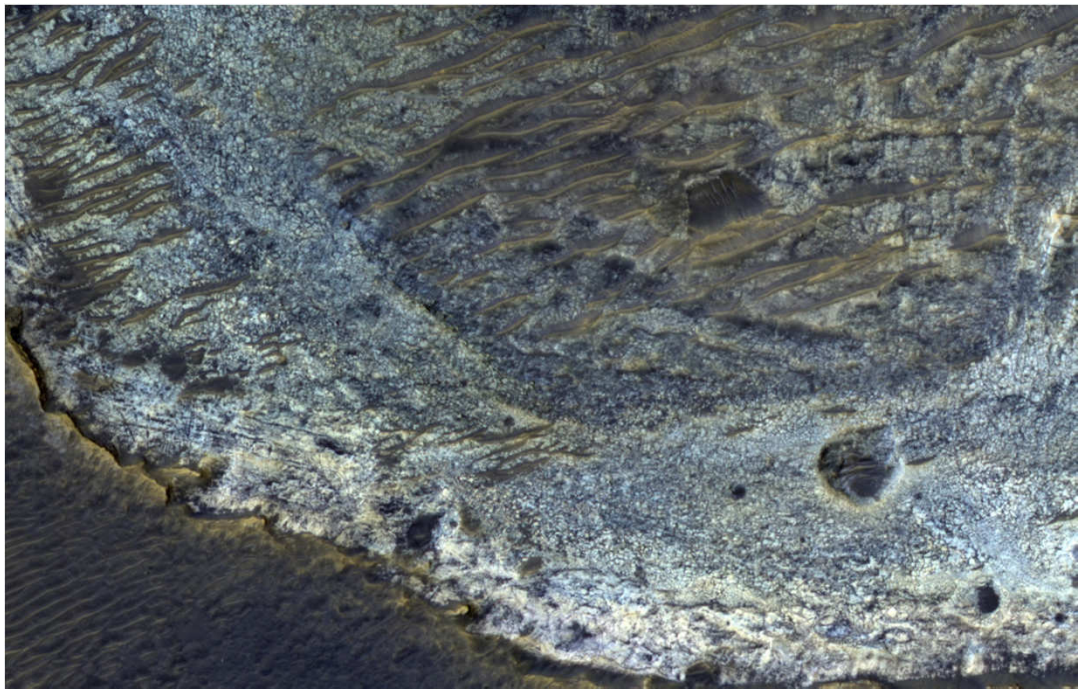
Fe-Mg clays, Al-clays, and sulfates in the northern Mawrth Vallis Region



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FRANK CHUANG
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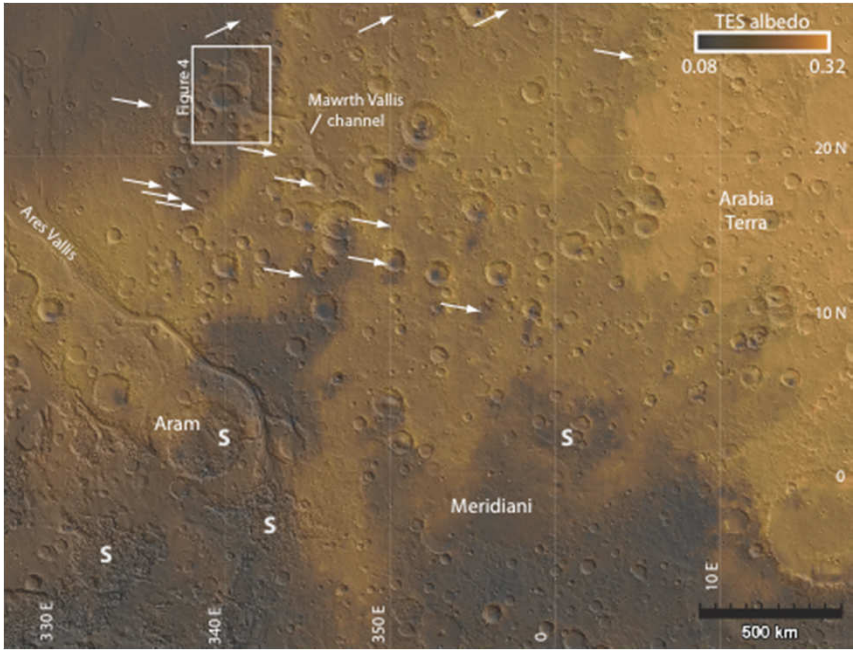
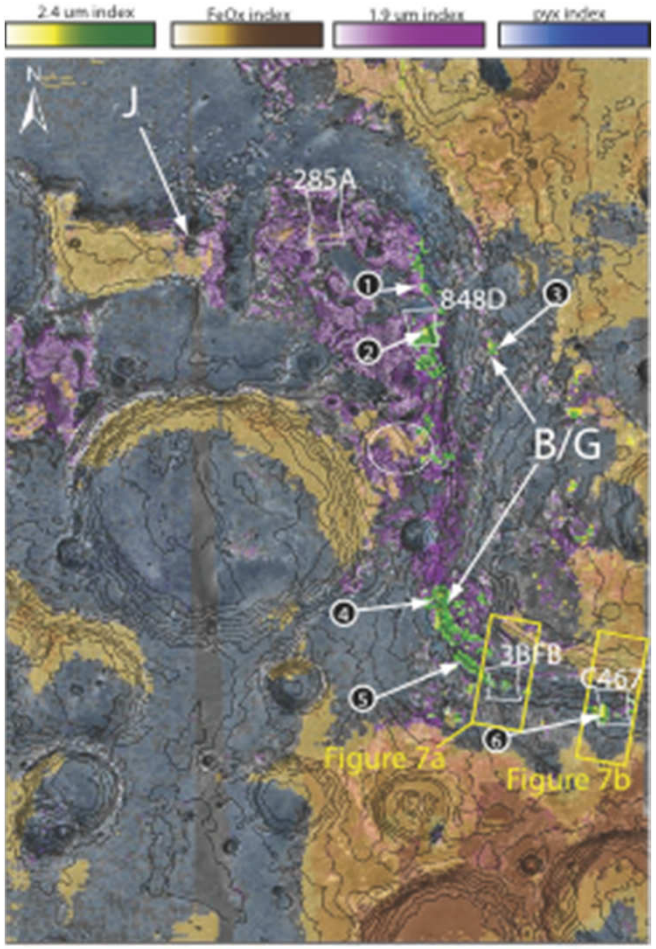
Background

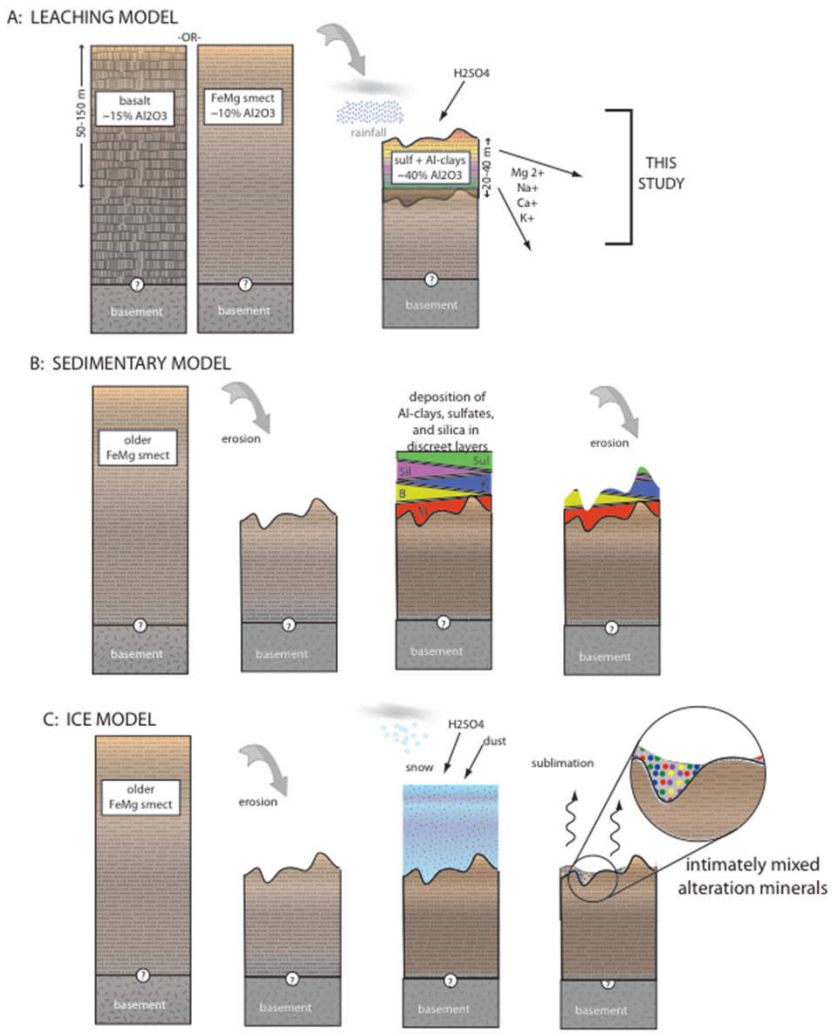
- Well known phyllosilicate mineralogy at MV
  - But there is more to that story!
- Detections of sulfates in the region
- Jarosite in the north [*Farrand et al.*, 2009]
- This site provides access to a range of clays and sulfates

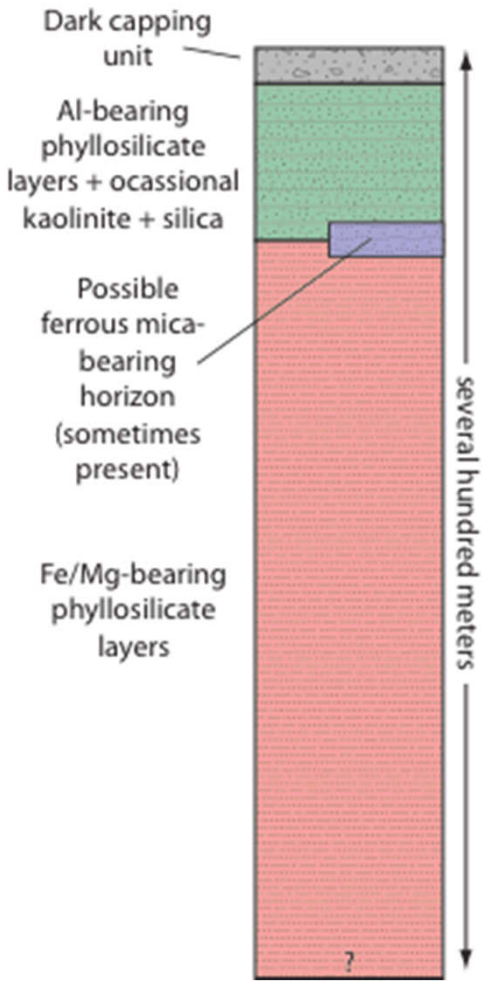




A global-scale puzzle:

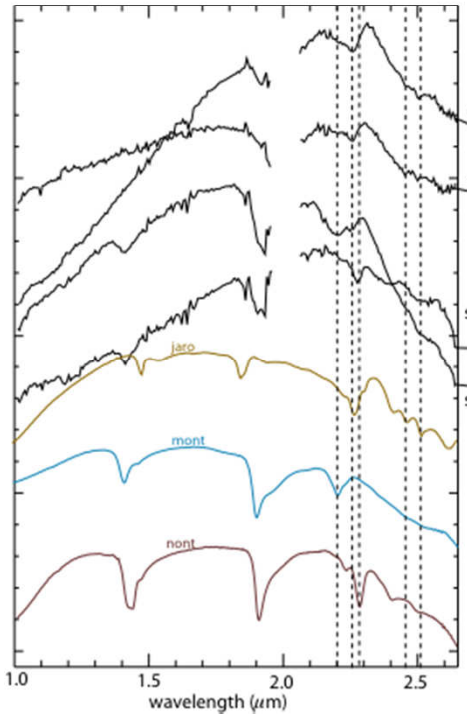
What causes compositional stratigraphy on Mars?

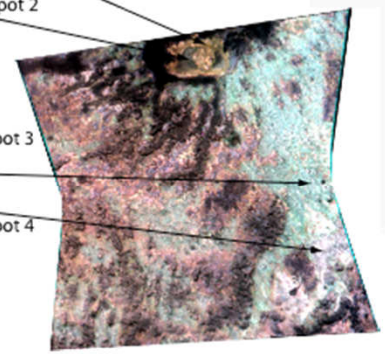


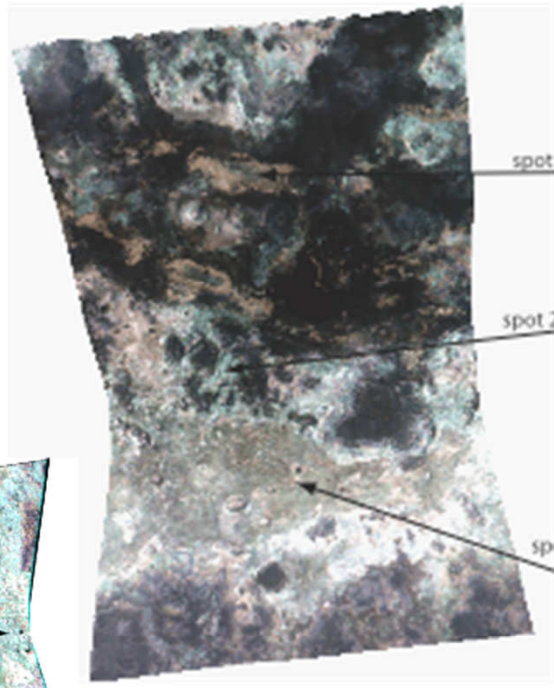


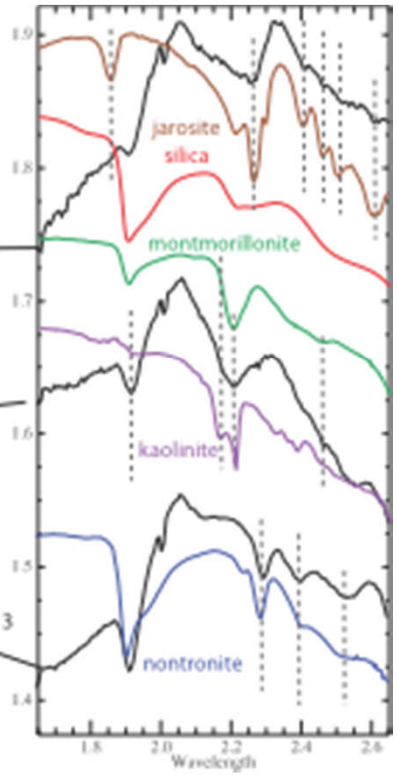
Motivation for this site

- Discovery of sulfates in Mawrth Vallis area by Farrand et al. [2009]
- ! Clays and sulfates
- Compositional stratigraphy

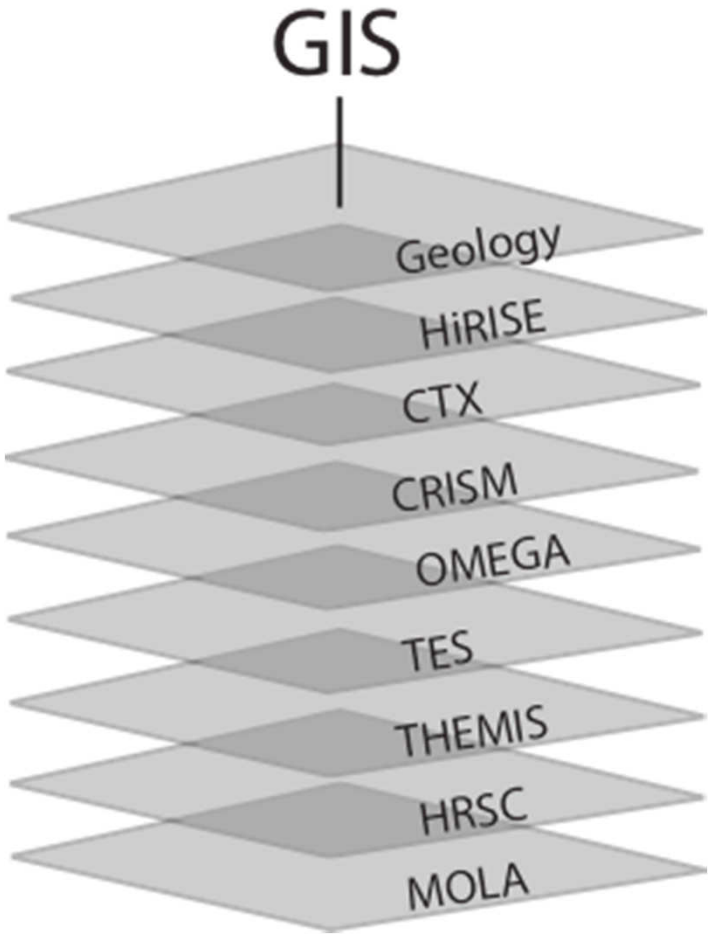


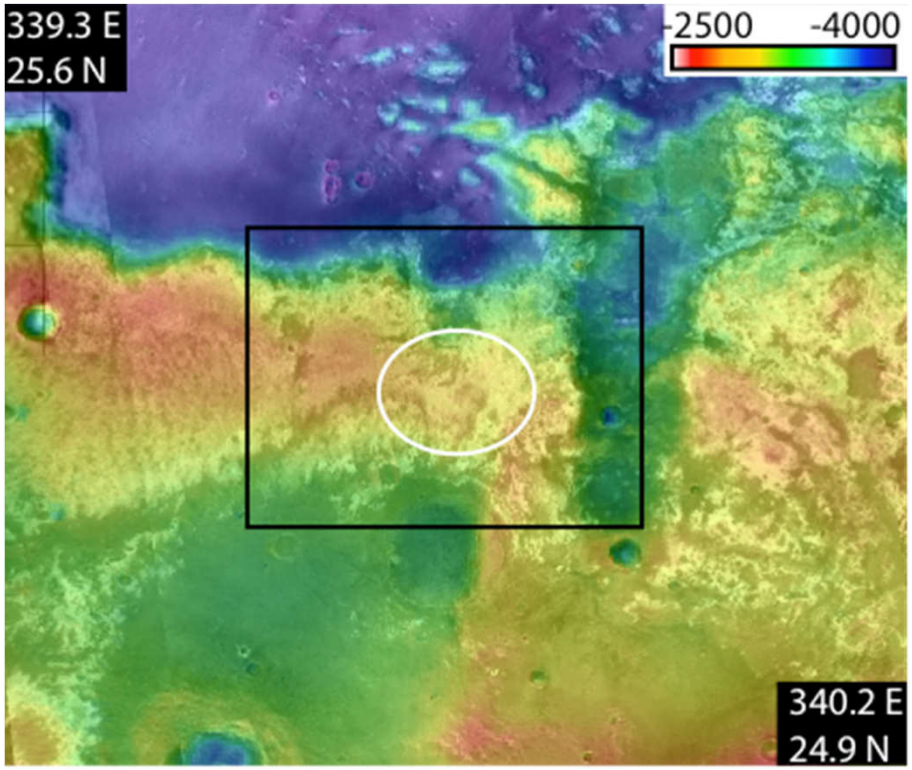




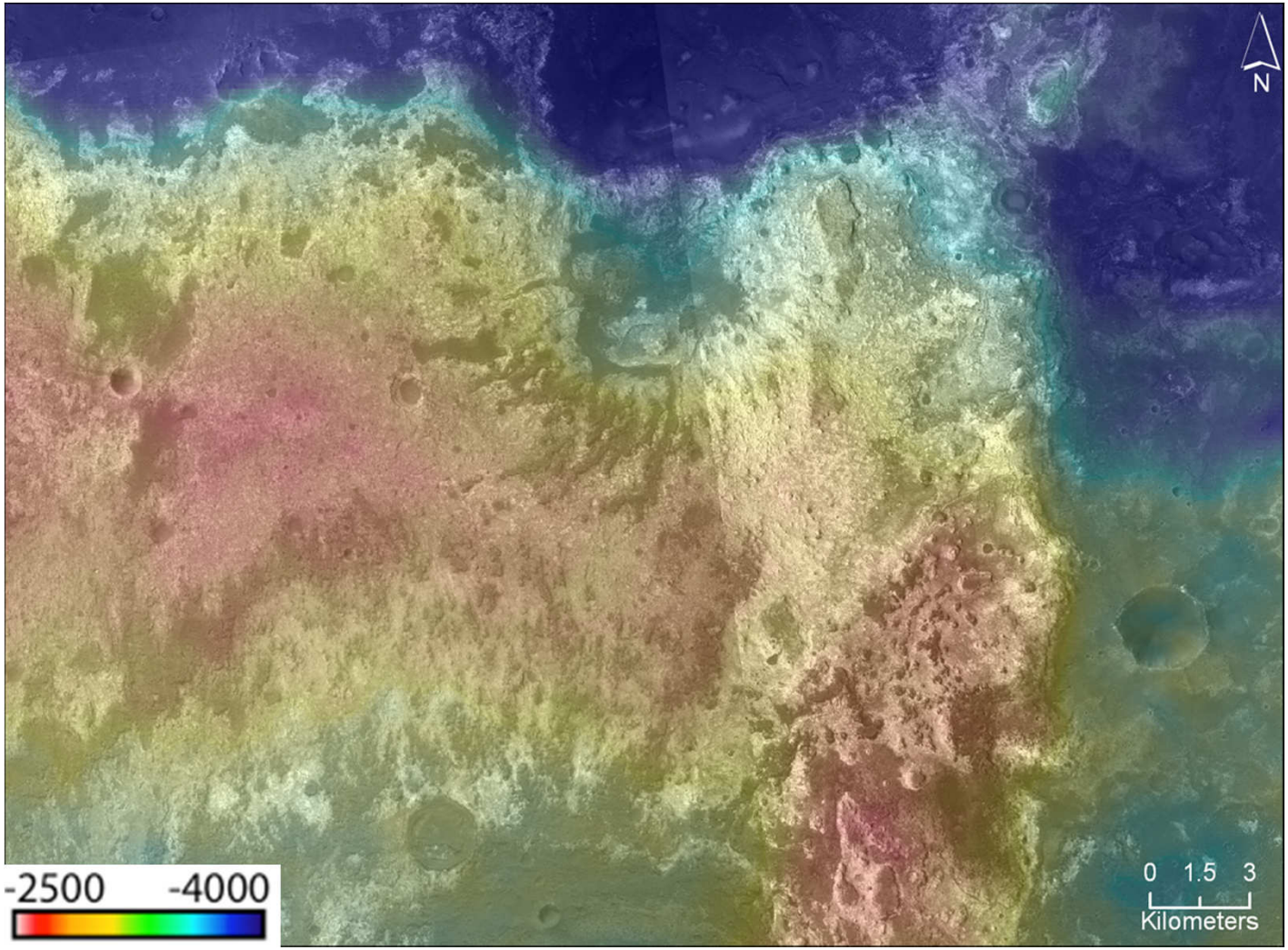


The proposed landing site

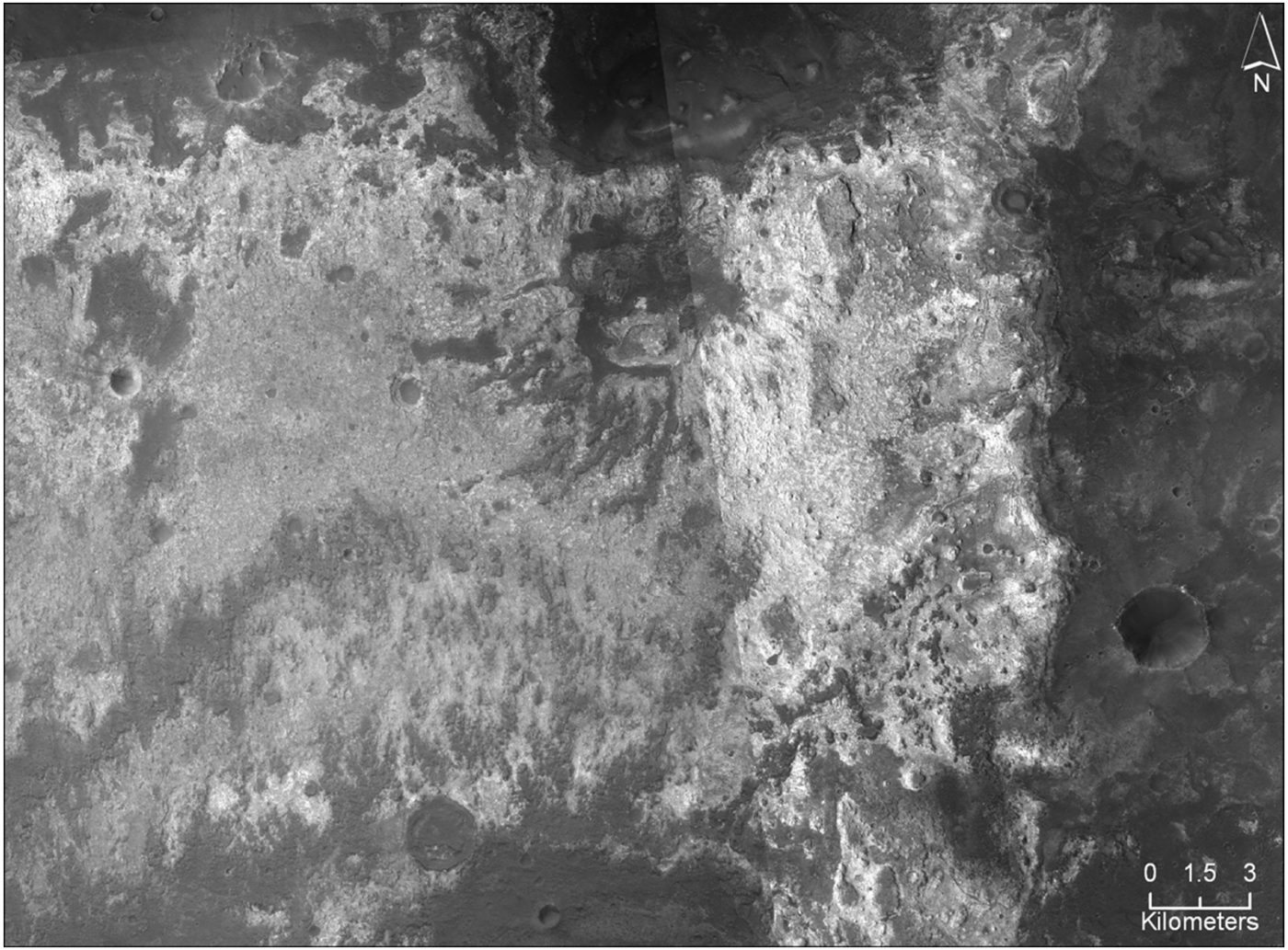




HRSC DTM



CTX mosaic



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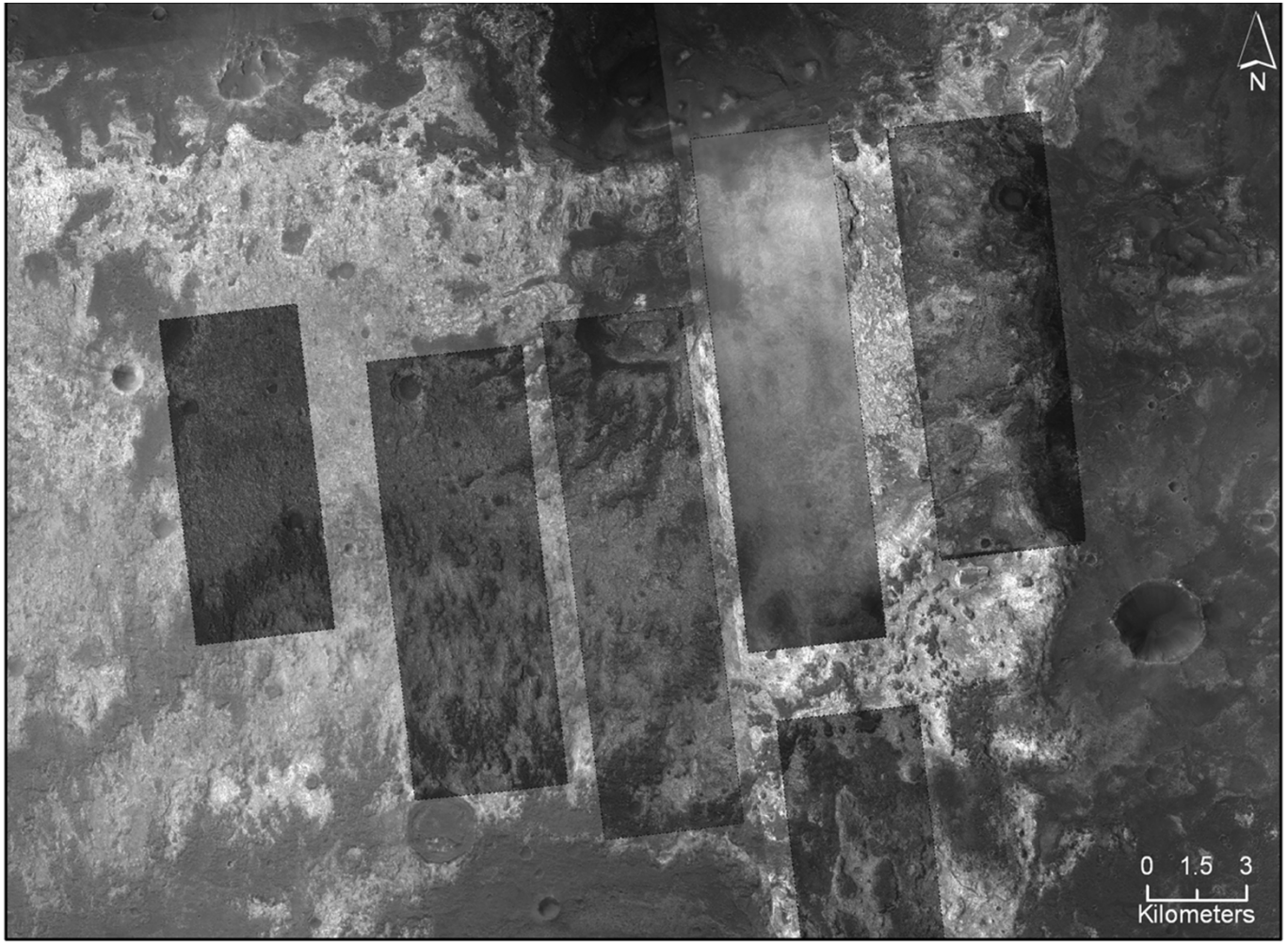
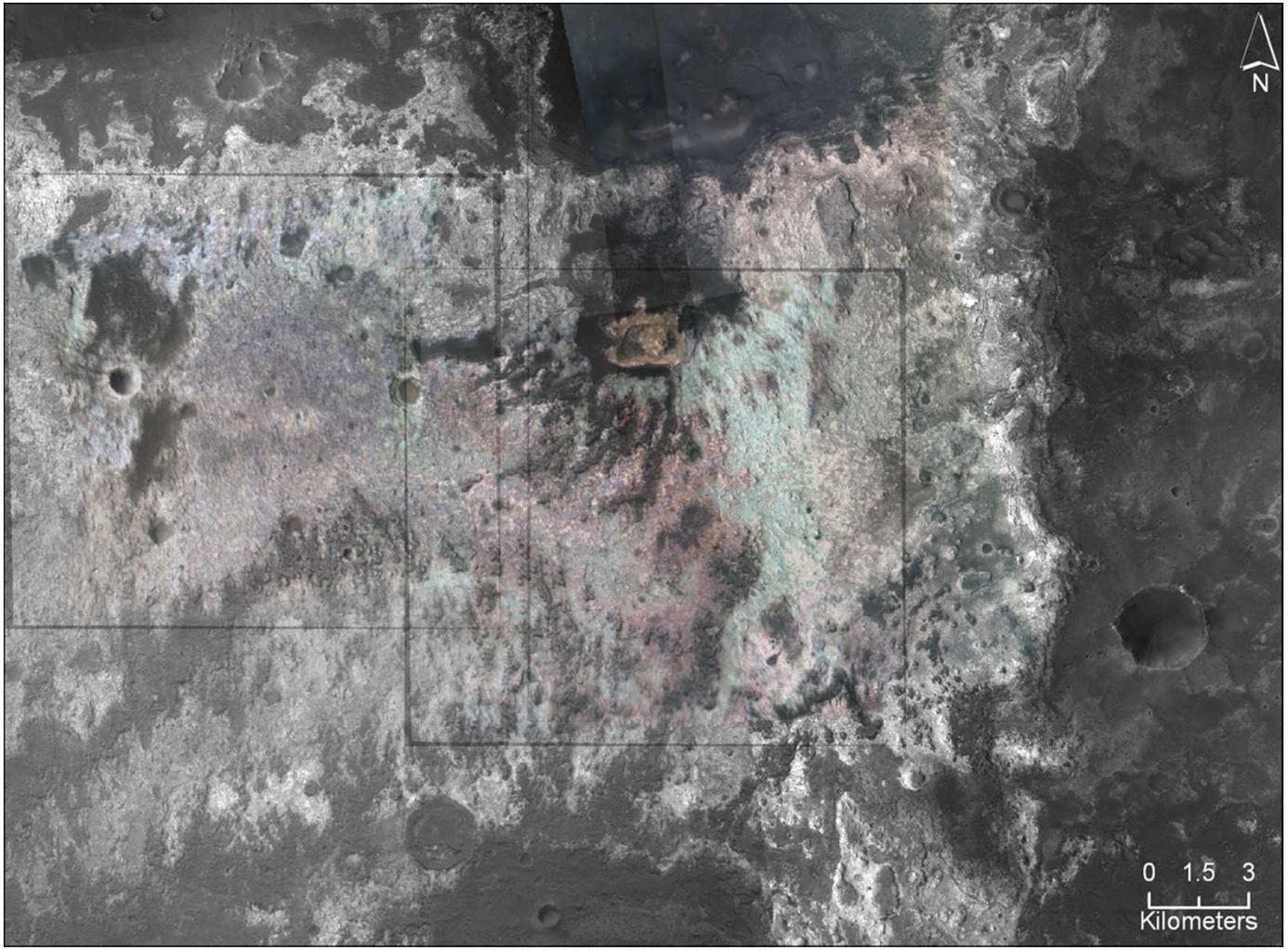
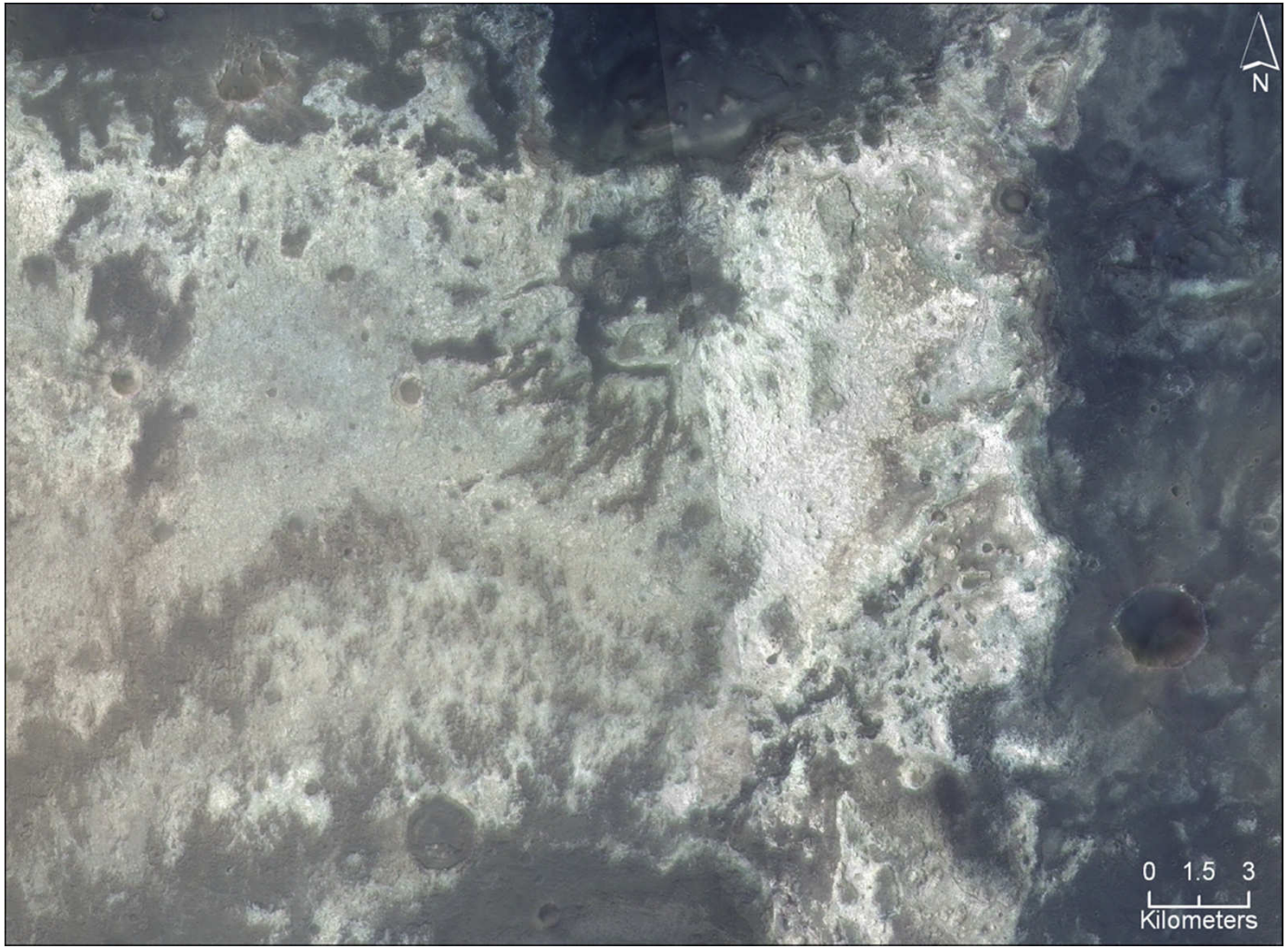


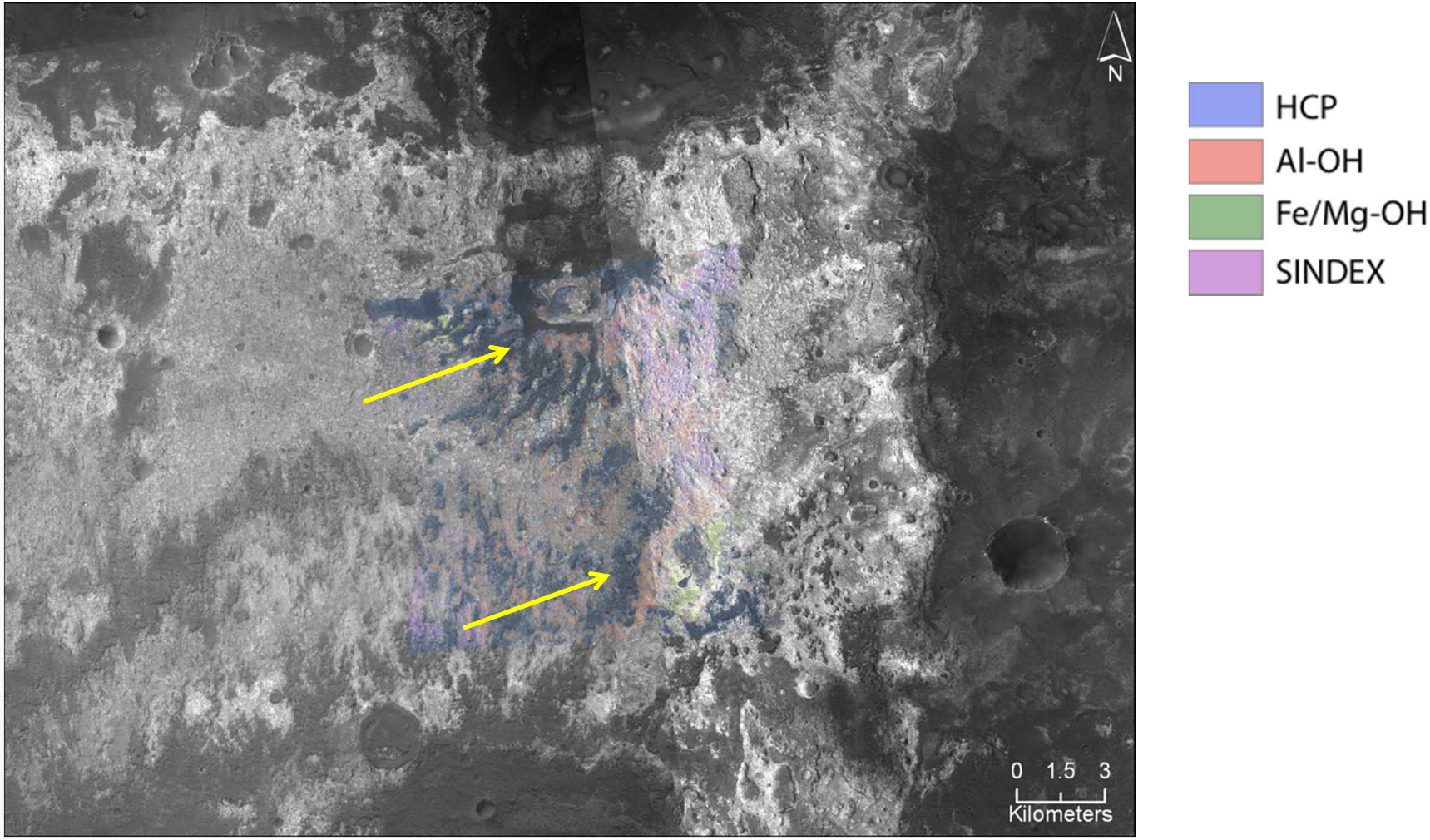
CTX + CRISM false color



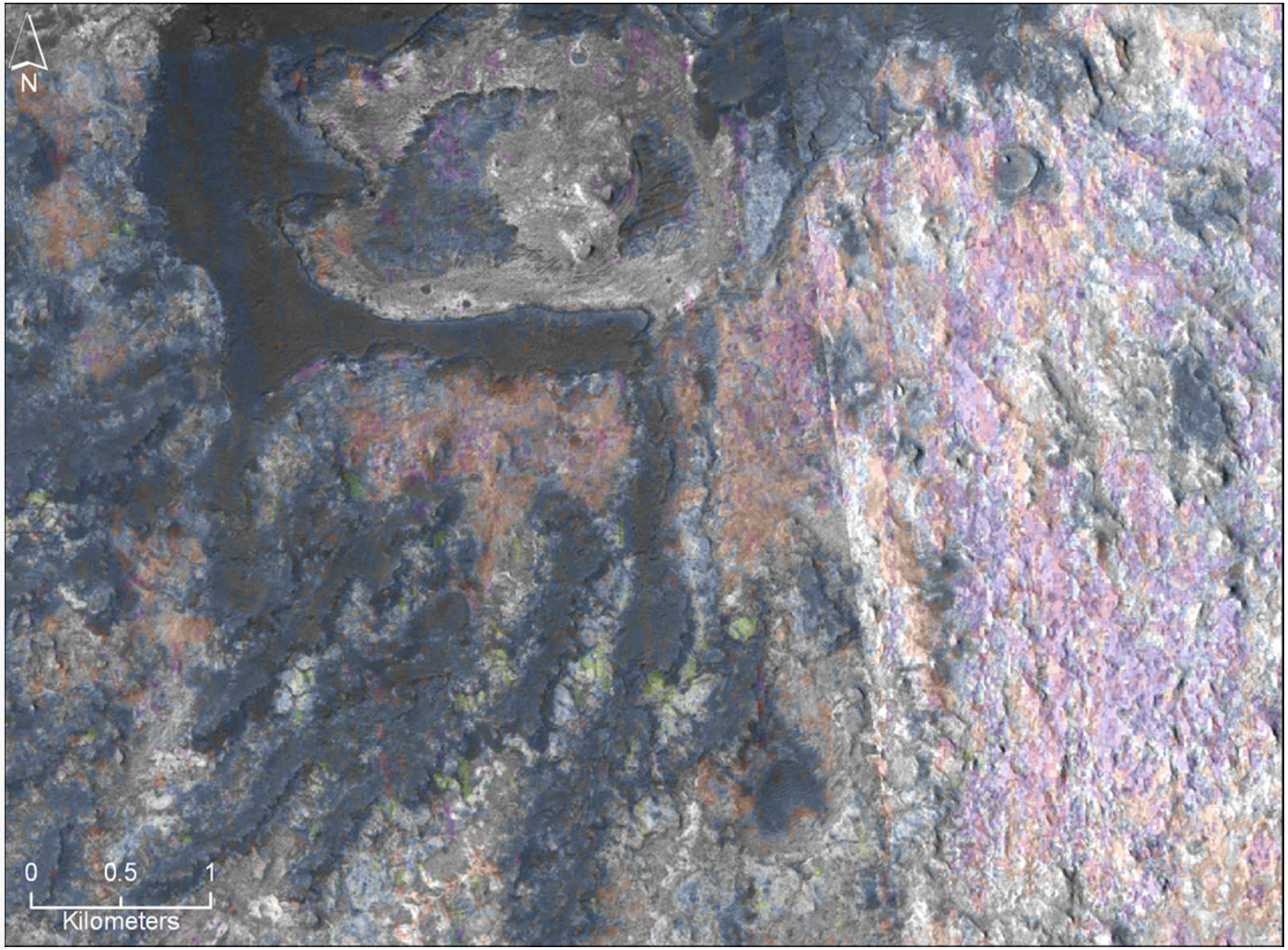
CTX+ HRSC color



CTX + CRISM index maps

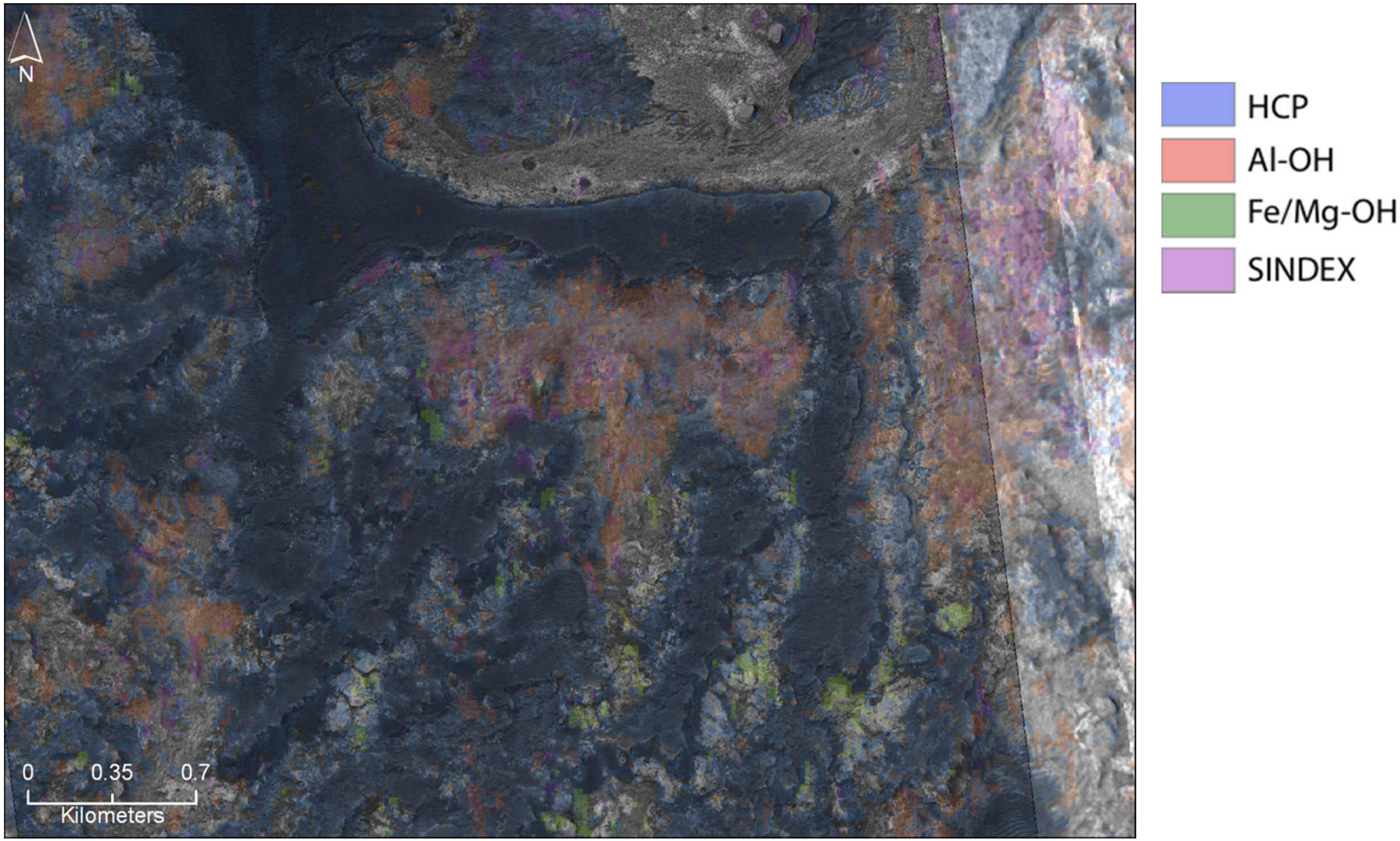


CTX + CRISM index maps

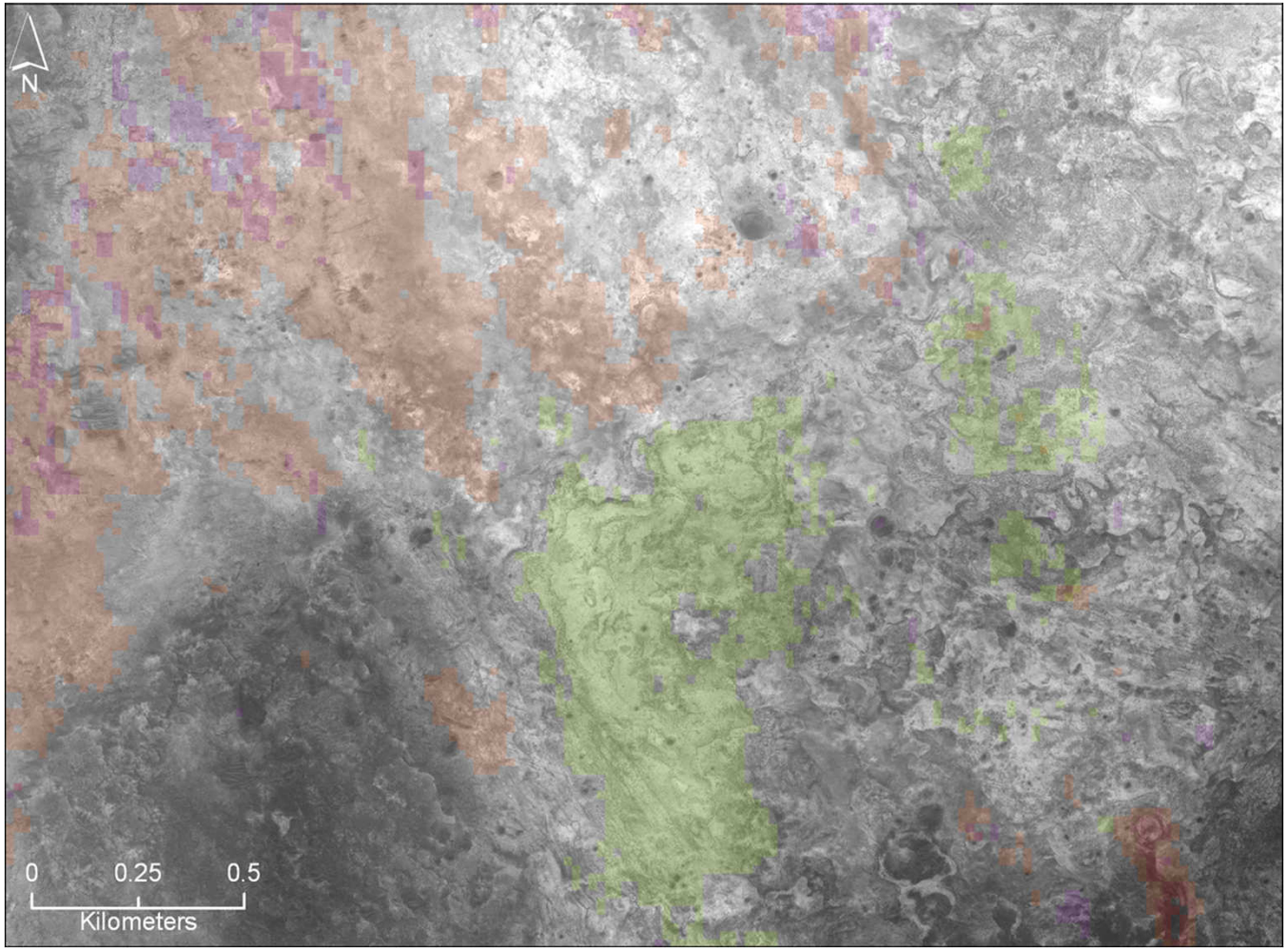


HCP
Al-OH
Fe/Mg-OH
SINDEX

HiRISE + CRISM indices



HiRISE + CRISM indices



HCP
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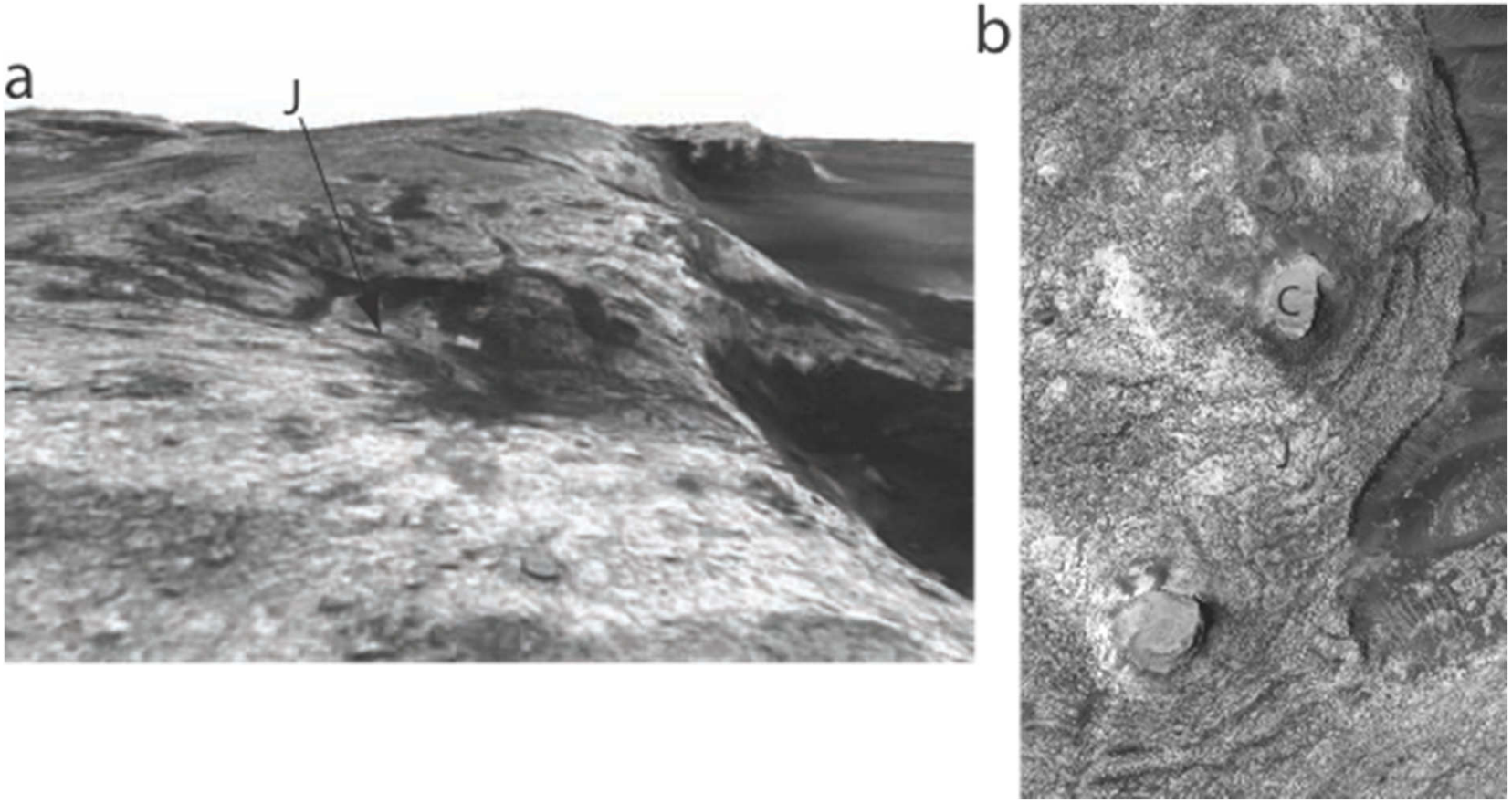
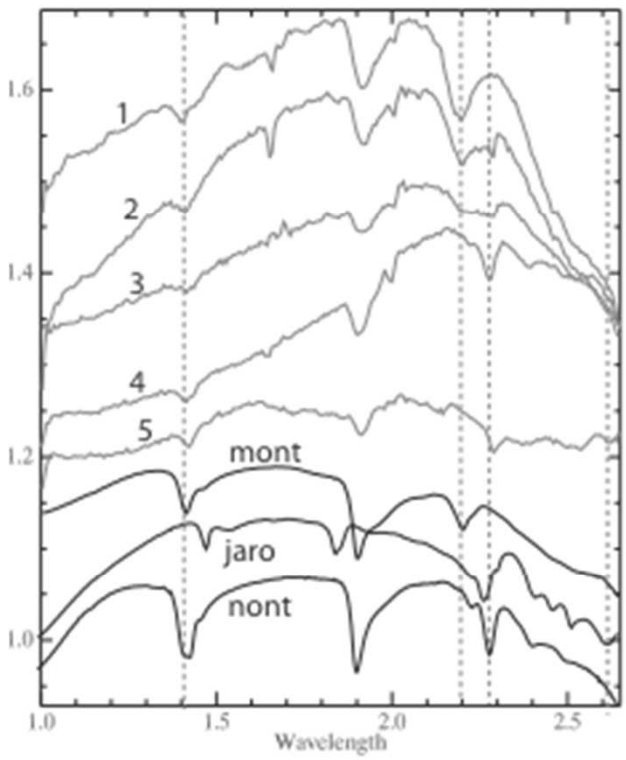
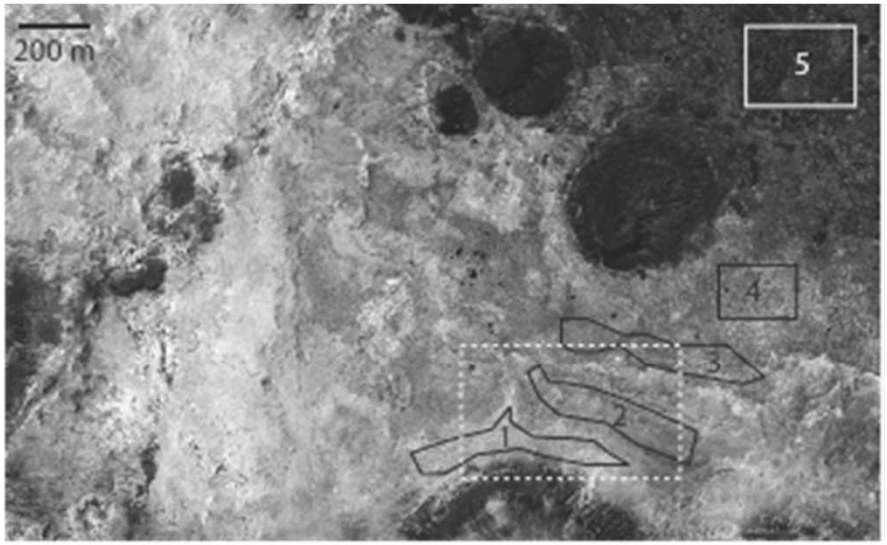
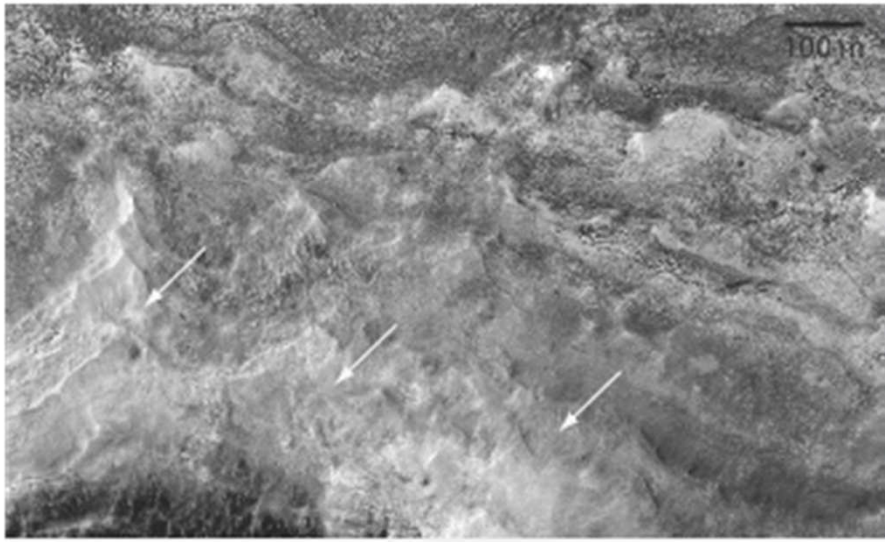
Geomorphic setting



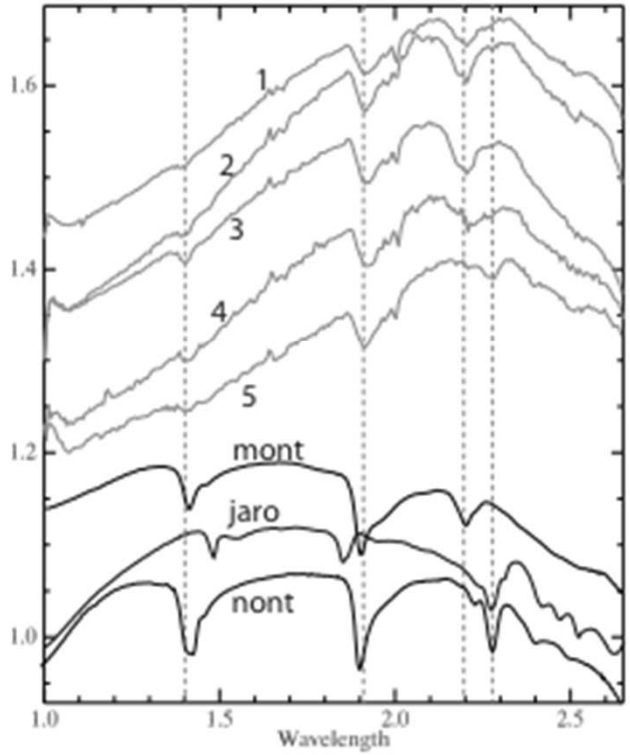
Comparison to other sites

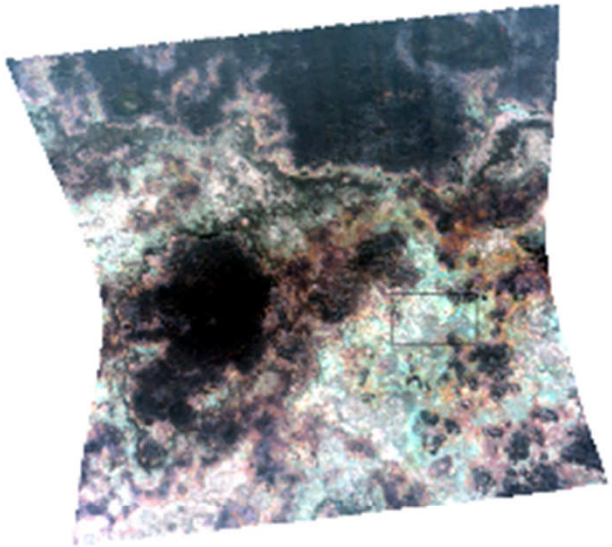


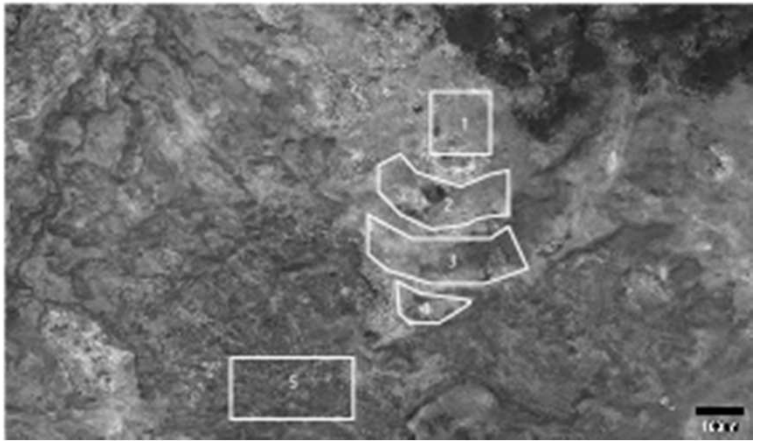




Comparison to other sites

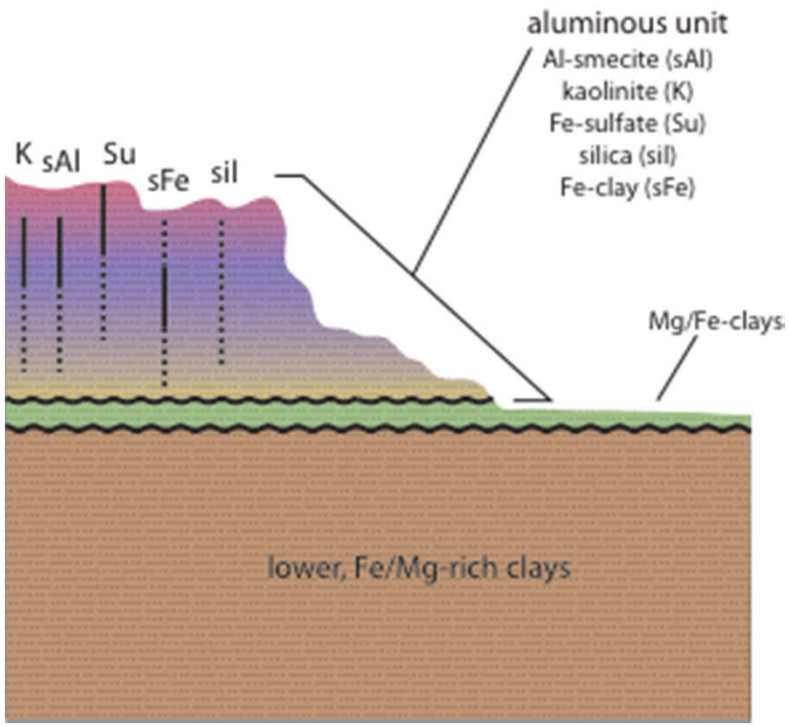




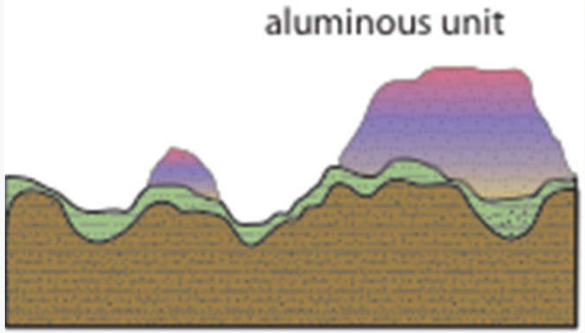


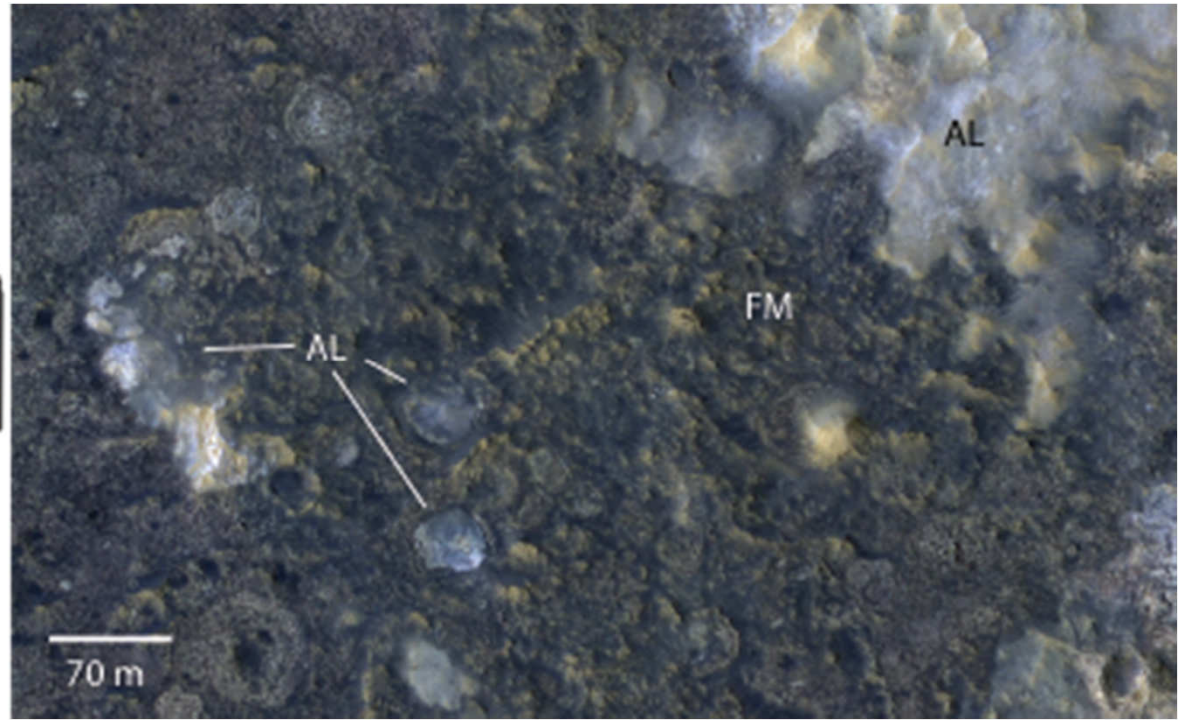
Compositional Stratigraphy

- "Aluminous Unit" is a mixture of:
  - Kaolinite
  - K-S mixed layer
  - Al-smectite
  - Fe-smectite
  - Fe-sulfate
  - Silica
  - Fe-oxides



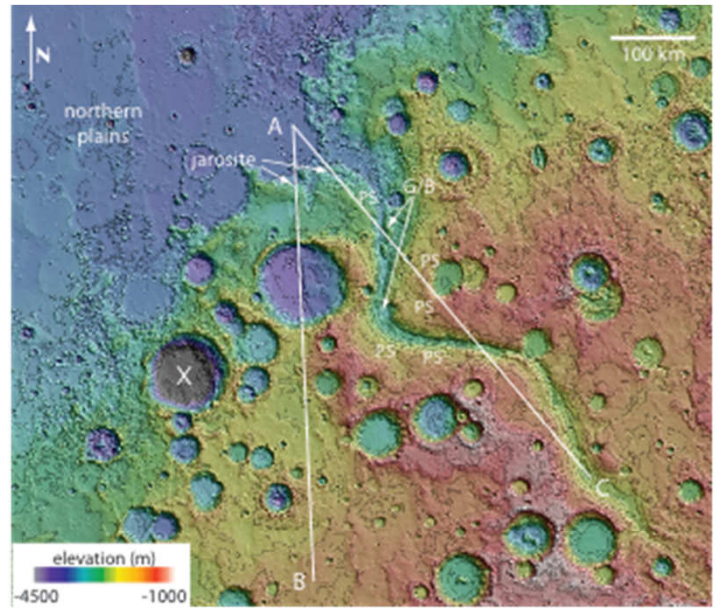
The aluminous unit is sedimentary

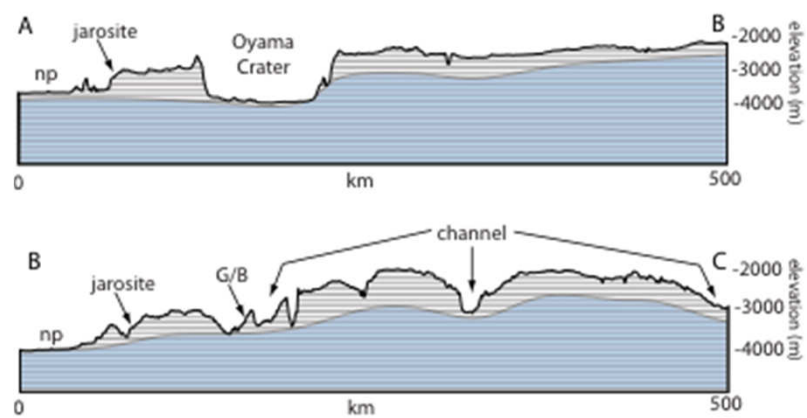




What about groundwater?

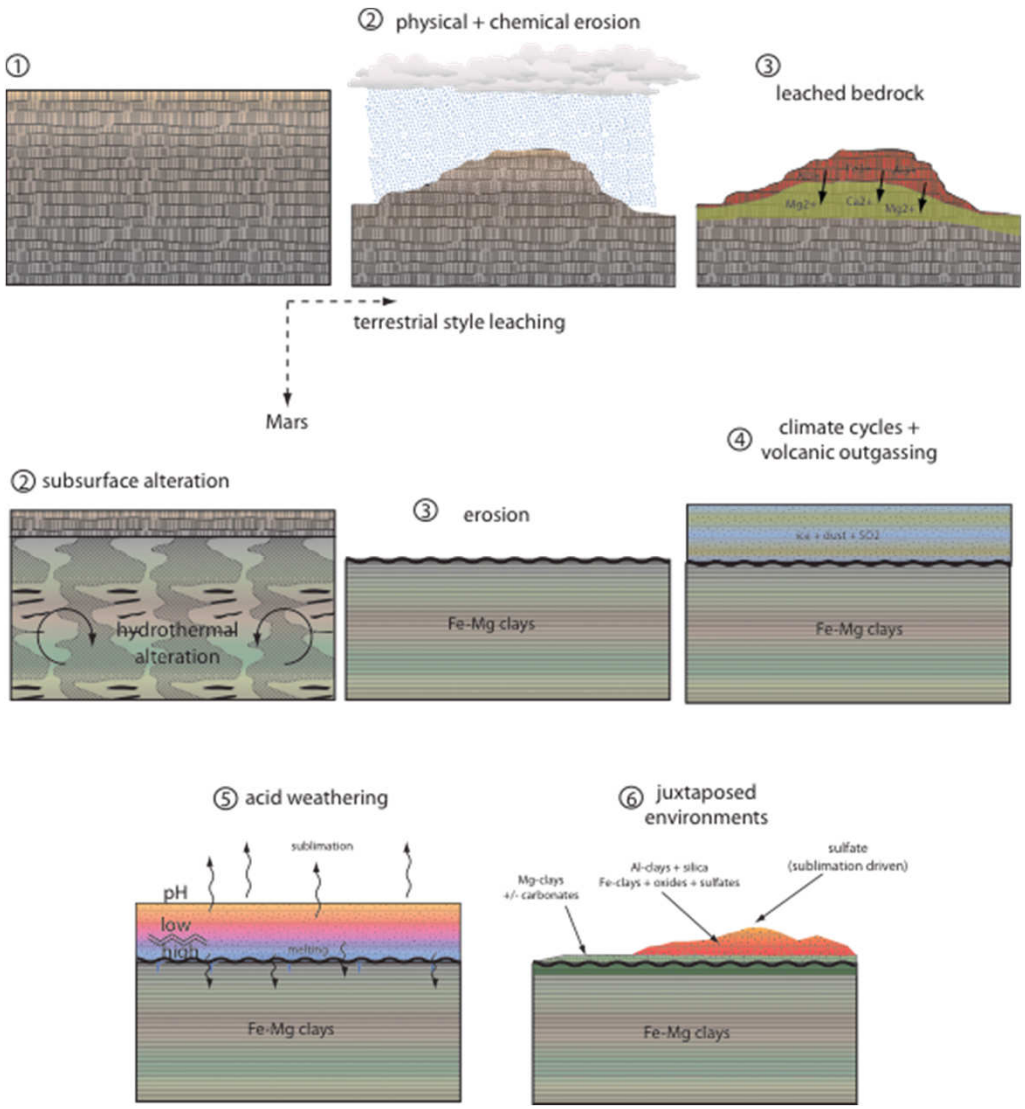
- Acid lake?
- Groundwater source?
- Not the solution at Mawrth Vallis



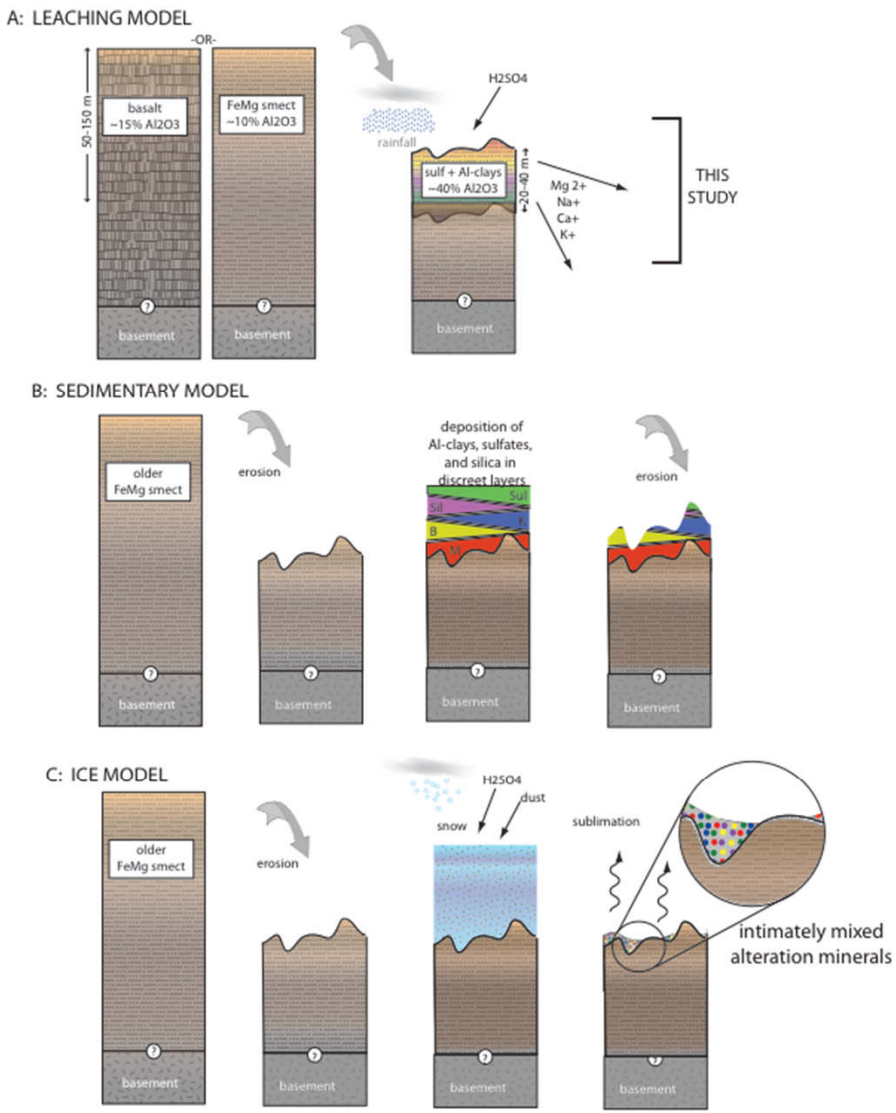


What about leaching?

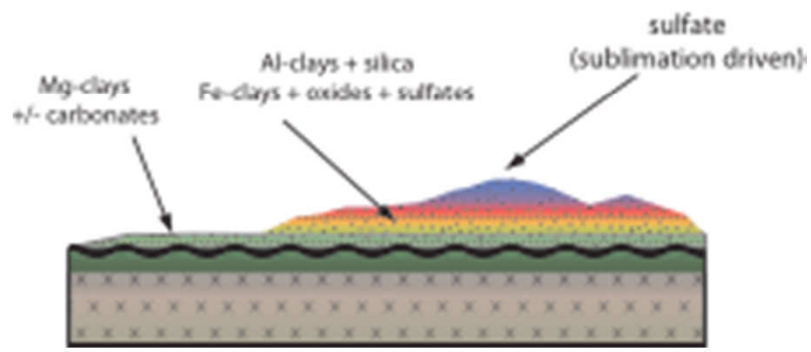
- Regional-scale, terrestrial style leaching is out
- Local-scale acid weathering of dust is a better solution
- Ice is a theme in all of Martian alteration



How does it fit?

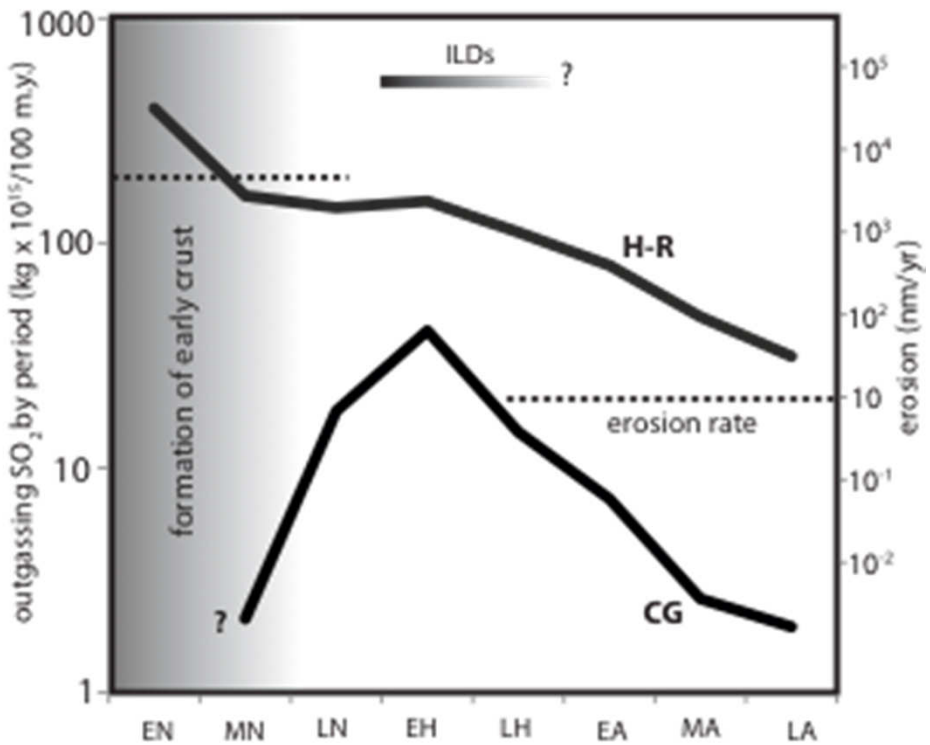


- Actually a combination of all three hypotheses
- Fundamentally similar to Gale Crater



The end

- Sulfur outgassing is a thread spun throughout Mars sedimentology



Michalski and Niles, Geology, in press (May 2012)