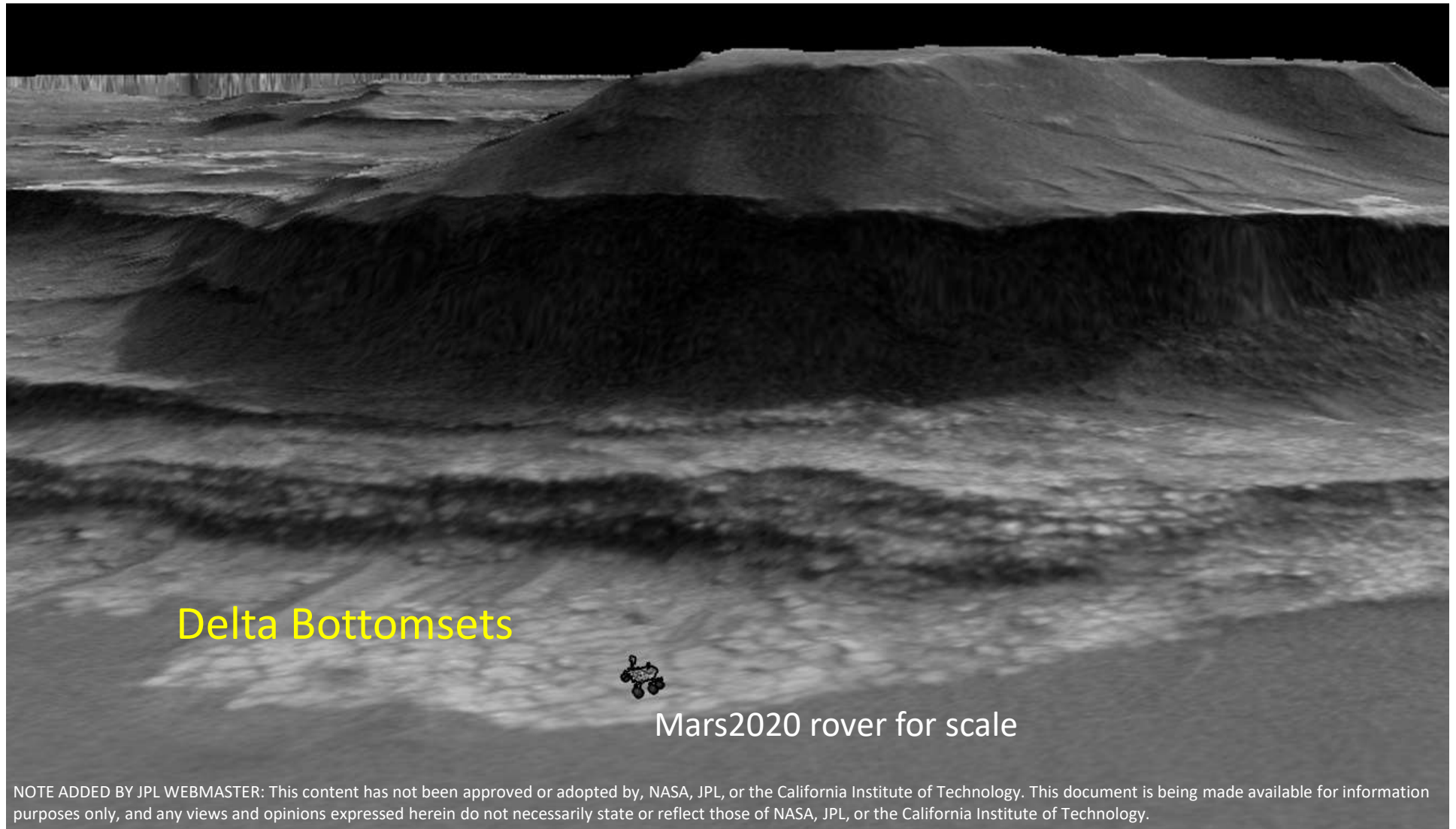


Summary of a Potential Mars2020 Investigation at Eberswalde crater

*Melissa Rice
Sanjeev Gupta
Nick Warner*

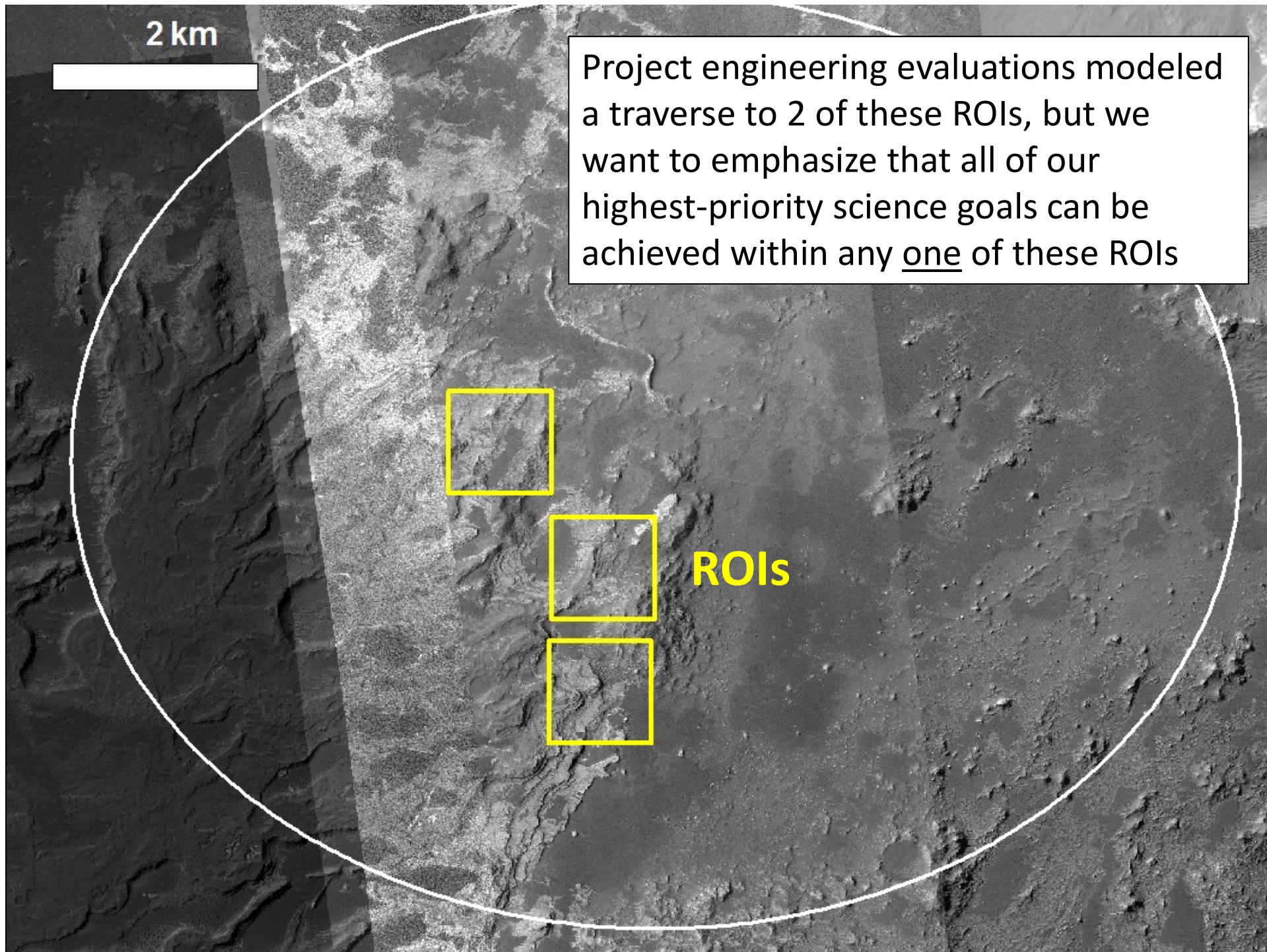


NO vertical exaggeration

2 km

Project engineering evaluations modeled a traverse to 2 of these ROIs, but we want to emphasize that all of our highest-priority science goals can be achieved within any one of these ROIs

ROIs

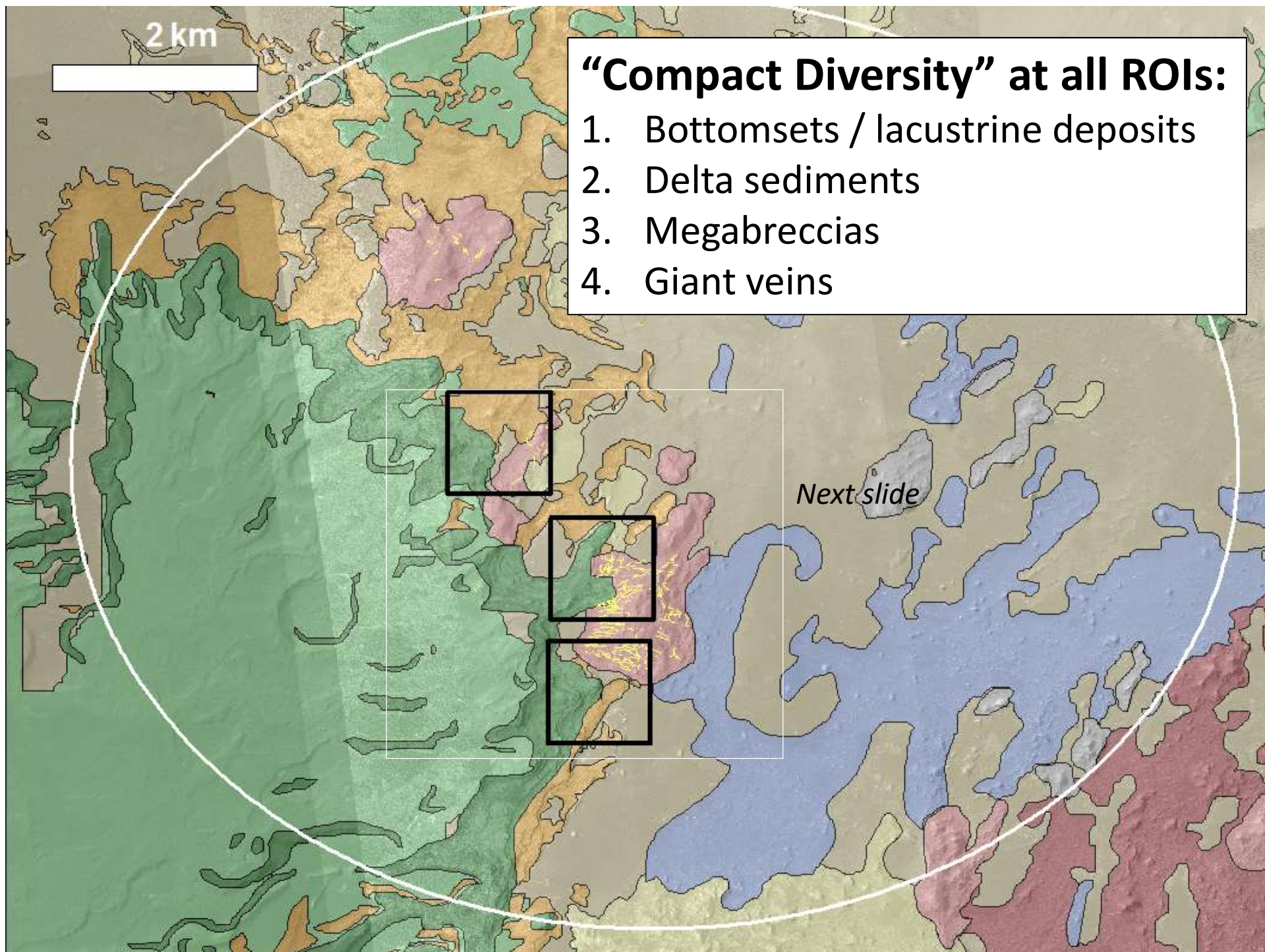


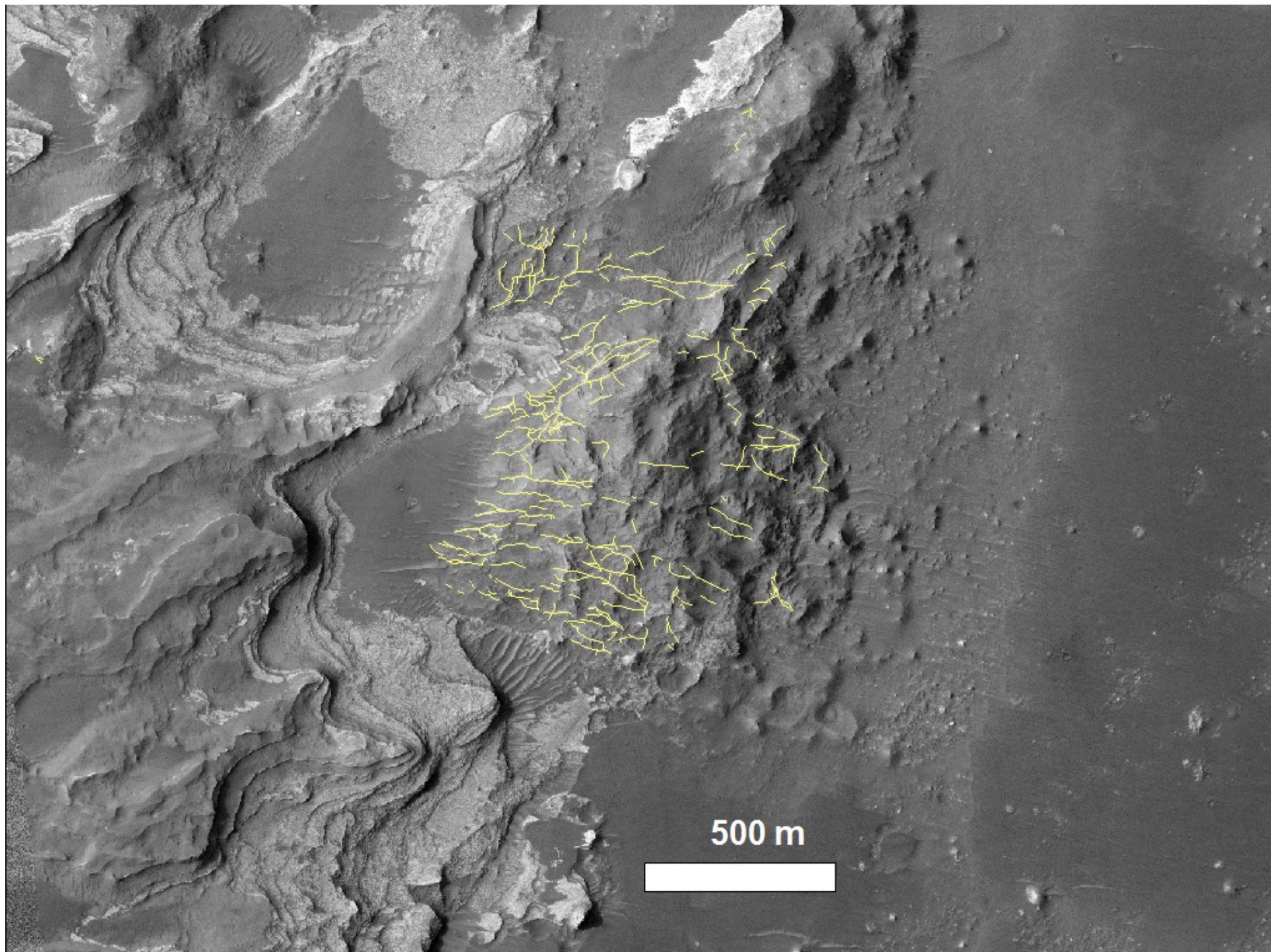
2 km

“Compact Diversity” at all ROIs:

1. Bottomsets / lacustrine deposits
2. Delta sediments
3. Megabreccias
4. Giant veins

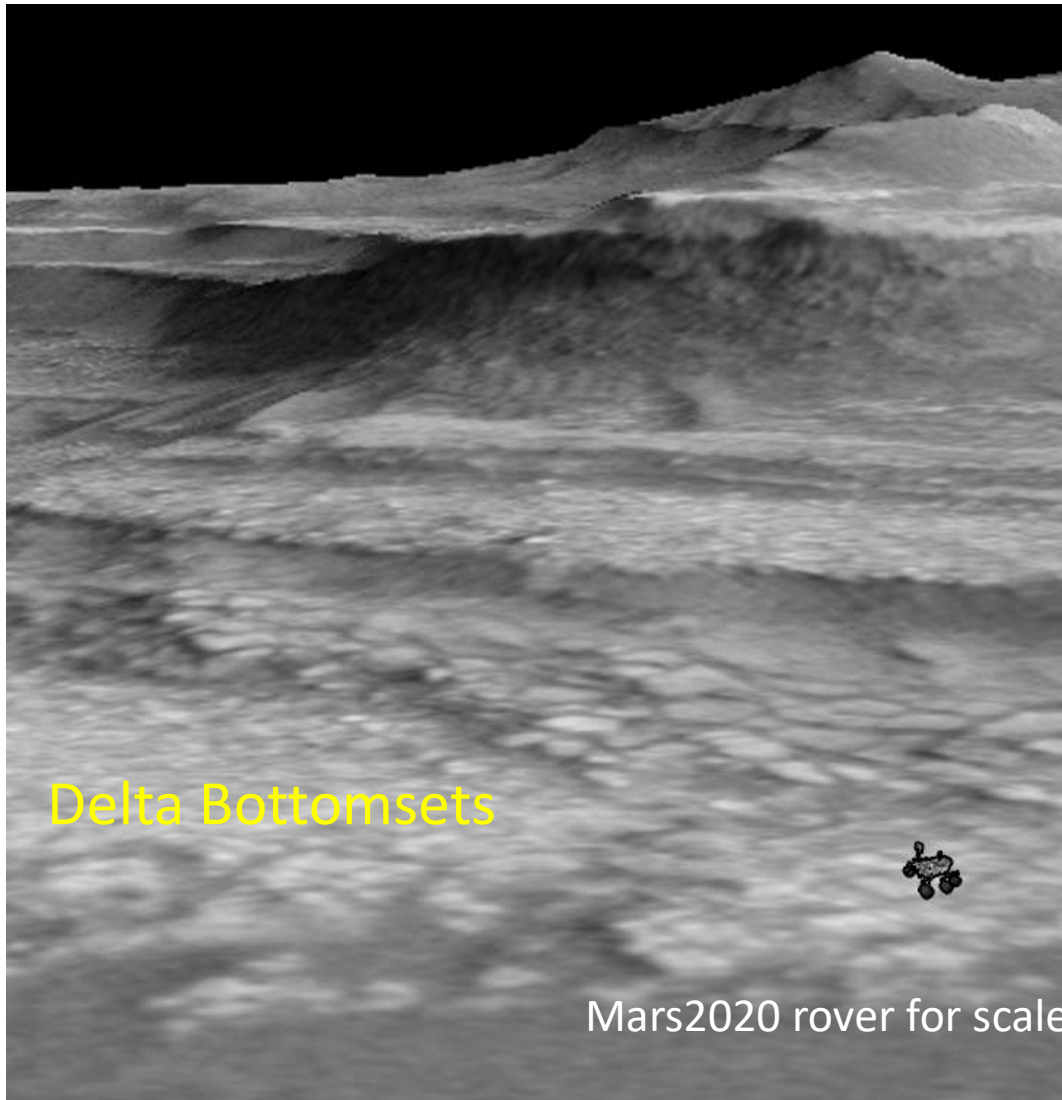
Next slide





Example Targets for *In-Situ* Science and Caching

1. Bottomset / Lacustrine Deposits



Testable Hypotheses:

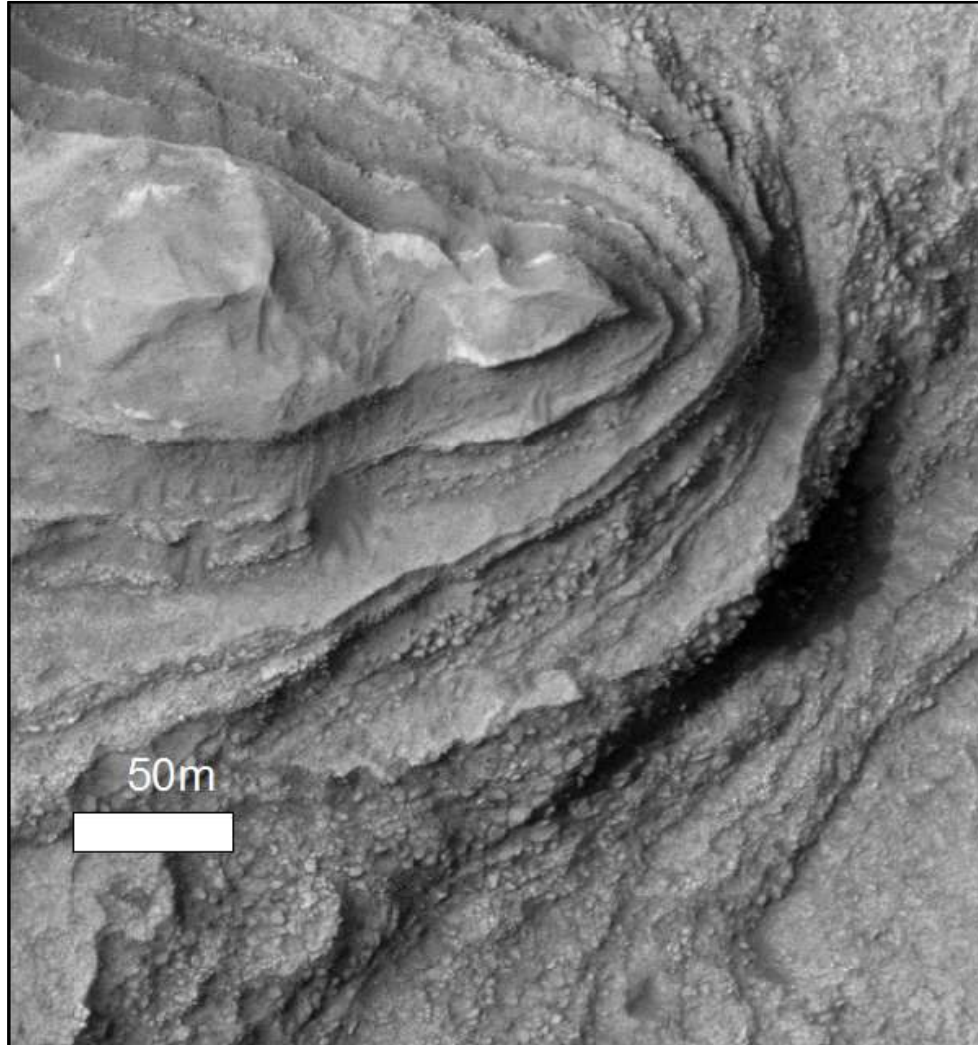
- Deposition in a low-energy, long-lived lacustrine environment
- Authigenic formation of or deposition of detrital clay minerals with fine-grained sediment
- Concentration and preservation of organics and other biosignatures in fine-grained sediment
- Possible preservation of microfossils in shallow water mats

Sampling Strategy:

- Target recessive “erosion bays” at the delta front where bottomsets may be recently-exposed from beneath retreating scarps

Example Targets for *In-Situ* Science and Caching

2. Delta Sediments



Testable Hypotheses:

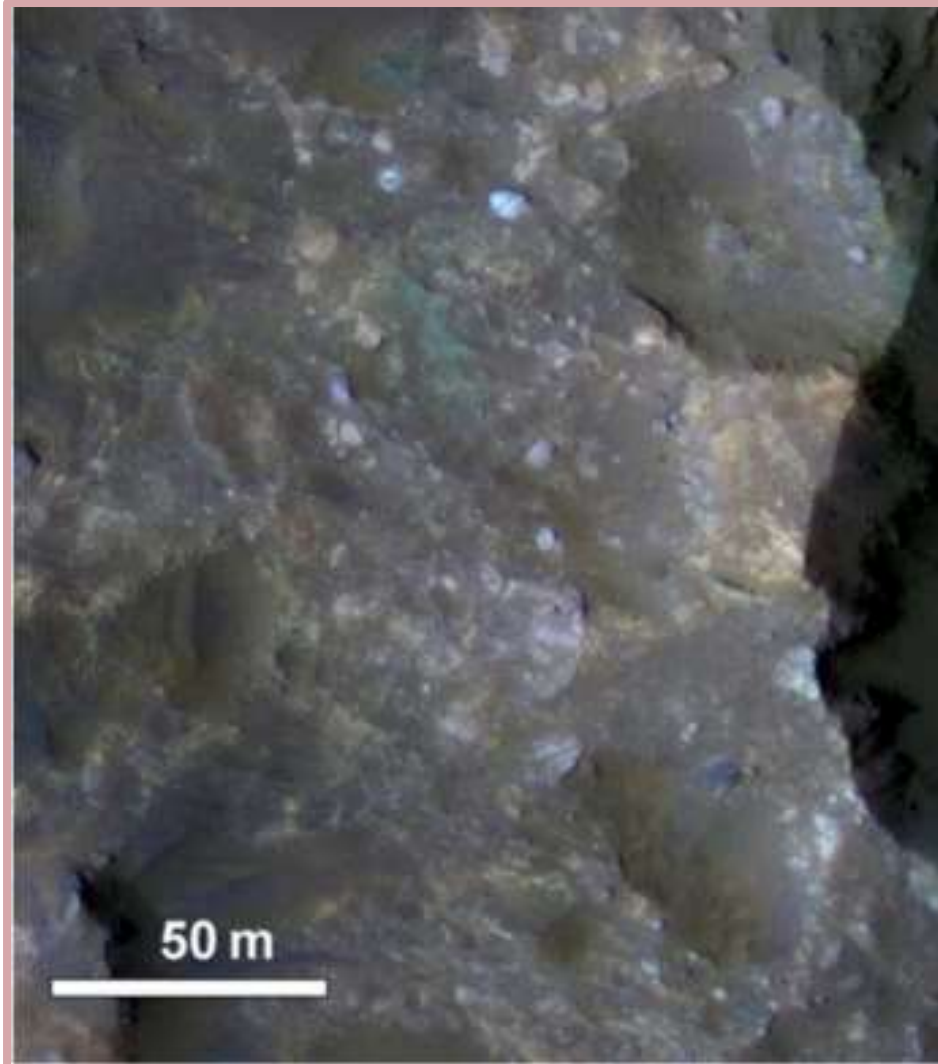
- Deltaic layers contain sediment from a large and geologically diverse catchment
- Opaline silica in delta is authigenic or diagenetic
- Sedimentary texture and facies analysis together with geochemical analysis can determine depositional evolution, lake level history, sediment provenance and sediment fluxes
- Stratigraphic observations can constrain relative timing and duration of aqueous activity

Sampling Strategy:

- “Walkabout” loop up the lower delta stratigraphy to identify a representative subset of facies to *in-situ* analysis and caching

Example Targets for *In-Situ* Science and Caching

3. Megabreccia



Testable Hypotheses:

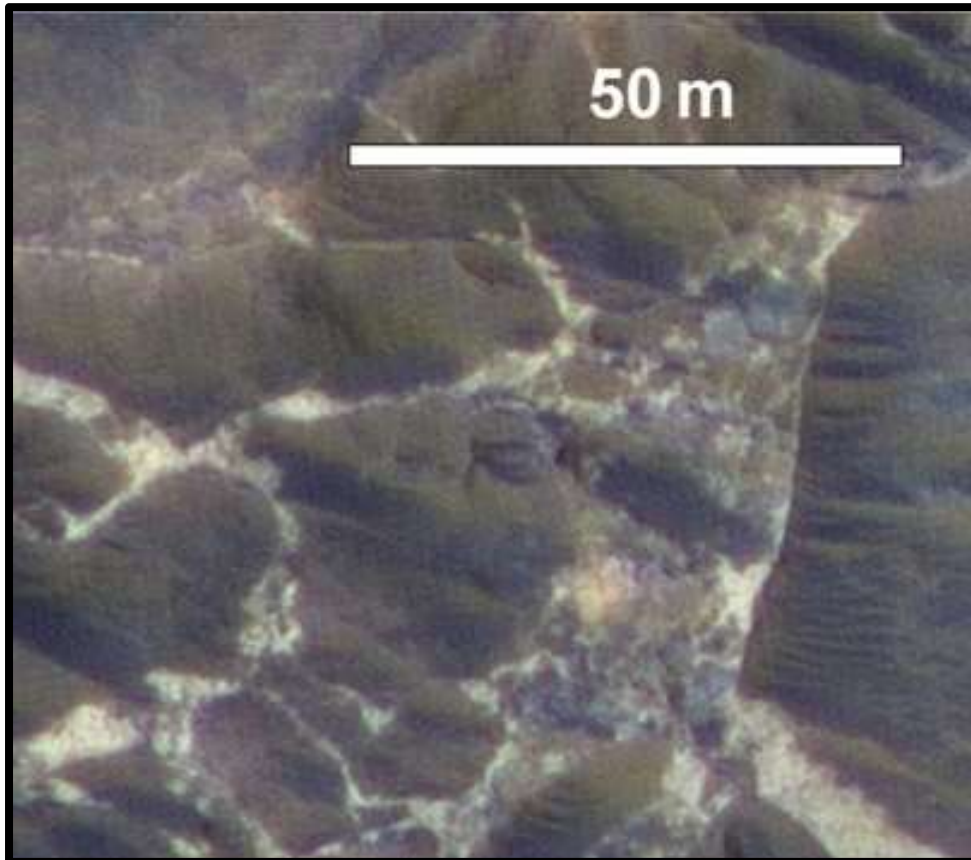
- Megabreccias contain diverse crustal materials from Holden impact ejecta
- Fe/Mg clays could be preserved from Noachian target material
- Breccia blocks can document ancient (possibly Noachian) crustal alteration
- Impact glasses from the Holden Impact, if present, can be sampled for age dating in returned sample analyses

Sampling Strategy:

- “Walkabout” loop with remote sensing instruments to document diversity and accessibility of megabreccia blocks, then select a representative subset of blocks for *in-situ* analysis and caching

Example Targets for *In-Situ* Science and Caching

4. Giant Veins



Testable Hypotheses:

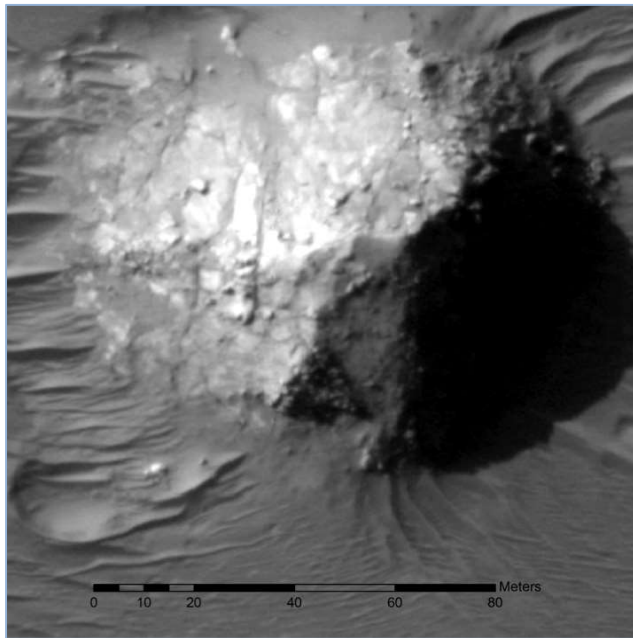
- Veins may be hydrothermal, formed by the circulation of fluids mineralization
- If hydrothermal, veins could represent a second habitable environment
- Alternative hypothesis is that veins are ancient (possibly Noachian) igneous dike swarms preserved in Holden impact ejecta
- If igneous, the veins could represent primary igneous material that can be dated

Sampling Strategy:

- Investigate contacts between vein and surrounding megabreccia in addition to centers of large veins

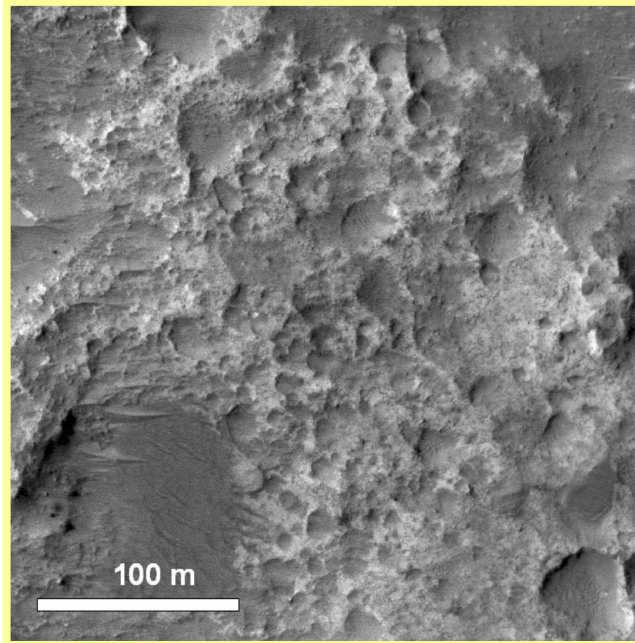
Example Targets for *In-Situ* Science and Caching

5. Knobby Unit



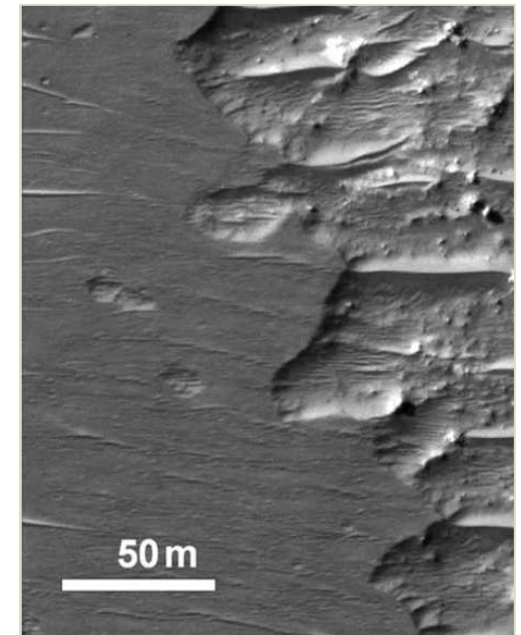
Test hypothesis that these are lacustrine remnants and search for potential biosignatures

6. Pitted Unit



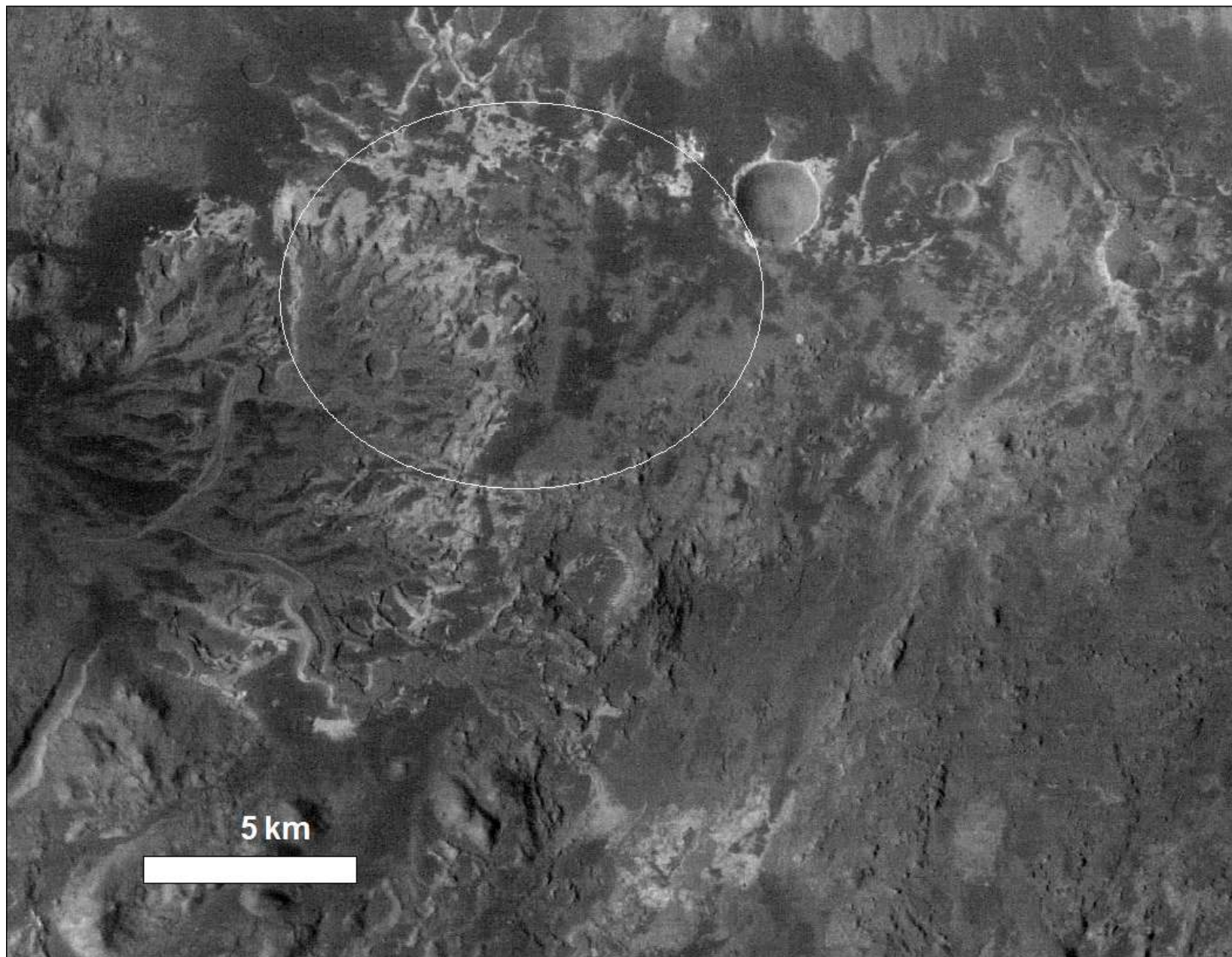
Test hypothesis that these are Holden ejecta deposits and search for impact melt and glasses

7. Mantling Unit

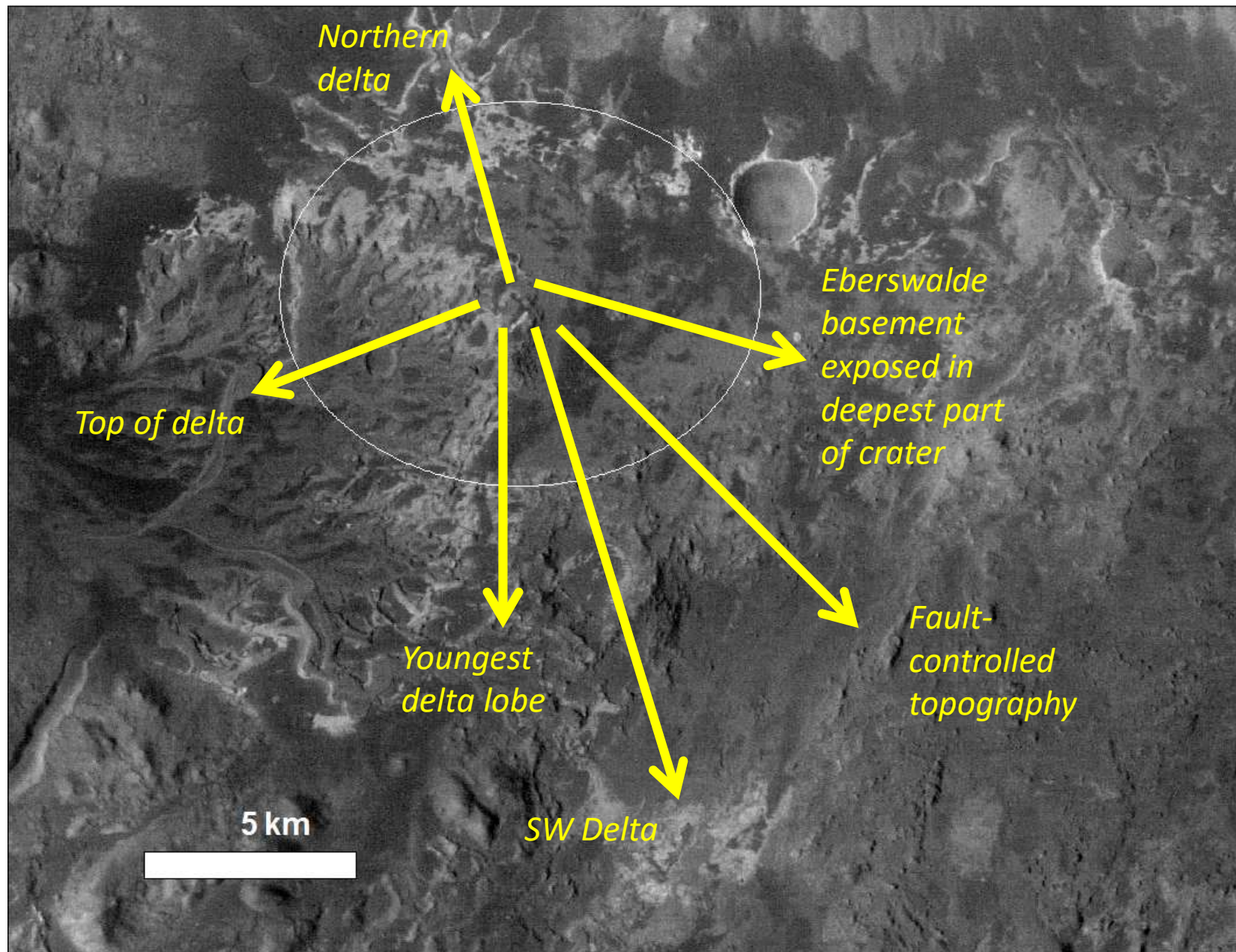


Test airfall origin hypothesis and sample for age dating if an ash deposit

Example Extending Mission Targets



Example Extending Mission Targets



Main Points:

- Eberswalde crater contains a spectacularly-preserved **delta** with **easily-accessible** bottomset deposits (which have a high potential for concentrating and preserving organic biosignatures)
- An opportunity to examine how **potentially long-lived** lacustrine systems were able to survive under changing global climate conditions in the early to mid Hesperian
- **Megabreccias** from the Holden crater impact and **giant veins** are also located in the **center of the ellipse**
- The “**compact diversity**” in the center of the Eberswalde ellipse, and the clear geologic context, would make for an **efficient sampling mission** with the potential for **fundamental scientific discoveries**