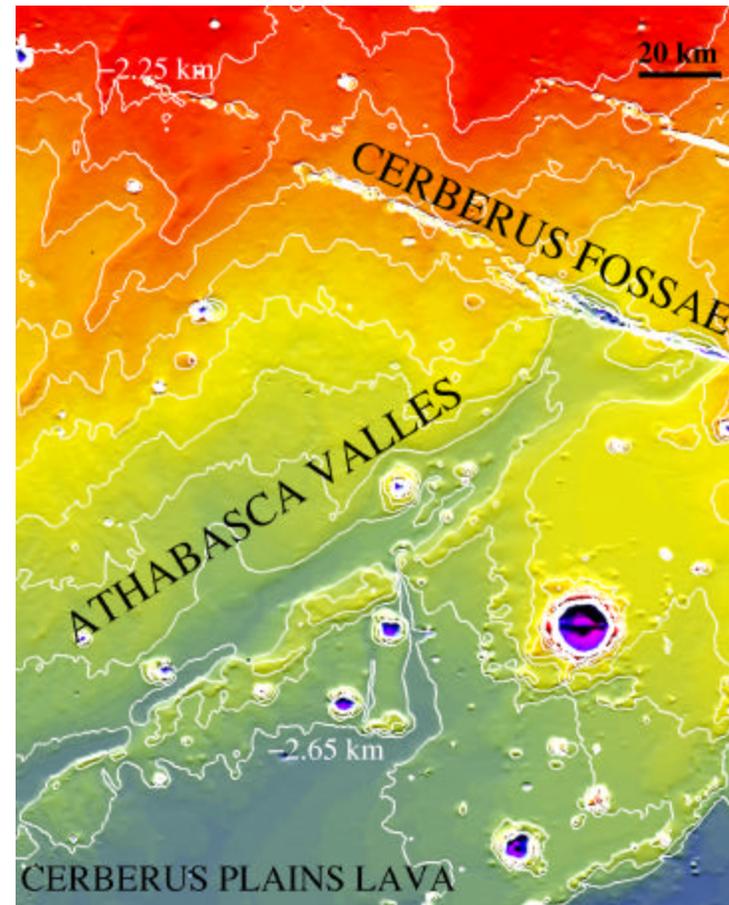


# Athabasca Valles: Evaluation as MER Landing Site

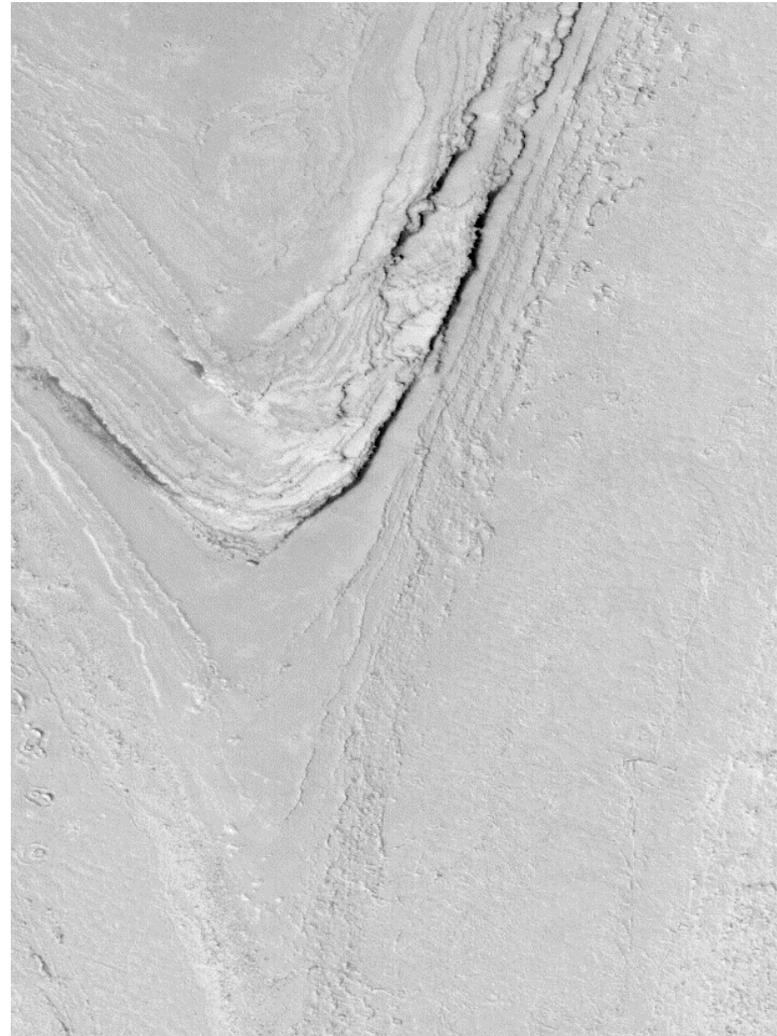
Alfred McEwen, March 27, 2001

- Great science at local scales
- Meets landing safety requirements
- Major concern about trafficability



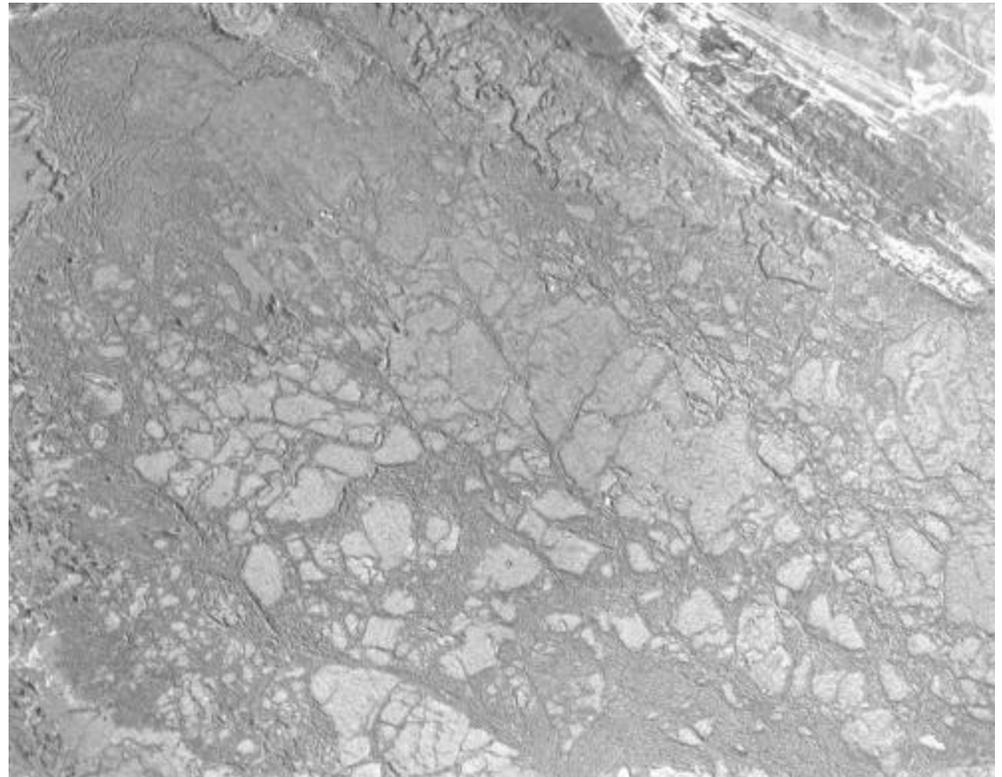
# Testable Hypotheses

- **Deep groundwater erupted onto the surface from Cerberus Fossae**
- **Fine layers of aqueous origin**
- **Giant current ripples, longitudinal grooves, terraces: constrain hydrology**
- **Multiple, interleaved floods of water and lava**
- **Extant hydrothermal system?**
- **Athena can study: composition, alteration, small-scale morphology**



# Testable Hypotheses (continued)

- **Other hypotheses from 2002 LPSC:**
  - **No water: CO<sub>2</sub> cryoclastic flows (Hoffman and Tanaka)**
  - **No lava: platy/ridged stuff is freeze-dried aqueous flood (Rice, Parker, et al.)**



**Origin of polygons/patterned ground  
(ponded lava, fluvial sediments)**



# Origin of layers eroded by Athabasca Valles?

Origin of fine layers (Malin and Edgett) may be fluvial, volcanic, eolian.

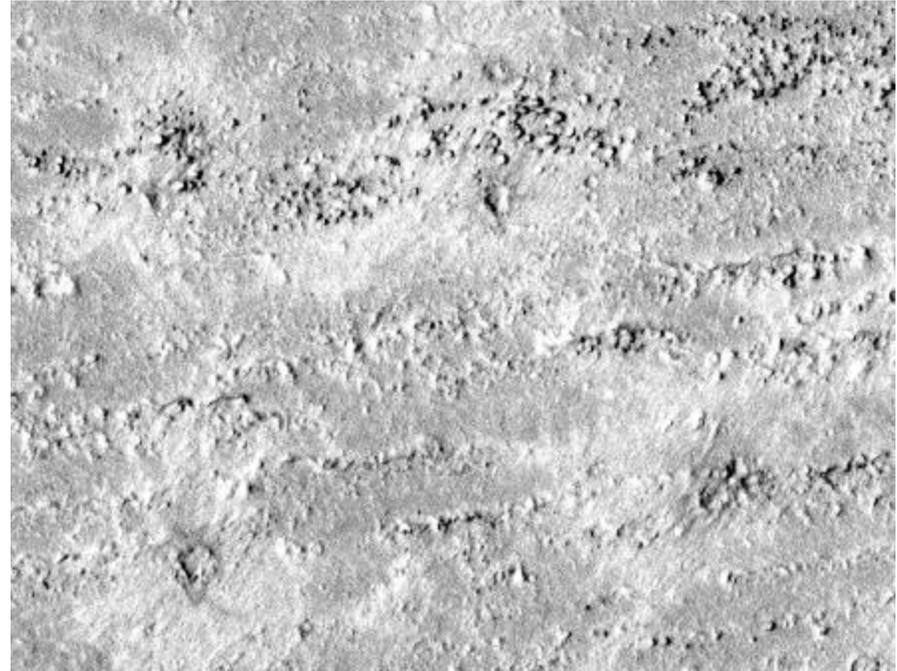


# Megaripples?



## EXHUMED TERRAIN?

Was fluvial activity < 10 Ma or is that the exposure age?

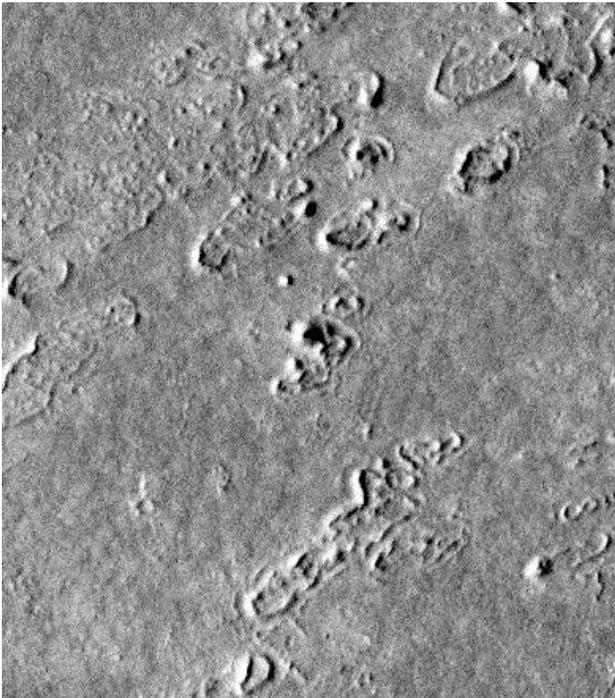


- Clearly exhumed lavas to the S, near Medusae Fossae Fm (left)
- Many bright-ejecta craters over Athabasca region (right)--puzzling, maybe indurated remnants of overlying layer?
- Important issue for Mars geologic/aqueous history
- Athena cannot date rocks or surfaces, but should provide important clues

# Geomorphology and

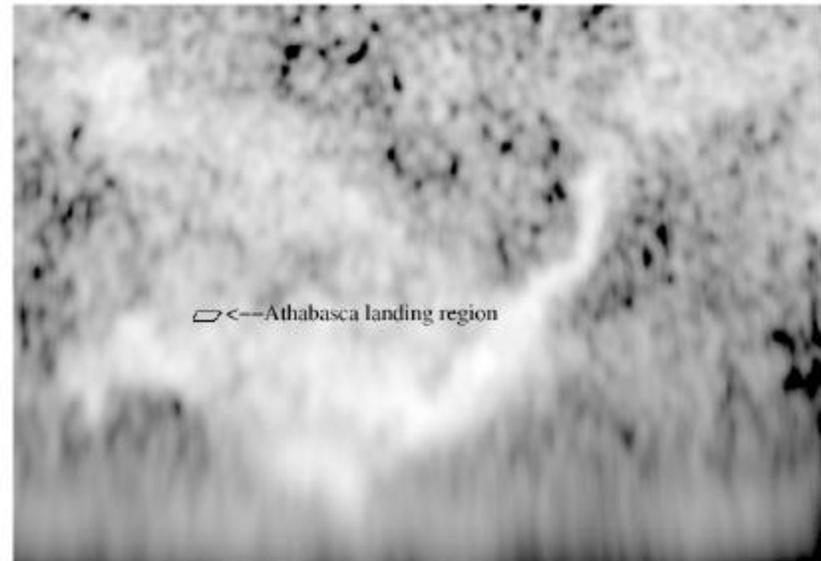
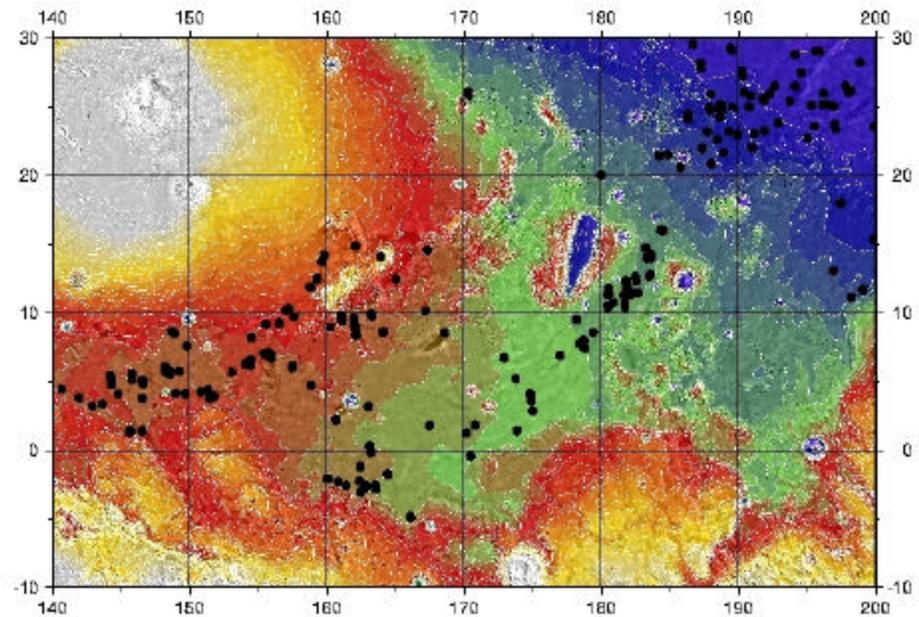
## Public Appeal

Very interesting region  
at MOC scales,  
especially full resolution  
(1.5 m/pixel)

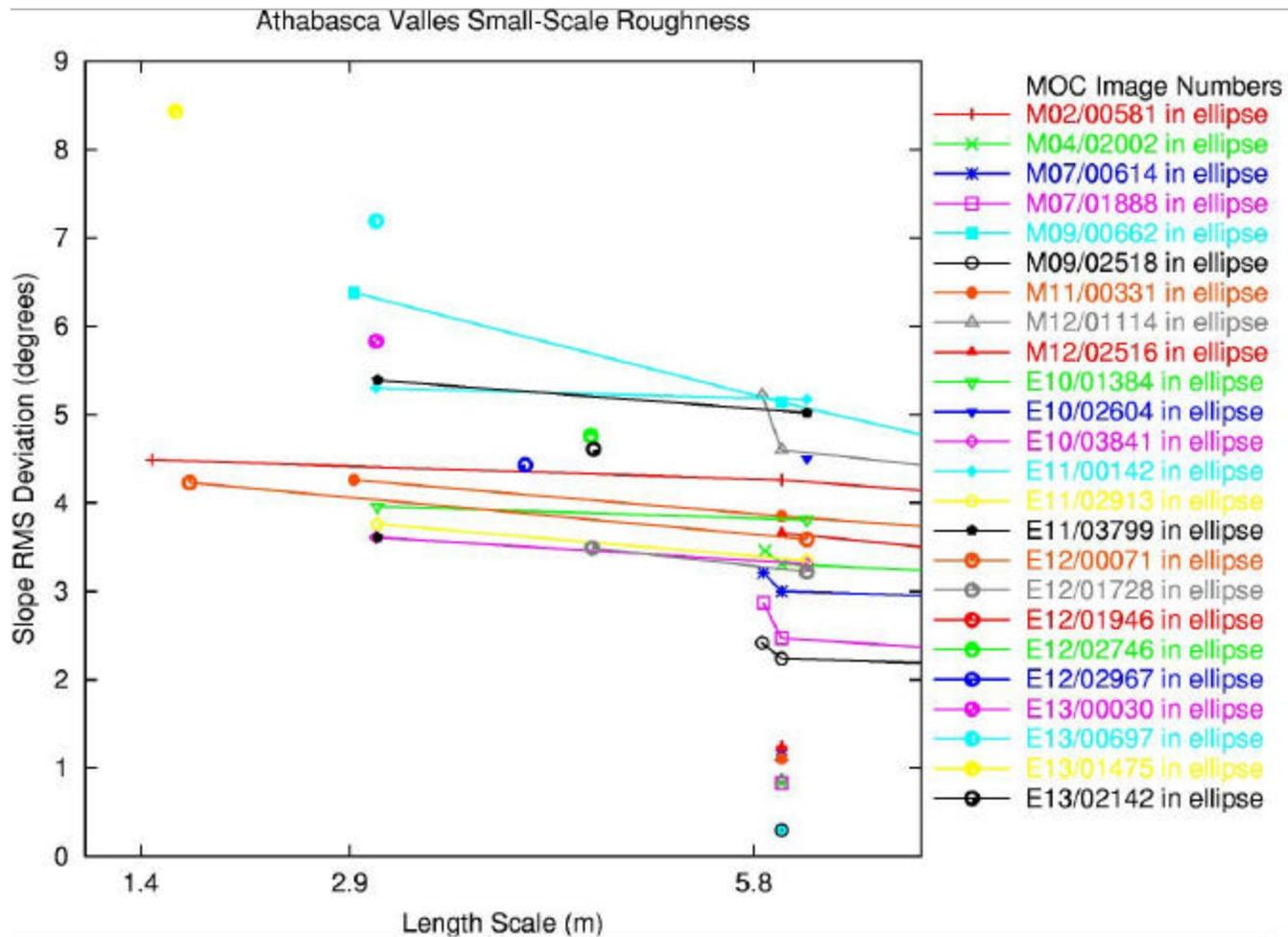


# Enhanced Radar Return

- Clear correspondence to regions of platy/ridged lava (PRL)
- Athabasca region not as bright as regions of mostly PRL
- MOC images suggest ~40% PRL near Athabasca
- Fluvially-modified regions may have decimeter roughnesses similar to Pathfinder.
- A landing ellipse can be placed with PRL only near margins; <5% chance of landing there.
- THEMIS 18 m/pixel coverage may be best to map morphologic units



No evidence for rapidly increasing small-scale roughness in highest-res MOC images. Is decimeter-scale roughness buried?

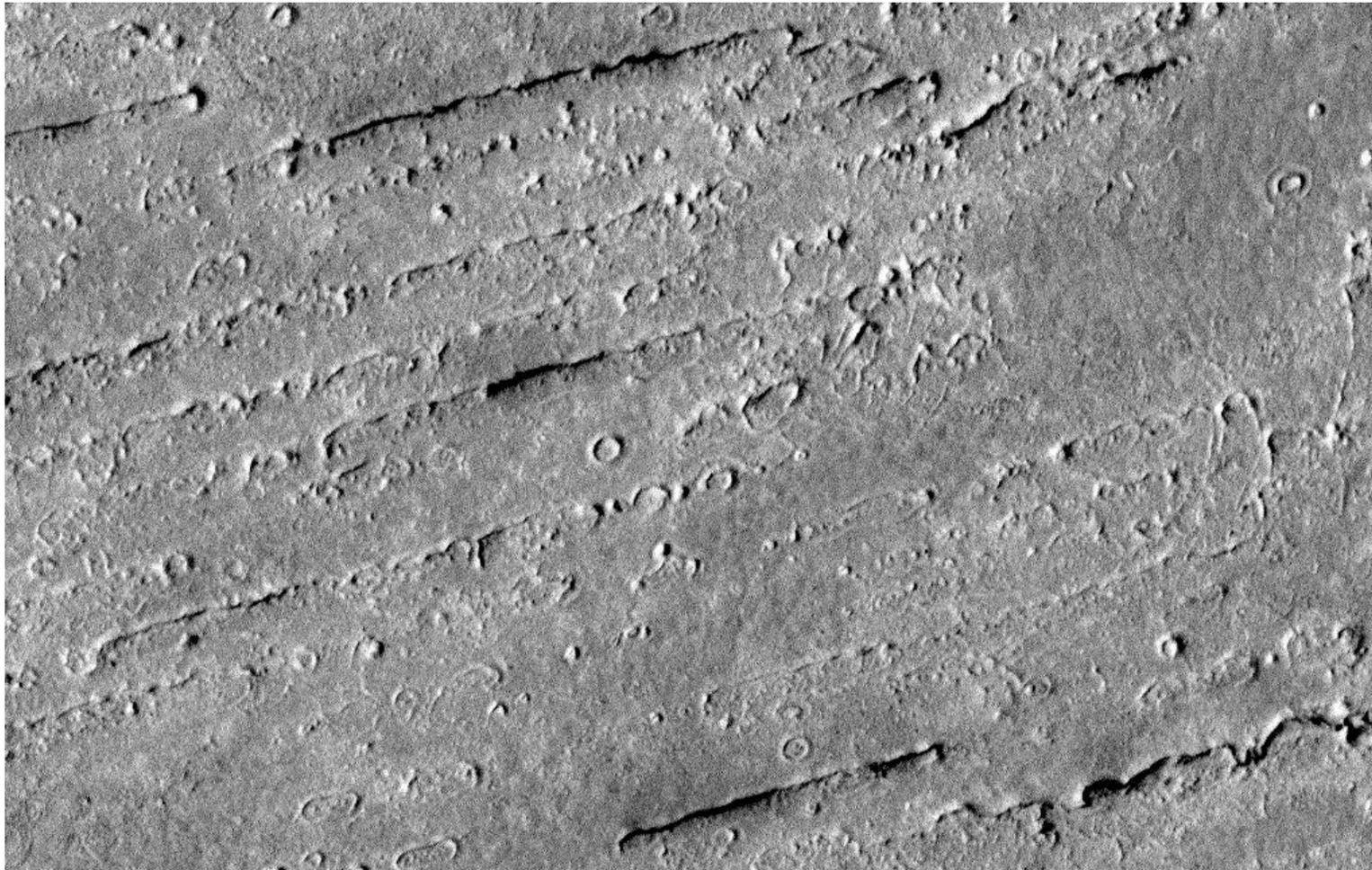


## Athabasca dust cover:

probably thin (moderate TI, temporal changes, THEMIS)

Can see small dust-free areas at high resolution

Exposed areas associated with slopes--more visible from ground



# How safe is this Athabasca landing ellipse?

~5% fresh lava (red), 10-15% older lava (yellow), concentrated at ends of ellipse.

Chances of landing in rough terrain < 10%

landing hazard if sharp edges can tear airbags

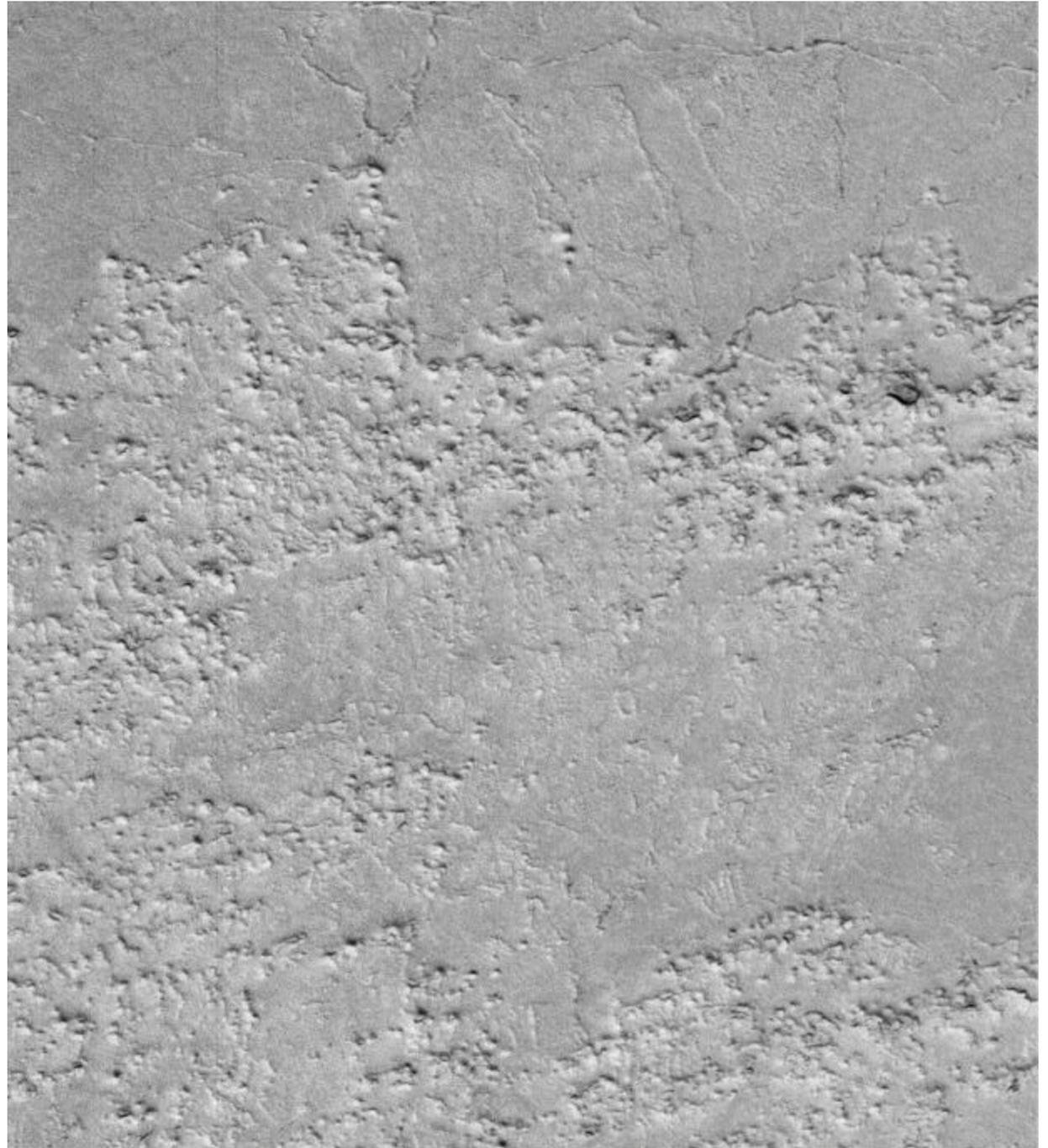
roving could be very difficult

Other landing hazards are relatively low

Need to look at all tradeoffs, compare with other candidate sites



Has even the  
youngest lava  
been eroded  
by aqueous  
flood?



# Athabasca Summary

- Do you believe that we can identify which terrains are responsible for the bright radar return? More careful correlation between radar and platy/ridged lava regional distribution could help; THEMIS coverage is key.
- Is ~5% chance of landing on nasty terrain acceptable? How does this risk compare with risks at other landing sites?
- We plan to keep studying this area.

