

2009 Mars Science Laboratory: Rhythmic Sedimentary Rock Outcrops in the West Arabia Terrane



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MSL Scientific Objectives

To explore and quantitatively assess potential habitability, past or present, of a local, surficial region of Mars

Enhance Habitability Potential

- ▶ **Geologically persistent fluid source**
- ▶ **Closed basin environment**
- ▶ **Relatively high fluid activities**

Enhance Preservation and Recovery

- ▶ **In situ mineral precipitation**
- ▶ **Fine-grained mineral deposition**
- ▶ **Erosional bedrock expression**

More about Habitability...

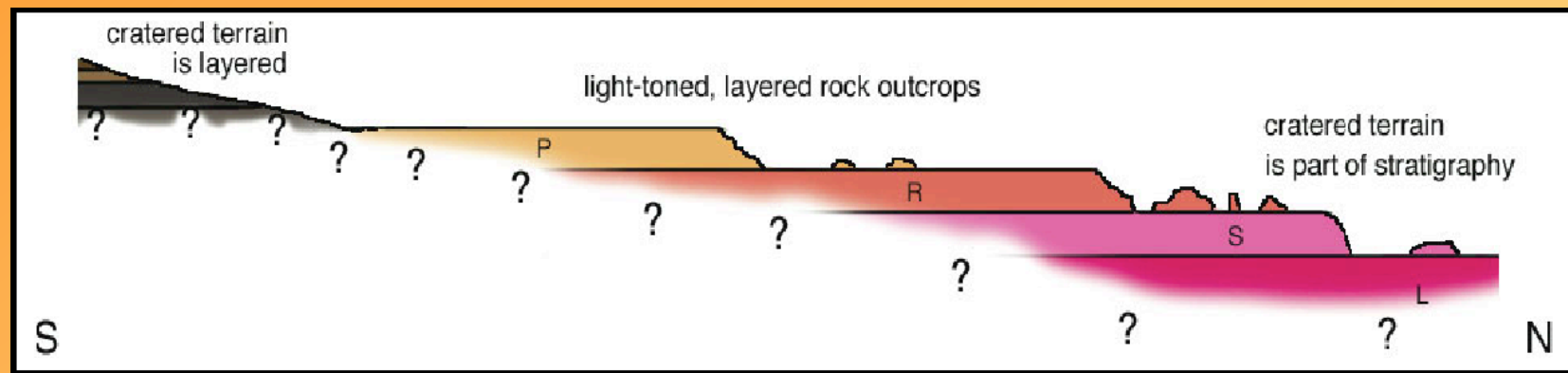
...or the Case for Layered Sedimentary rocks

- ▶ **Layering is a fundamental property of sedimentary rocks that records a change in the ambient depositional conditions**
- ▶ **Layers containing *in situ* precipitated minerals phases, increases the preservation potential in terms of both morphology and potential biochemical information**
- ▶ **Accretion of layering preserves an archive of these changing conditions through geologic time**

Maximizes Science Potential of MSL

A comment regarding intracrater strata...

- ▶ A recent model of Edgett (2005) suggests that many craters occur in strata significantly older than that examined by the MER-B rover
- ▶ Thick packages of rhythmically layered strata within these craters suggests a record of a potentially extended aqueous history



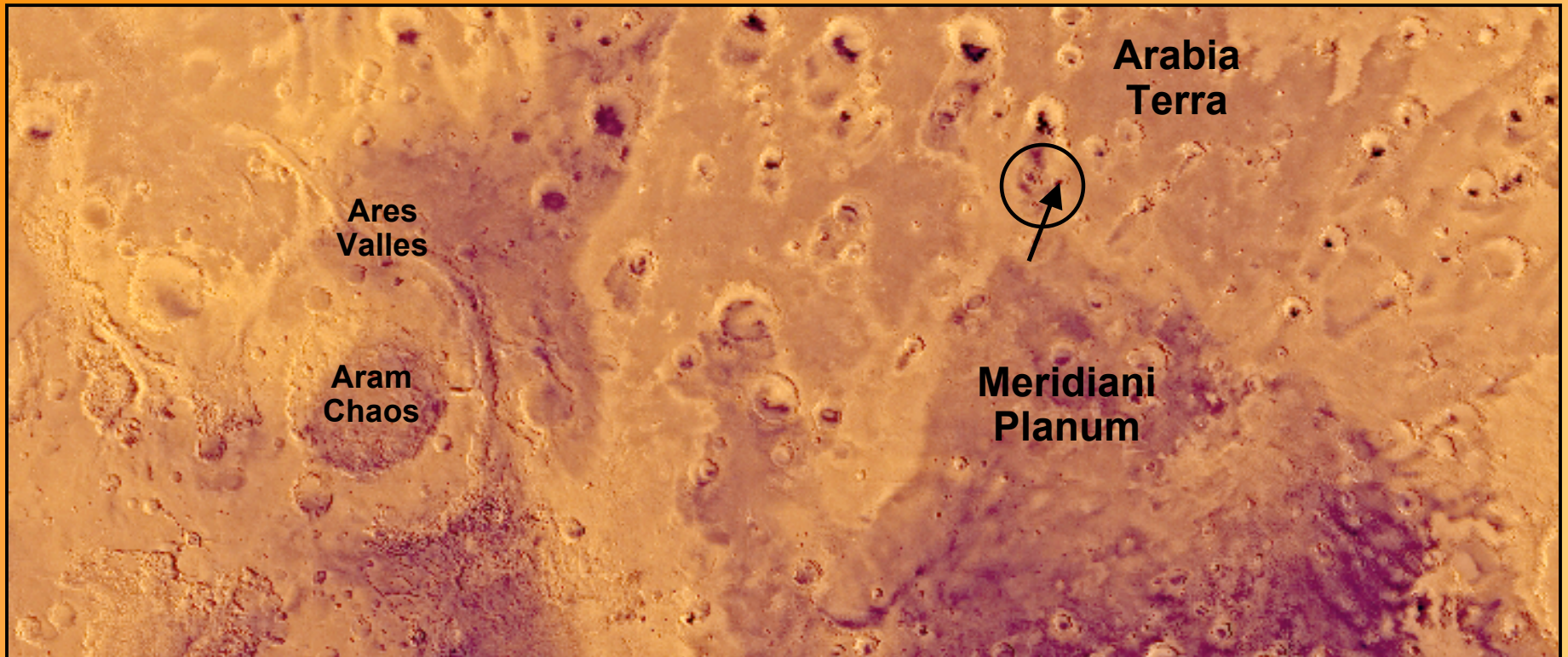
Edgett (2005)

Opportunity to examine stability of aqueous environments

West Arabia Crater

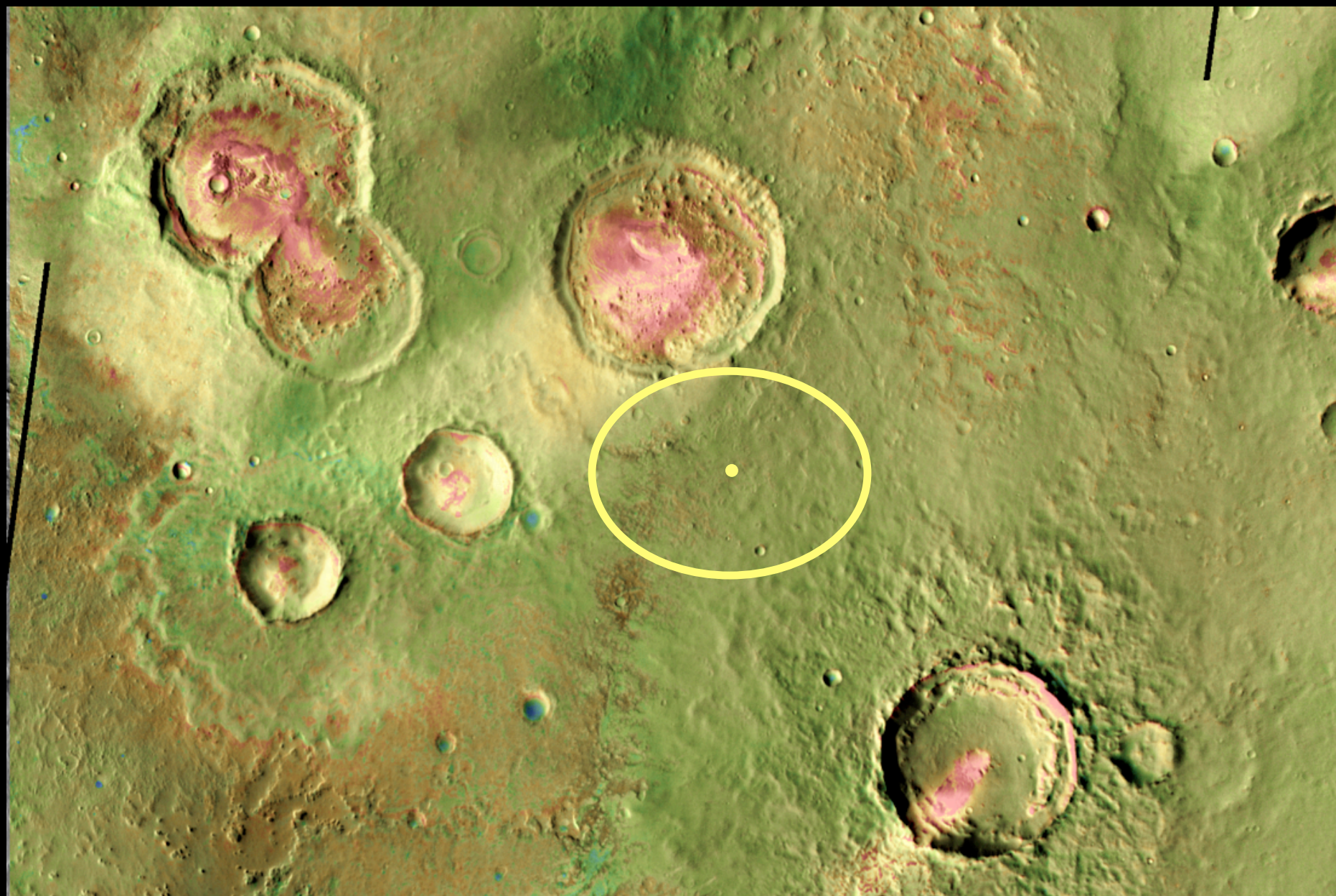
8.9°N, 1.2°W

15° N

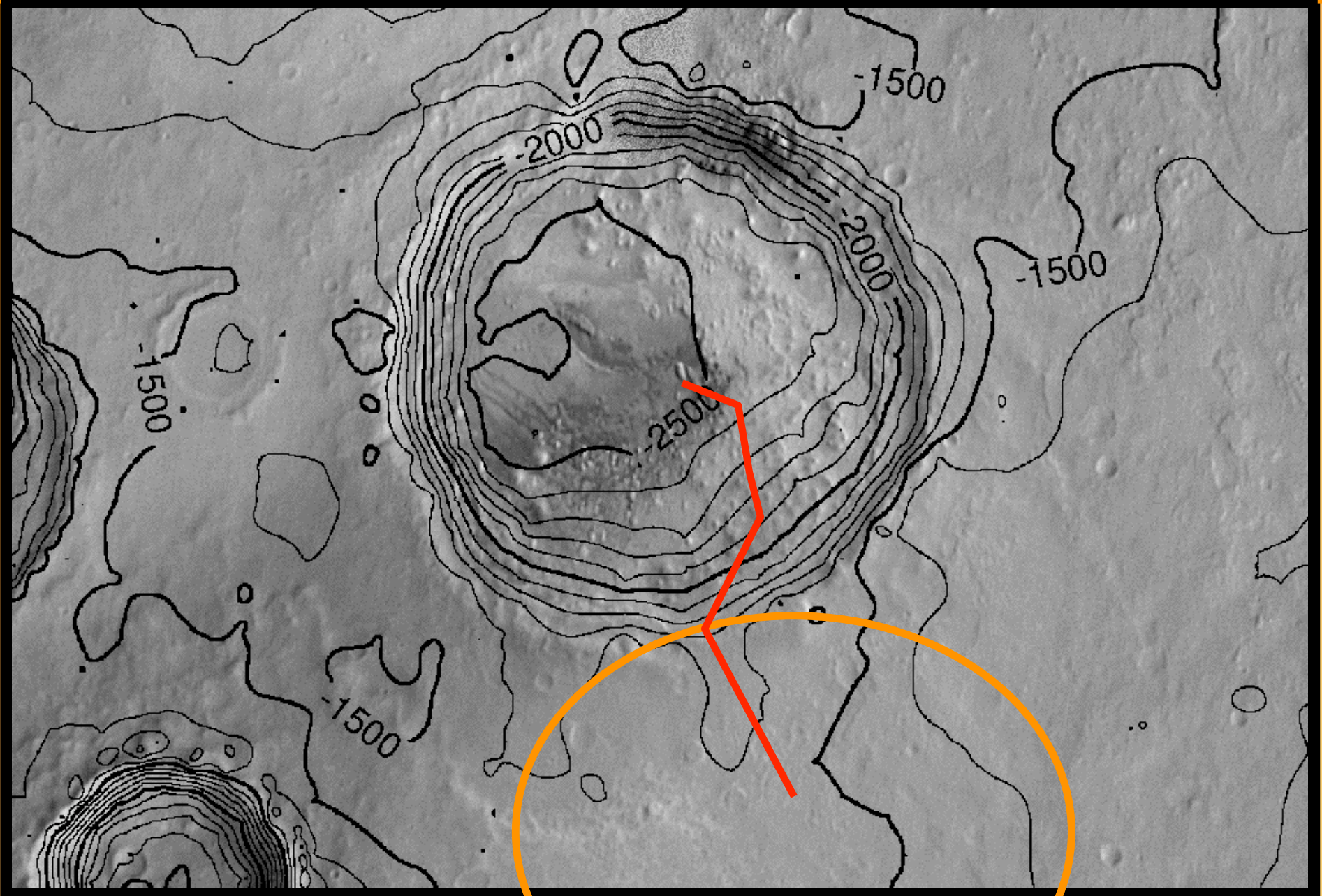


- ▶ Occurs within strata that is 100's meters beneath MER-B site
- ▶ Potentially Noachian (to Hesperian) in age
- ▶ Lies between -1400 m (landing ellipse) and -2500 m (floor)
- ▶ Exclusively a "go-to" site

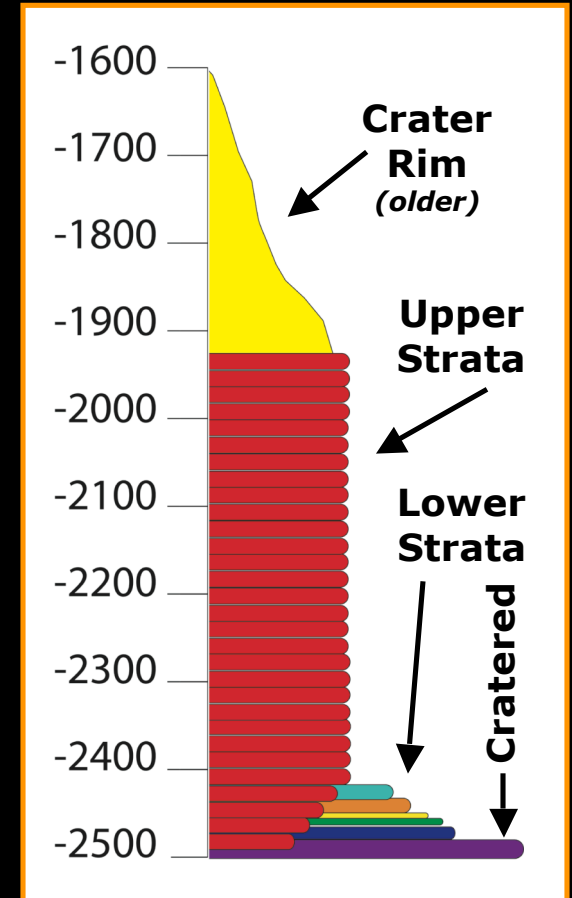
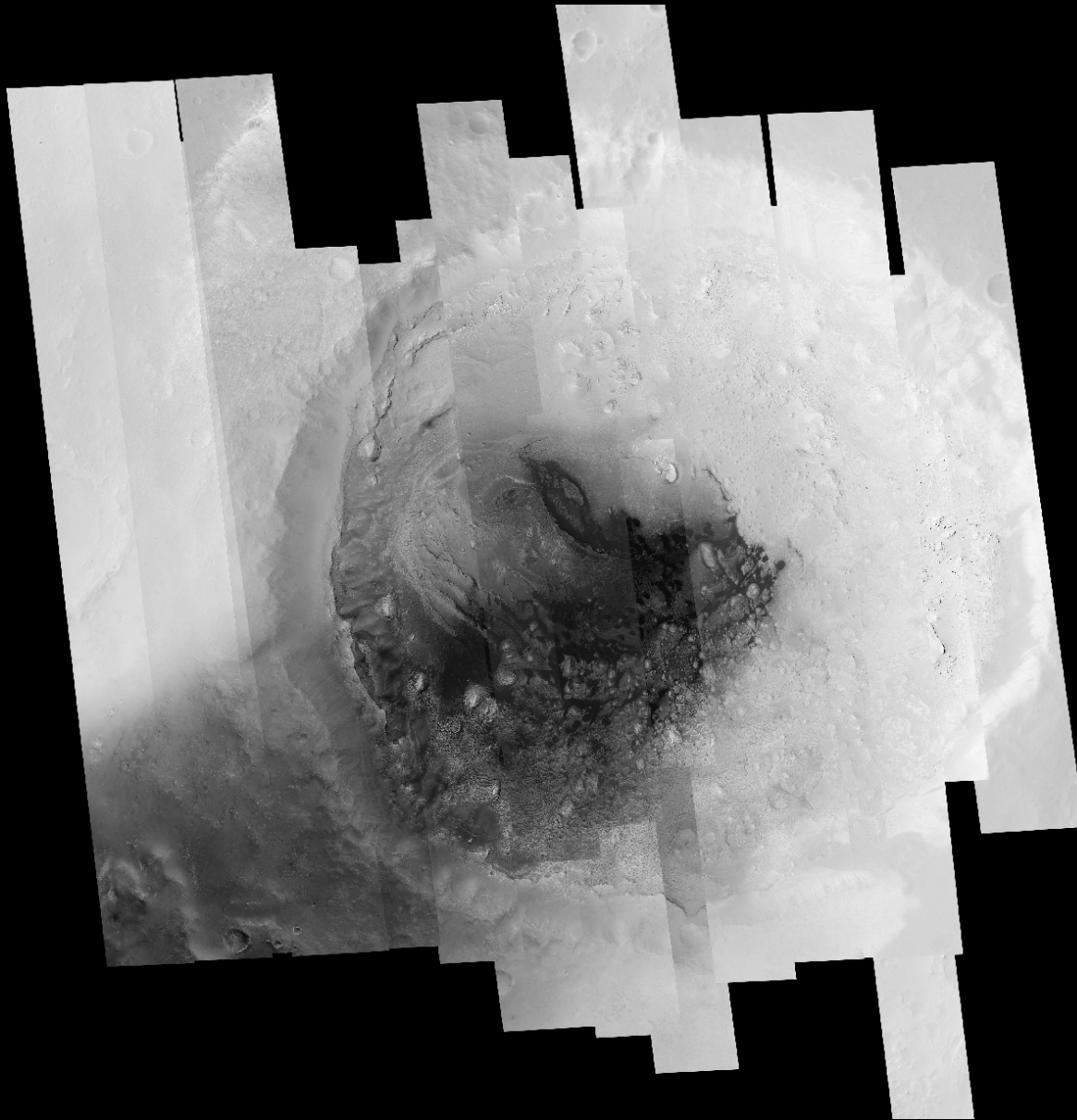
Landing Ellipse



Topographic Profile

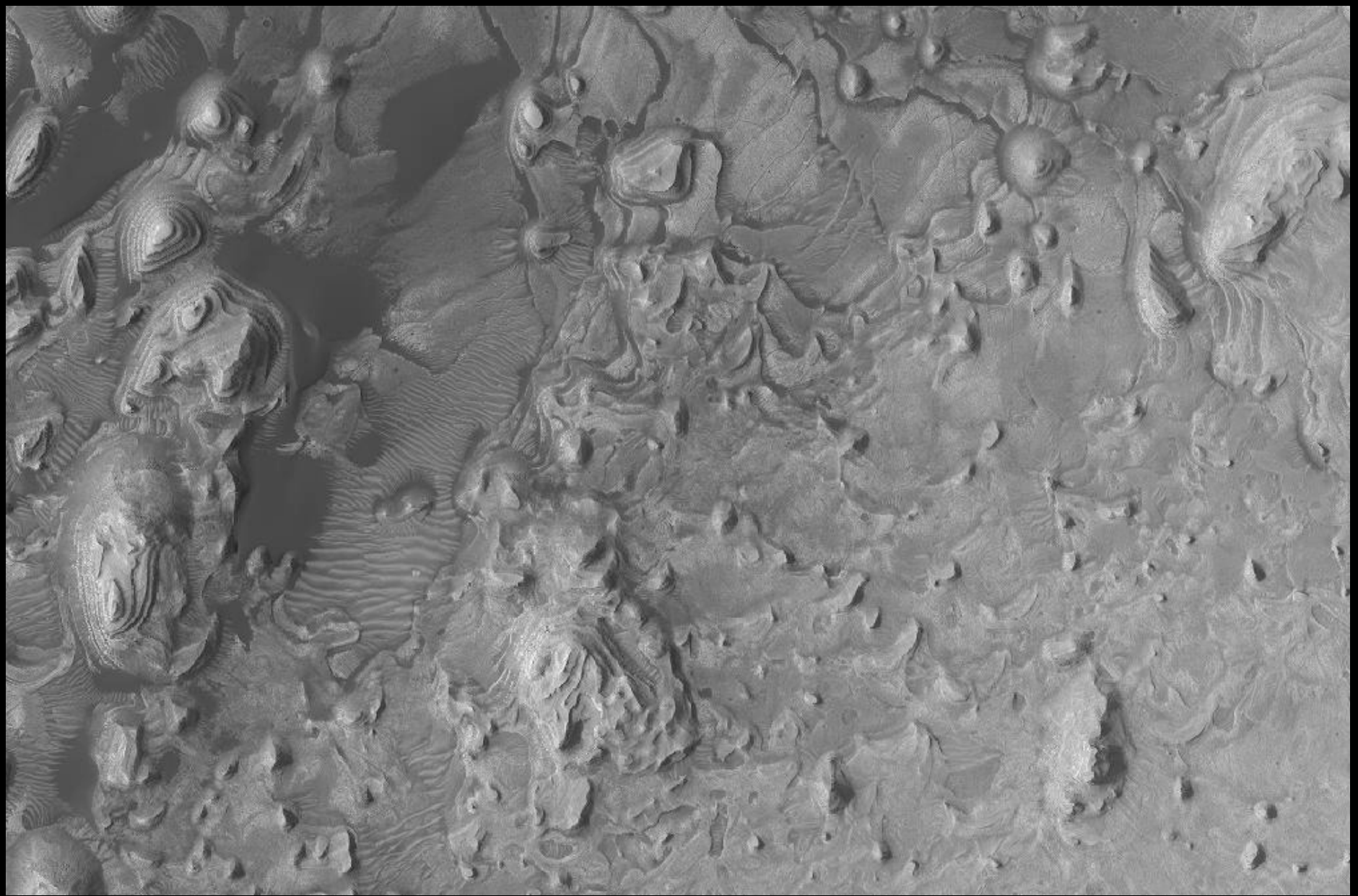


Diversity of Stratigraphic Units



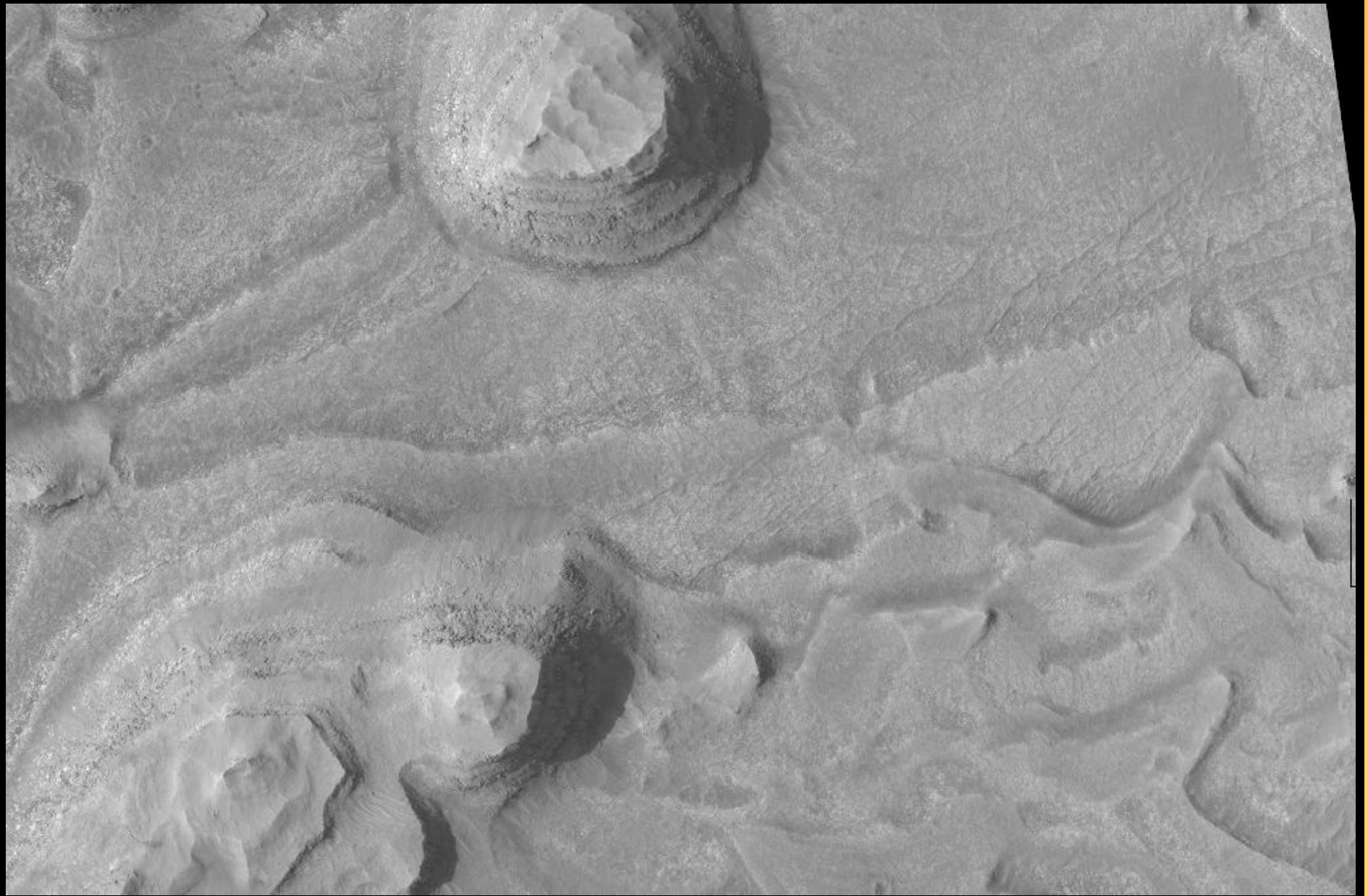
Trafficability

HiRise (1.5 km width)



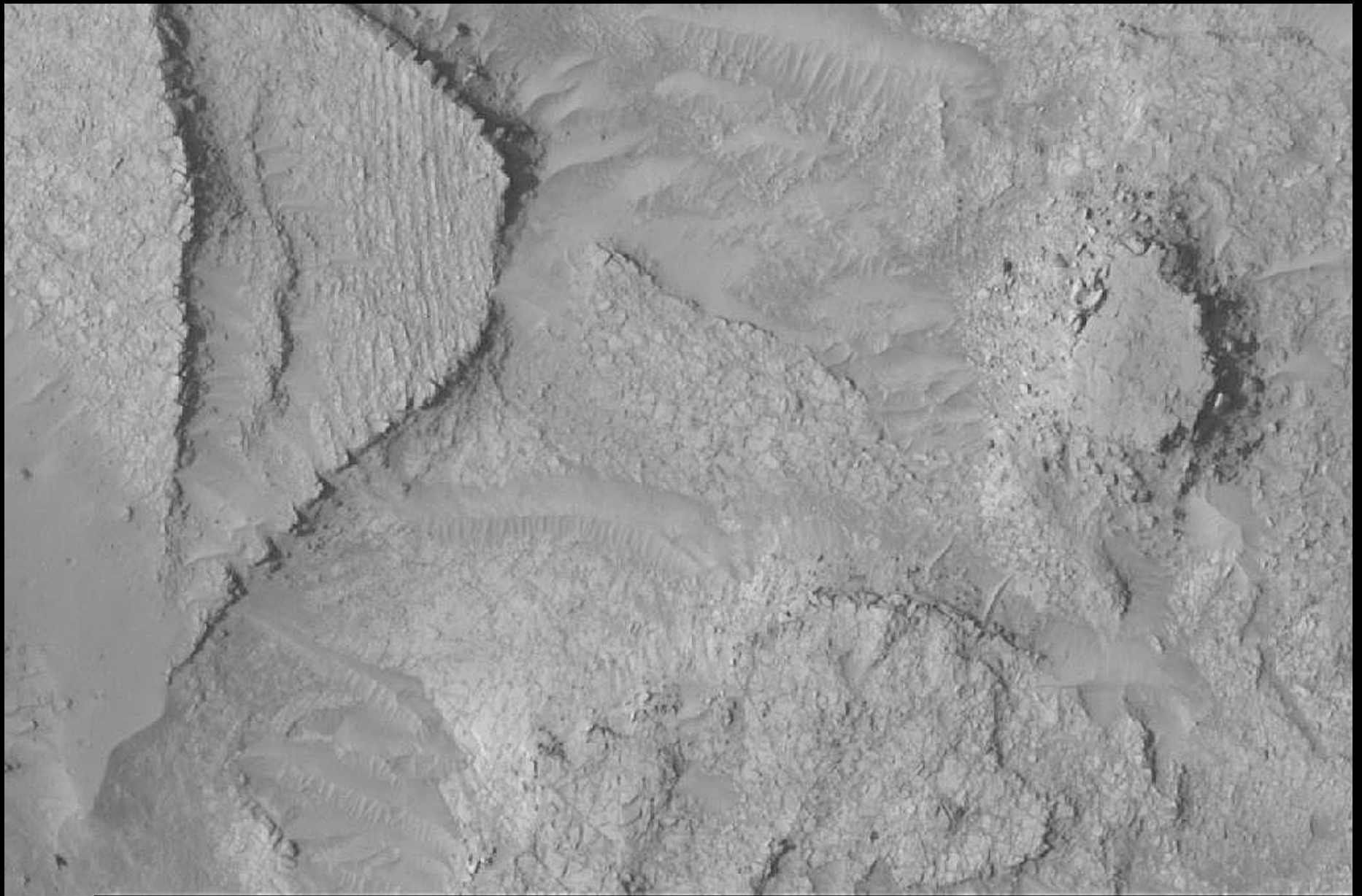
Variation in Lithologic texture

HiRise (0.5 km width)



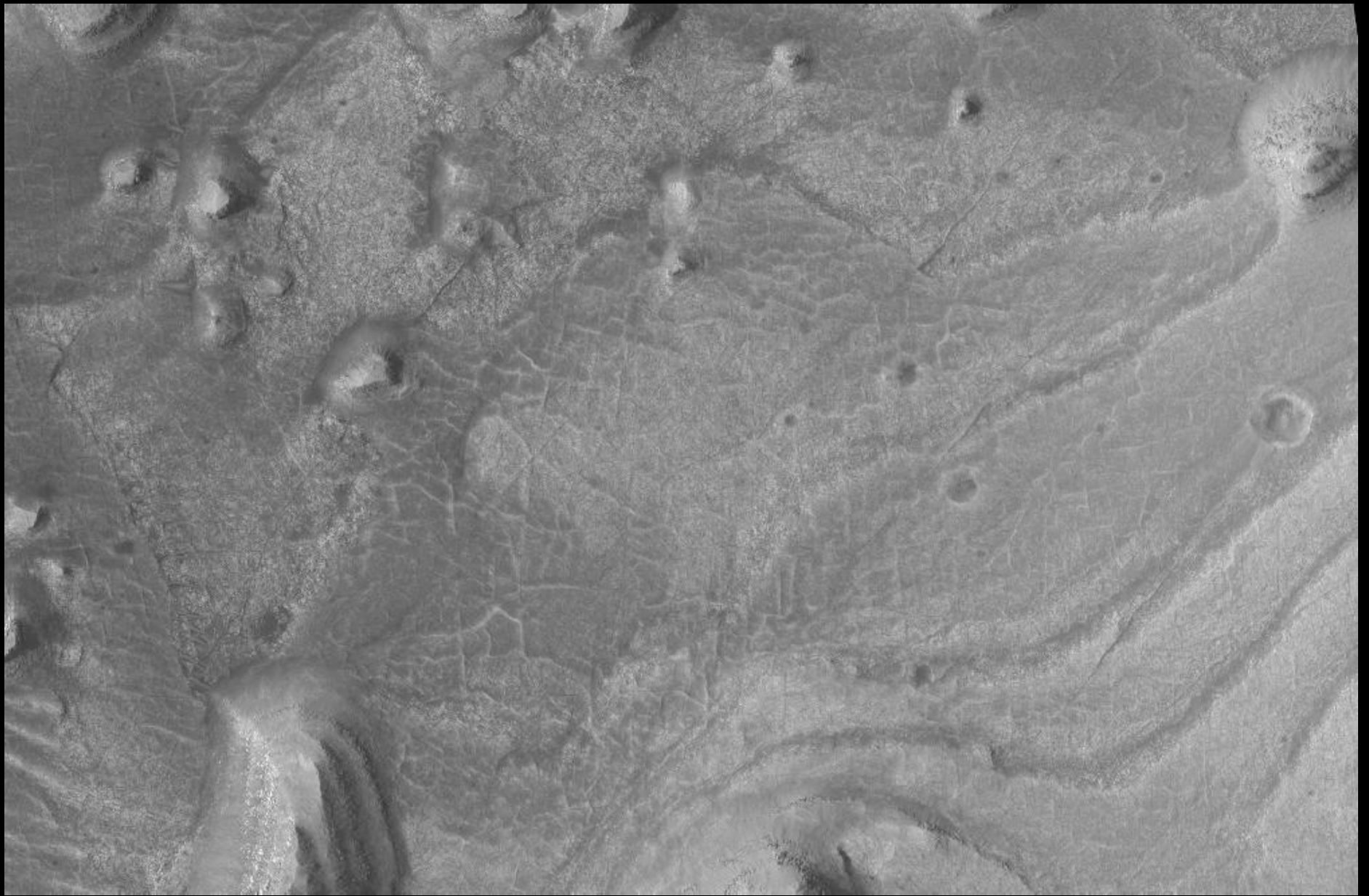
Variation in Lithologic texture

HiRIse (0.2 km width)



Variation in Lithologic texture

HiRise (0.5 km width)



Variation in Lithologic texture

HiRIse (0.5 km width)



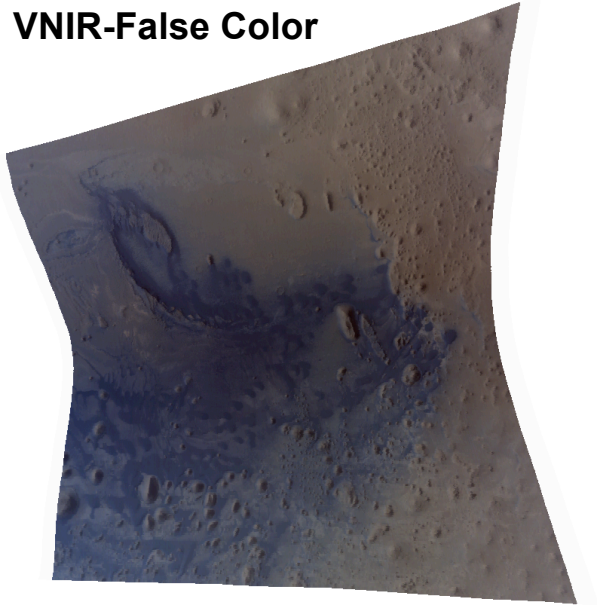
West Arabia Crater

8.9° N, 1.2° W

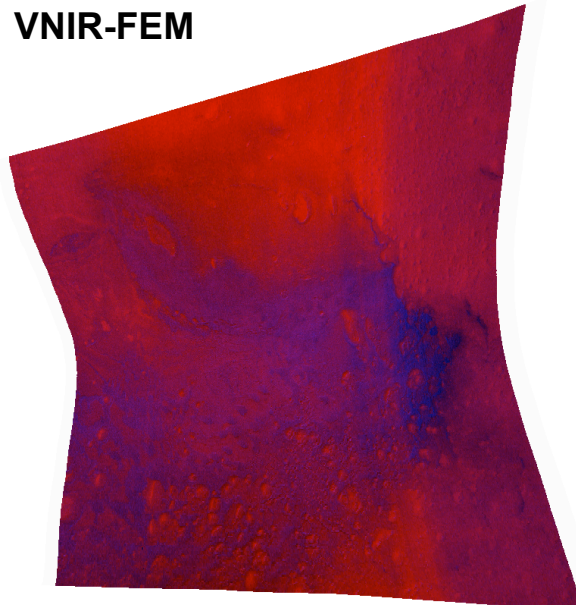
- ▶ **At present, shows favorable conditions for the landing site ellipse, but remains a “go to” site**
- ▶ **Good trafficability (slopes $<10^\circ$, and most $<5^\circ$) permits sampling of >500 meters of strata within 10 km of the landing ellipse**
- ▶ **Distinct stratigraphic units (extra crater strata, rhythmic crackly strata, lower contiguous strata, crater floor) allow exploration of environmental evolution through an extended time interval**
- ▶ **However...CRISM does not show clear signatures of either sulfates or phyllosilicates**

CRISM Data

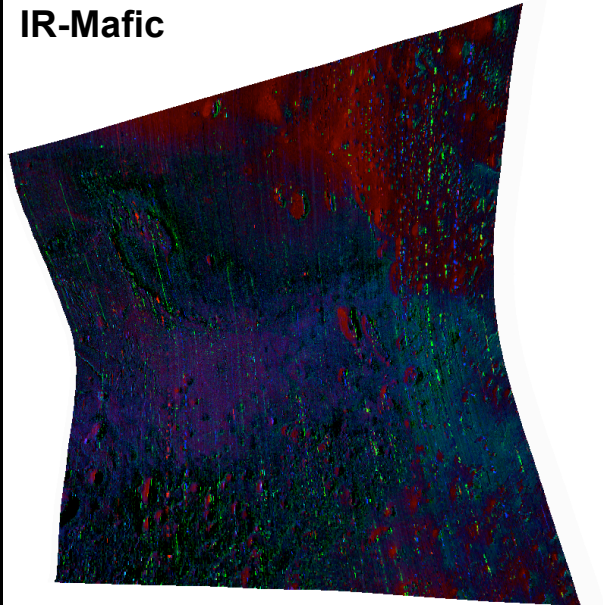
VNIR-False Color



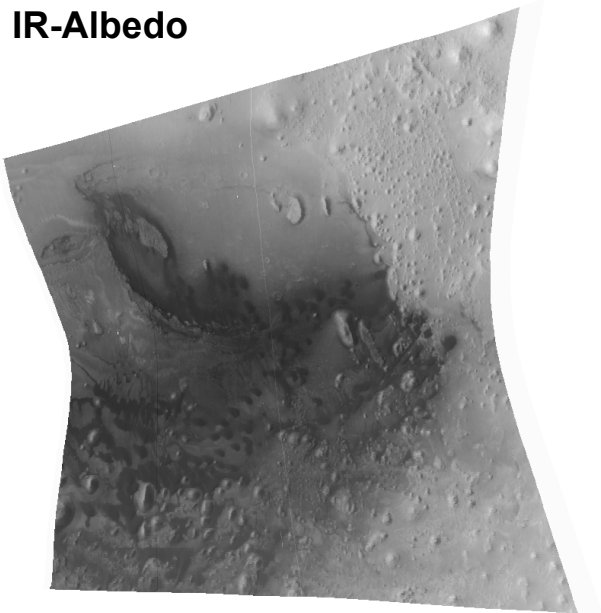
VNIR-FEM



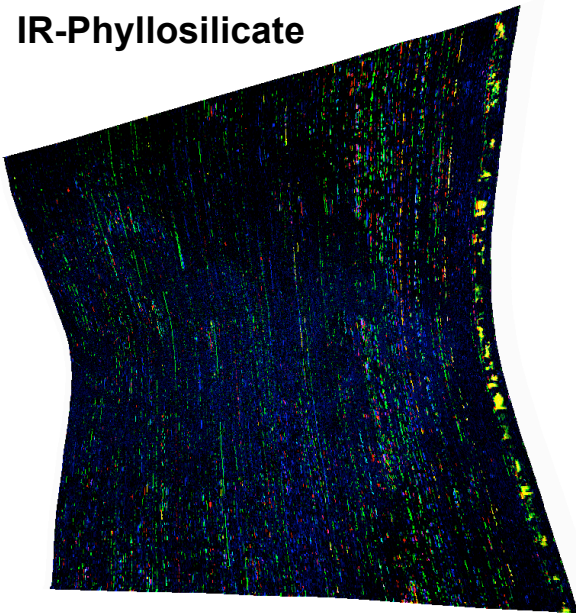
IR-Mafic



IR-Albedo



IR-Phyllosilicate



IR-hydrated

