Regional Geologic Mapping of the Oxia Planum Landing Site for ExoMars

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Session PS4.2:
Mars Science and Exploration
Chat Mon, 04 May, 08:30–12:30

Introductory Note

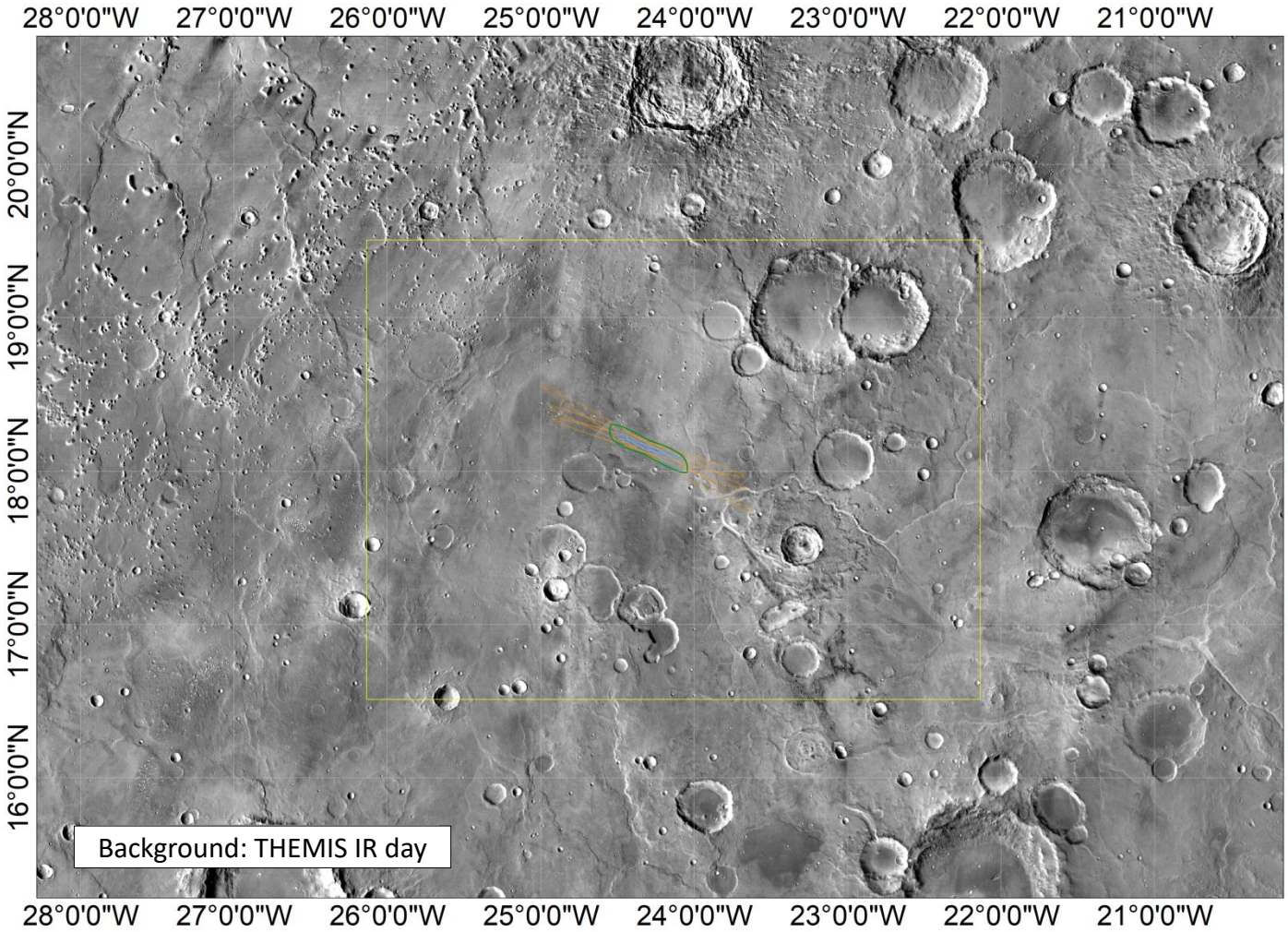
- This mapping effort is intended to parallel and complement a joint mapping effort at HiRISE scale, in which >100 individual 1×1 km boxes of the landing ellipse area will be mapped by about the same number of volunteer mappers (Sefton-Nash et al., Lunar Planet. Sci. Conf. 51, 2020).
- The CTX-scale map presented here will cover a geographically much wider region around the landing ellipses and will provide geologic and geomorphologic context.
- The covid-19 crisis has considerably slowed down our progress, as access to DLR is no longer possible, and the student mappers (S. Acktories and S. Steffens) were prohibited to continue their work in early March. Consequently, please note that we can only show here a preliminary stage of our work, and all results are subject to change! The main purpose here is to show the status quo and learn about your feedback – thank you!

CTX-scale mapping of Oxia Planum

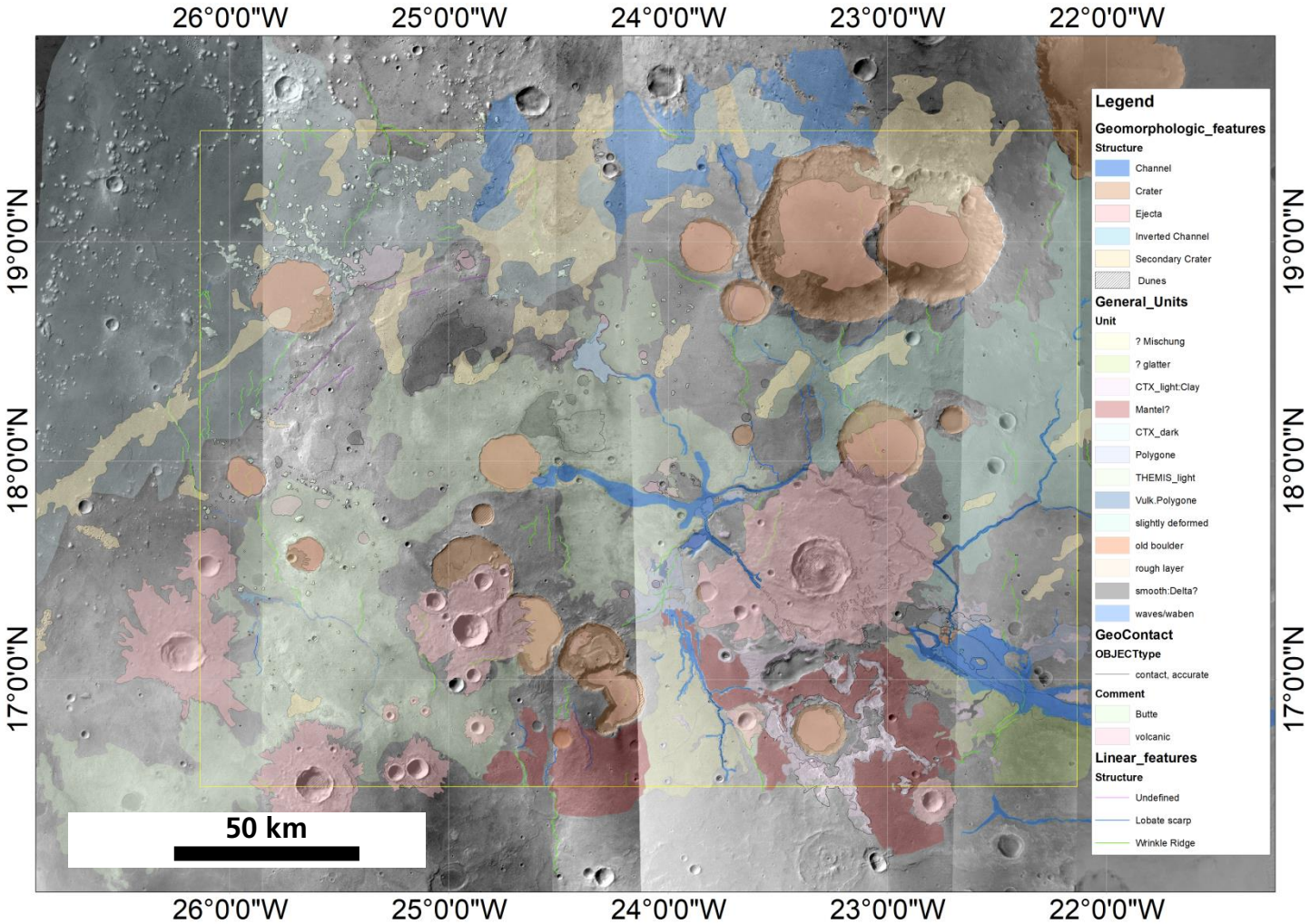
«Every context has a context!»

The HiRISE-scale mapping will provide context for rover observations,
and our CTX-scale mapping provides context for the HiRISE scale mapping.

- Fills gap between global map (TANAKA et al., 2014) and HiRISE
  - Complements Quantin et al. (Astrobiology, *in revision*) and Molina et al. (2017)
  - Complements joint mapping effort at HiRISE scale
  - Part of ExoMars RSOWG (Rover Science Operations Working Group) activities
- GIS mapping scale 1:100,000 (final map scale 1:1M)
- MOLA, THEMIS IR (day & night), HRSC, CTX, CaSSIS



Mapping Area



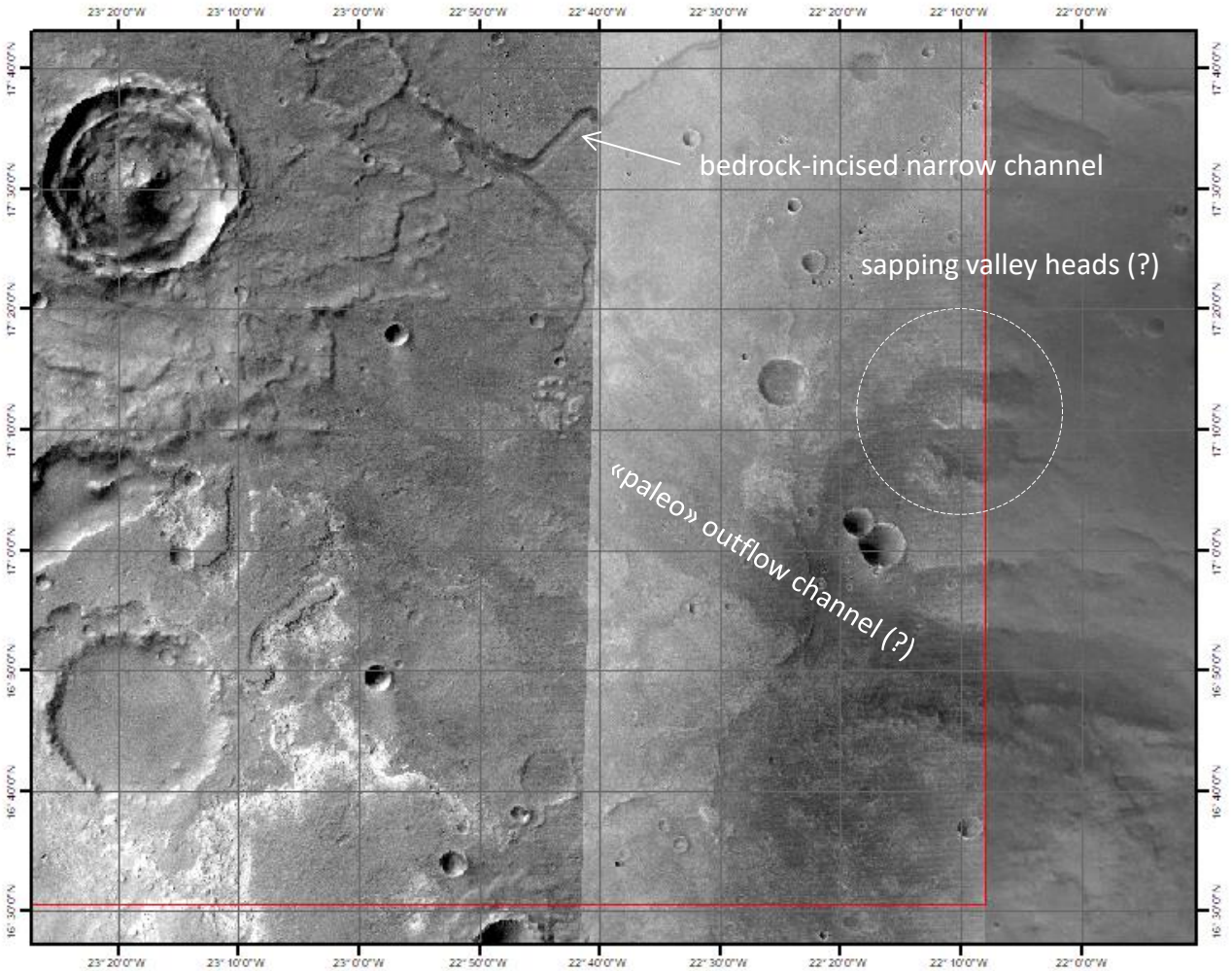
Preliminary map

Please note that neither the geologic contacts nor the unit names are close to final!

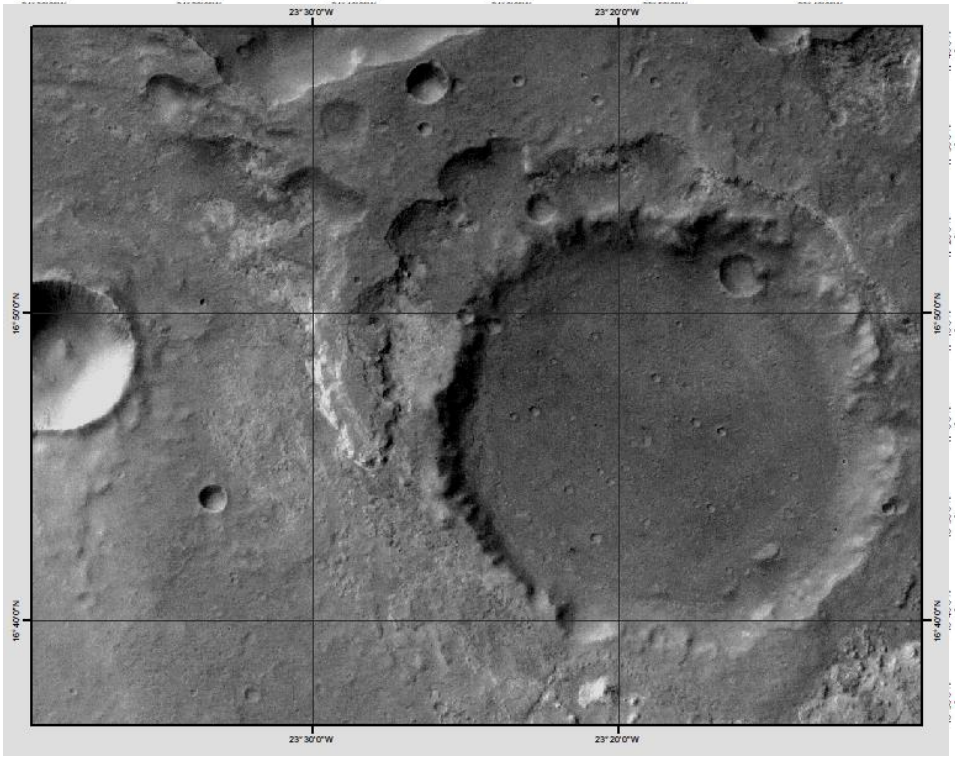
Inverted morphology

- Nature of indurating material?
  - widespread
  - lava???
  - pyroclastic?
- Local, regional (or even global) process?

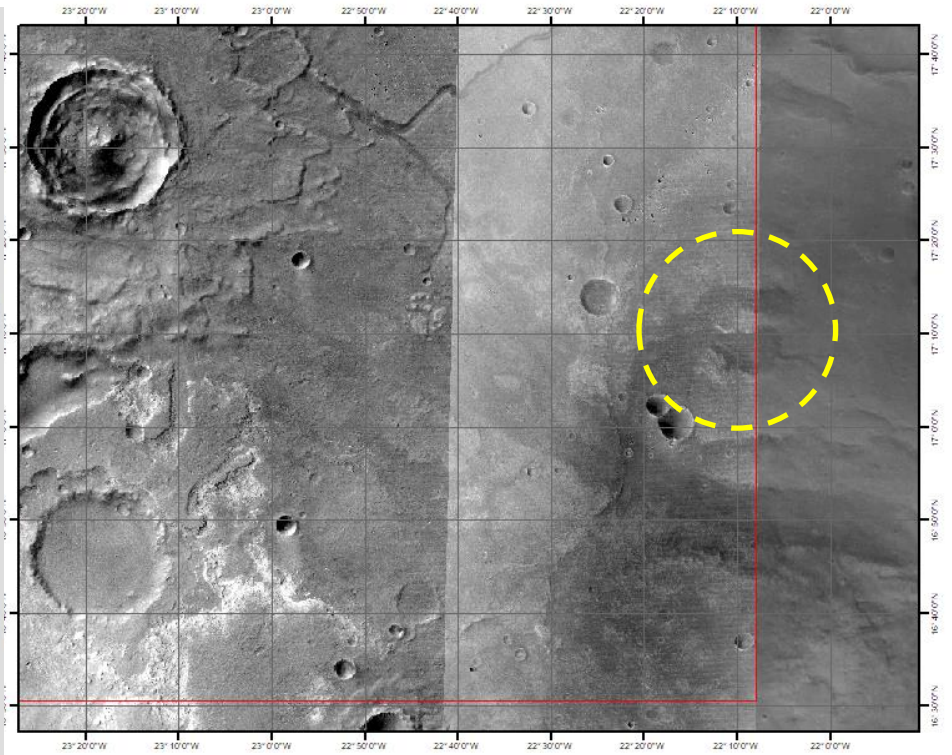
Diverse types of fluvial landforms



see also Molina et al. (2017; 2019); García-Arnay et al. (2019); Fawdon et al. (2019)

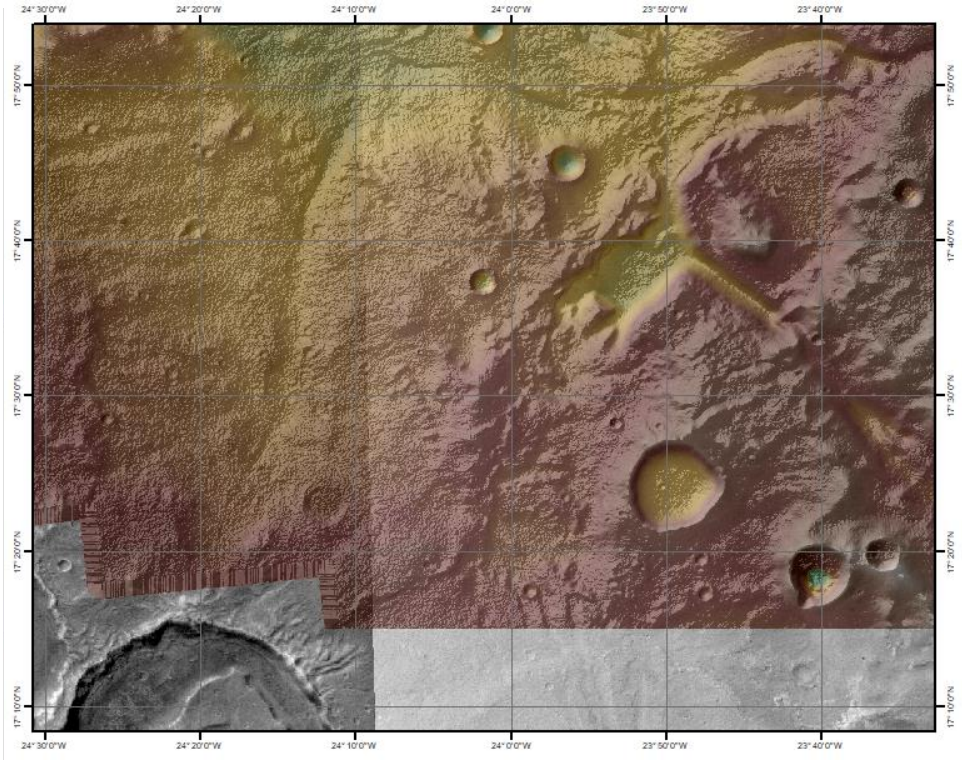


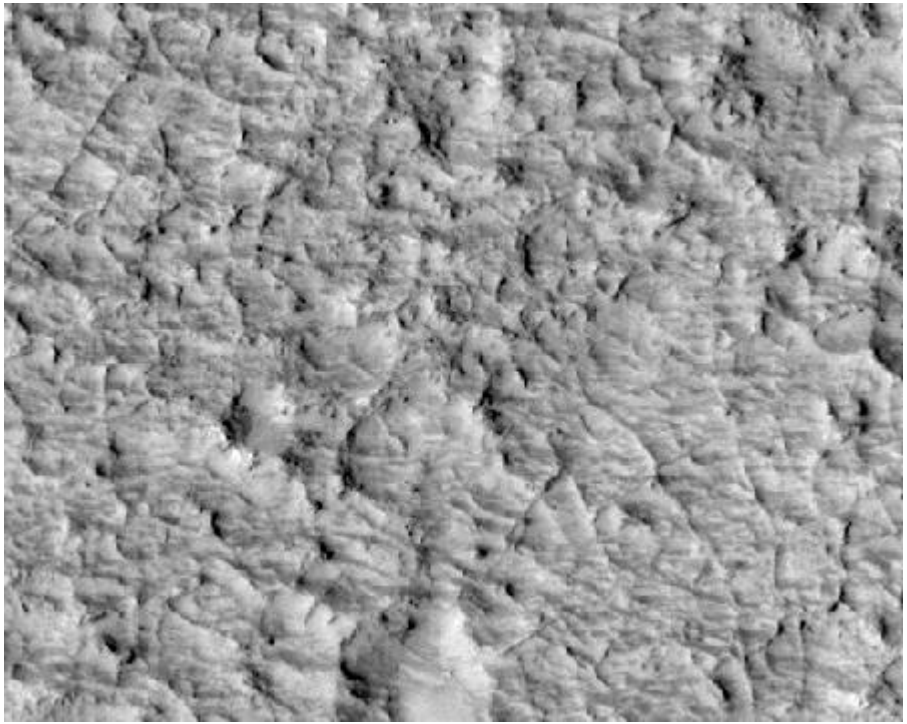
Backward erosion along alcoves



Box canyon-like alcoves

Diverse lines of evidence for groundwater activity



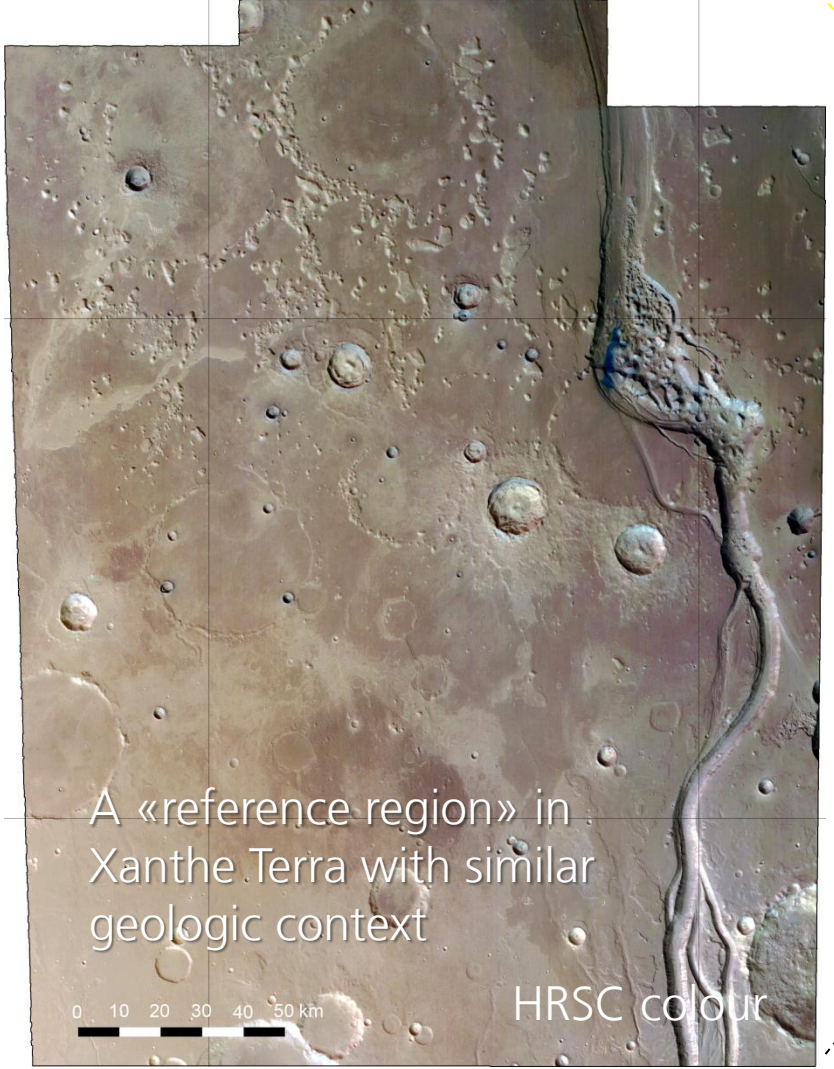


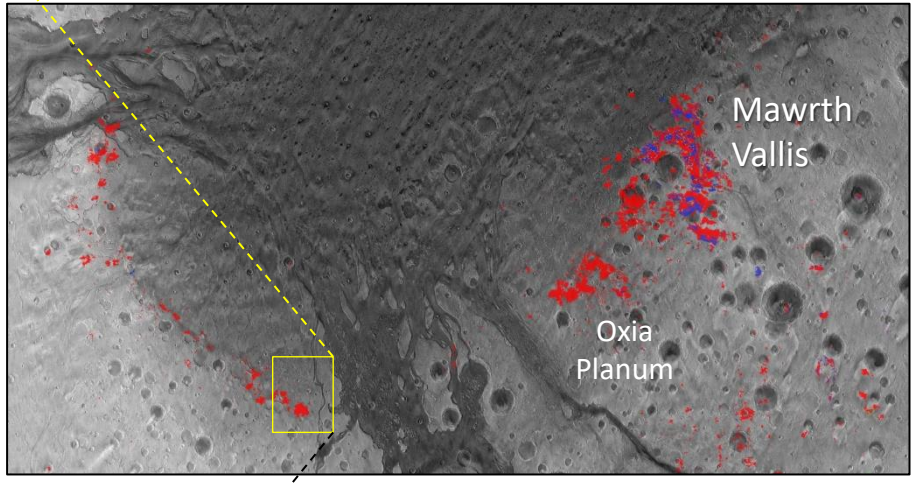
Backward erosion along linear depression

Polygonal ridges (fracture fillings)

Diverse lines of evidence for groundwater activity

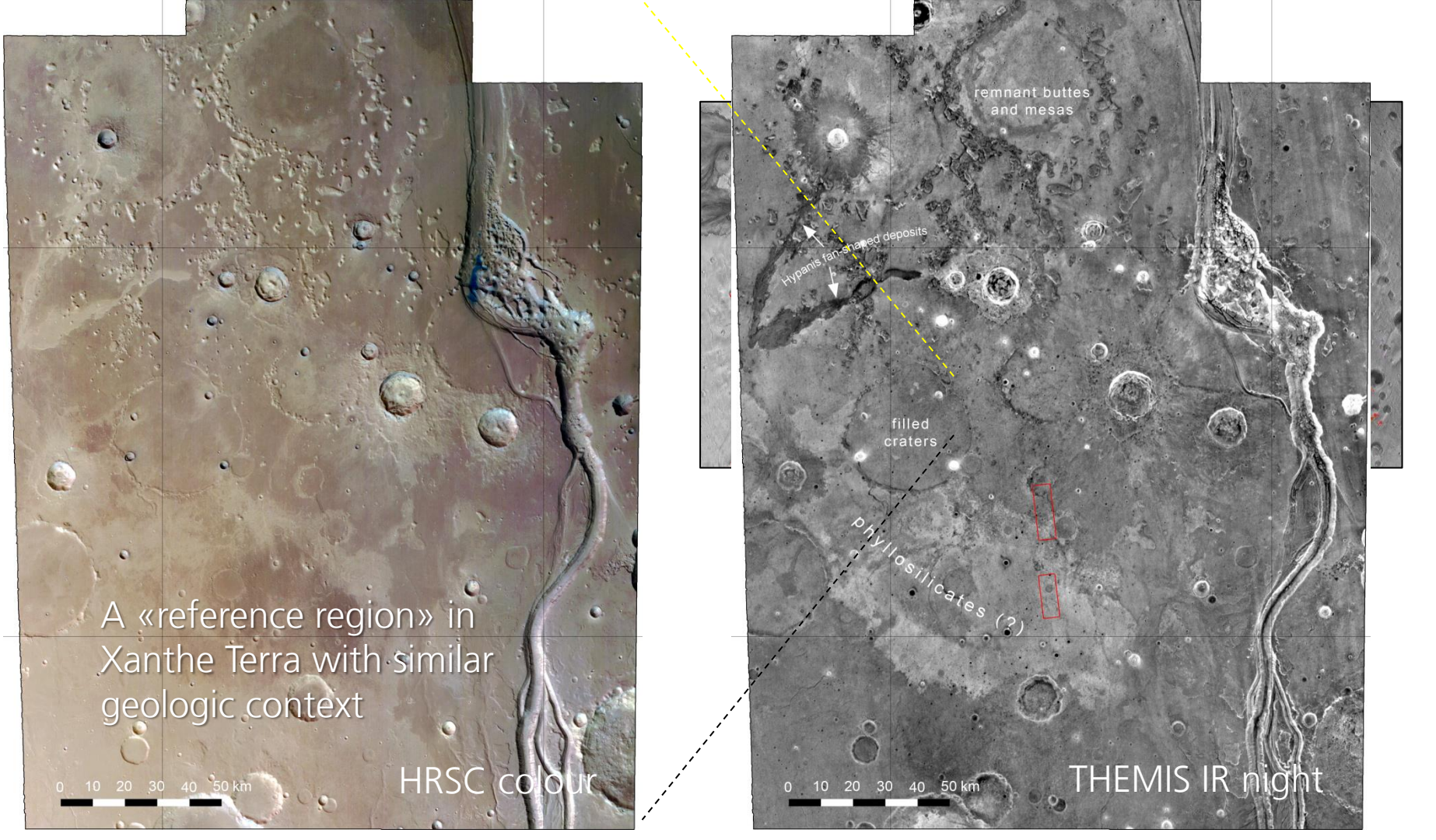
• Rates? • Timing? • Geochemistry?





Mineral map by John Carter

Do we have a „reference“ area where we can test our hypotheses?


remnant buttes
and mesas
Hypanis fan-shaped deposits
filled
craters
phyllosilicates (?)
A «reference region» in
Xanthe Terra with similar
geologic context
0 10 20 30 40 50 km
HRSC colour
0 10 20 30 40 50 km
THEMIS IR night


Light-toned fractured bedrock
Xanthe Terra → equivalent to textures of phyllosilicate-bearing rocks in Oxia Planum
100 m

Summary

- Overall: Confirmation of work by Quantin et al. (submitted) and Molina et al. (2017, 2019)
  - Open questions about several issues (stratigraphy, type of materal)
- Evidence for diverse (and possibly long-lasting) fluvial processes, including groundwater activity (timing?)
- Some units hard to delineate (complicates formal mapping)
- «reference» mapping area in Xanthe Terra at margin of Chryse Planitia
- Next step: completion of formal mapping