

# THEMIS-modeled phyllosilicate abundances at the Mawrth Vallis landing site



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# How *much* clay is actually in a “phyllosilicate-rich” surface?

Why is this relevant?:

- Environment of formation:
  - Short-lived or long-term weathering regimes?
- Lithologic host:
  - Clay abundance has implications for rock type

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Preservation potential

## Determining abundance:

- VIS/NIR:

- Spectra do not mix linearly
- Radiative transfer modeling required

- ✓ TIR:

- Spectra mix linearly
- Straightforward linear deconvolution

# Abundance discrepancy: Mawrth Vallis

- VIS/NIR result:

- OMEGA/CRISM radiative transfer modeling [Poulet et al. / Ehlmann et al, this meeting] :

- Nontronite: 45-50%

- Kaolinite: 12-30%

- Nontronite: 10-25%

- Al-clay : 25%

- TIR result:

- TES linear

- unmixing [Michalski & Fergason 2009] :

- Clay: <15% (LOD)

- Si-rich materials, feldspars, zeolites

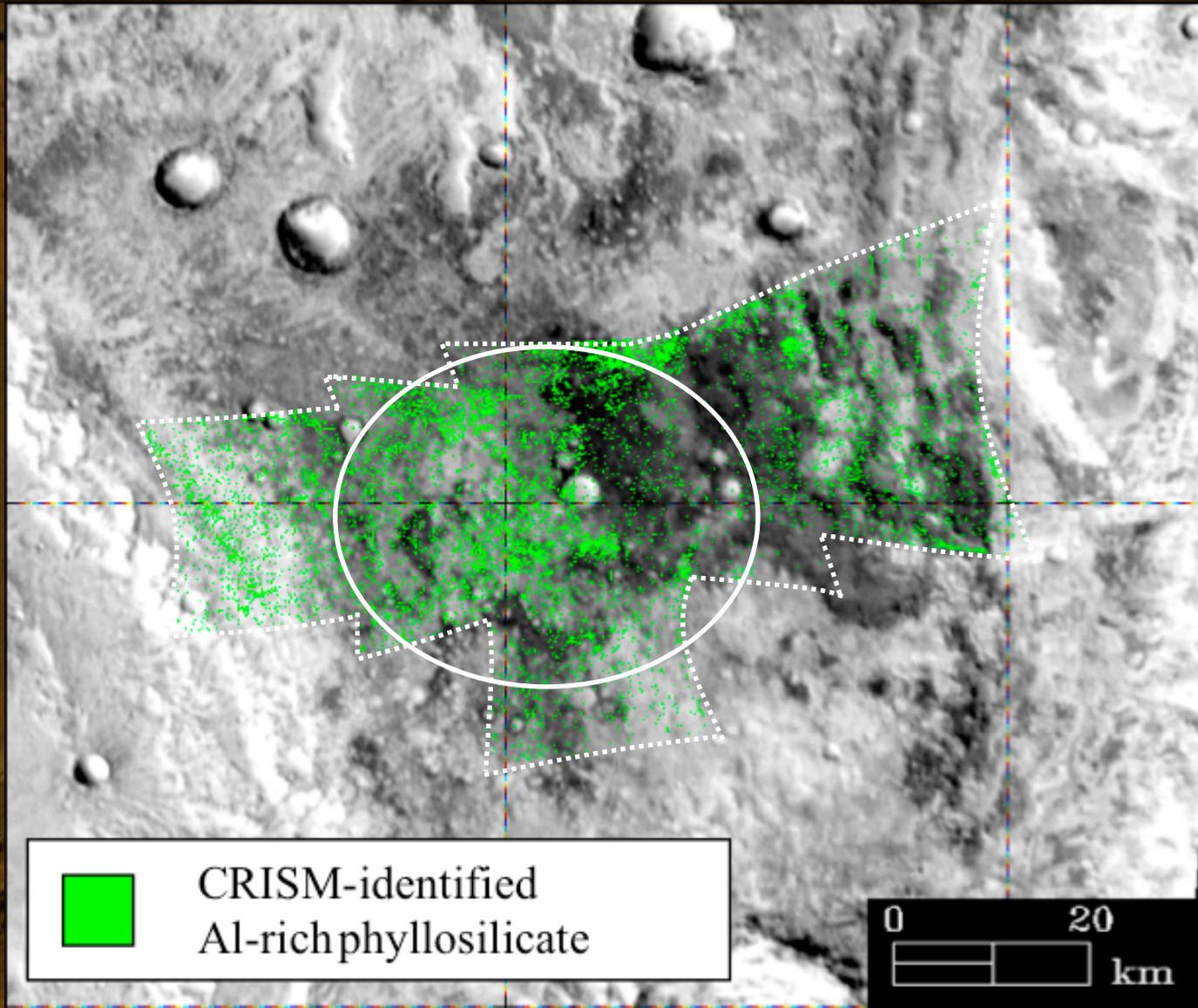


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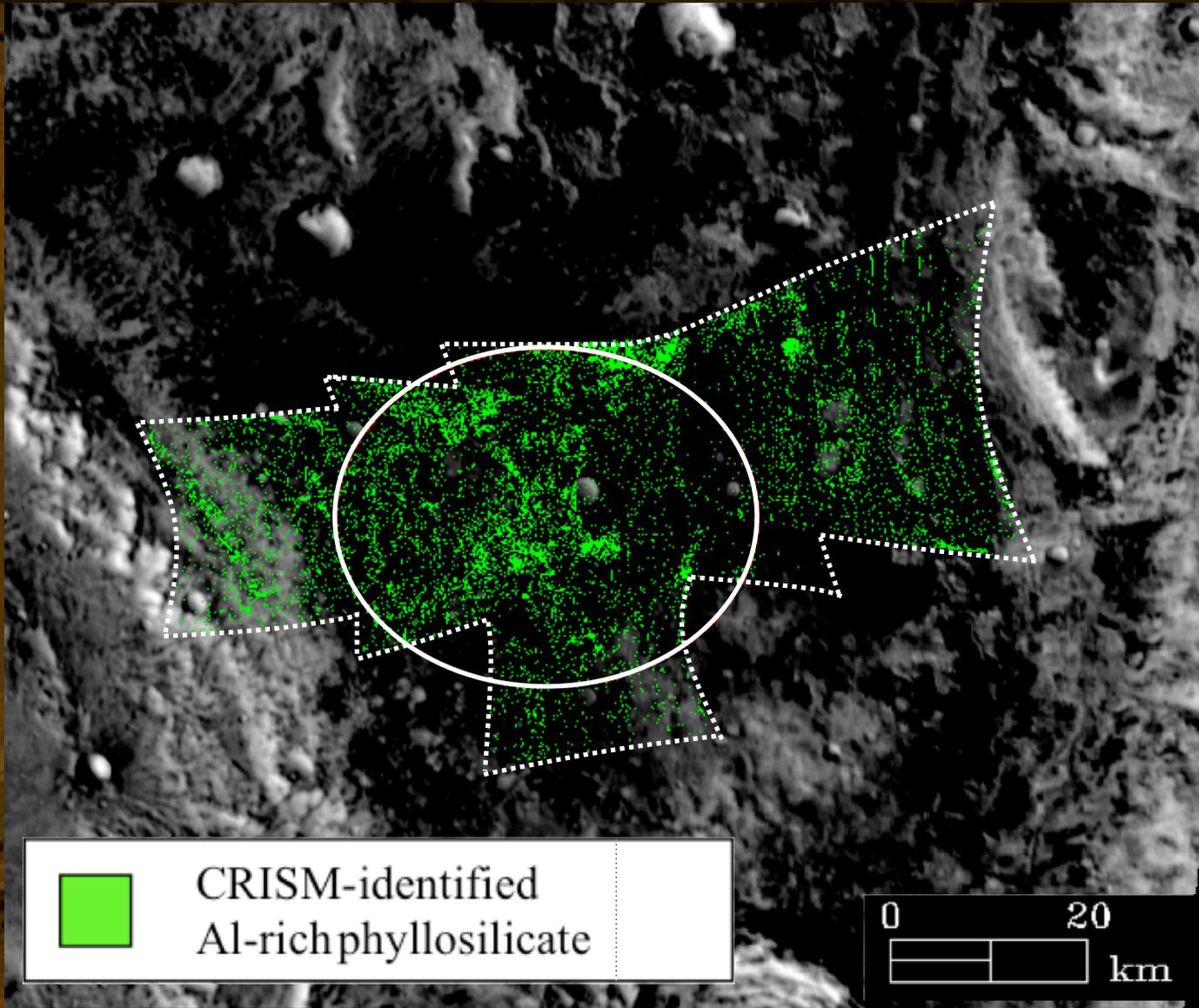
# Application to Mawrth Vallis

- Modeling THEMIS abundances with:
  - 7 usable bands
  - 6 unmixing endmembers:
    - 3 in-scene endmembers
    - Al-rich smectite (montmorillonite)
    - Fe/Mg-rich smectite (saponite)
    - blackbody
- Provides phyllosilicate abundance at 100 m scale

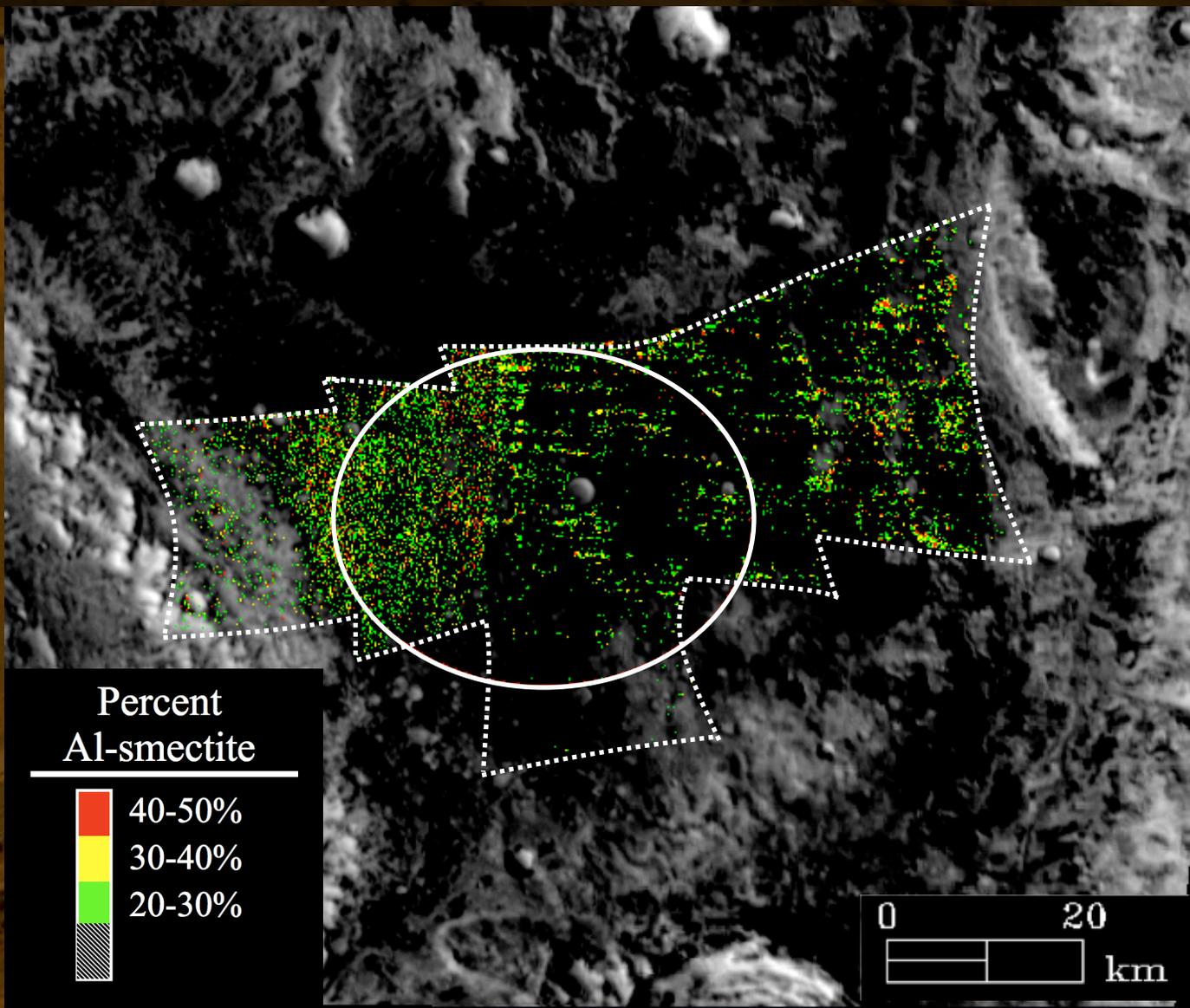
# CRISM-identified Al-clay



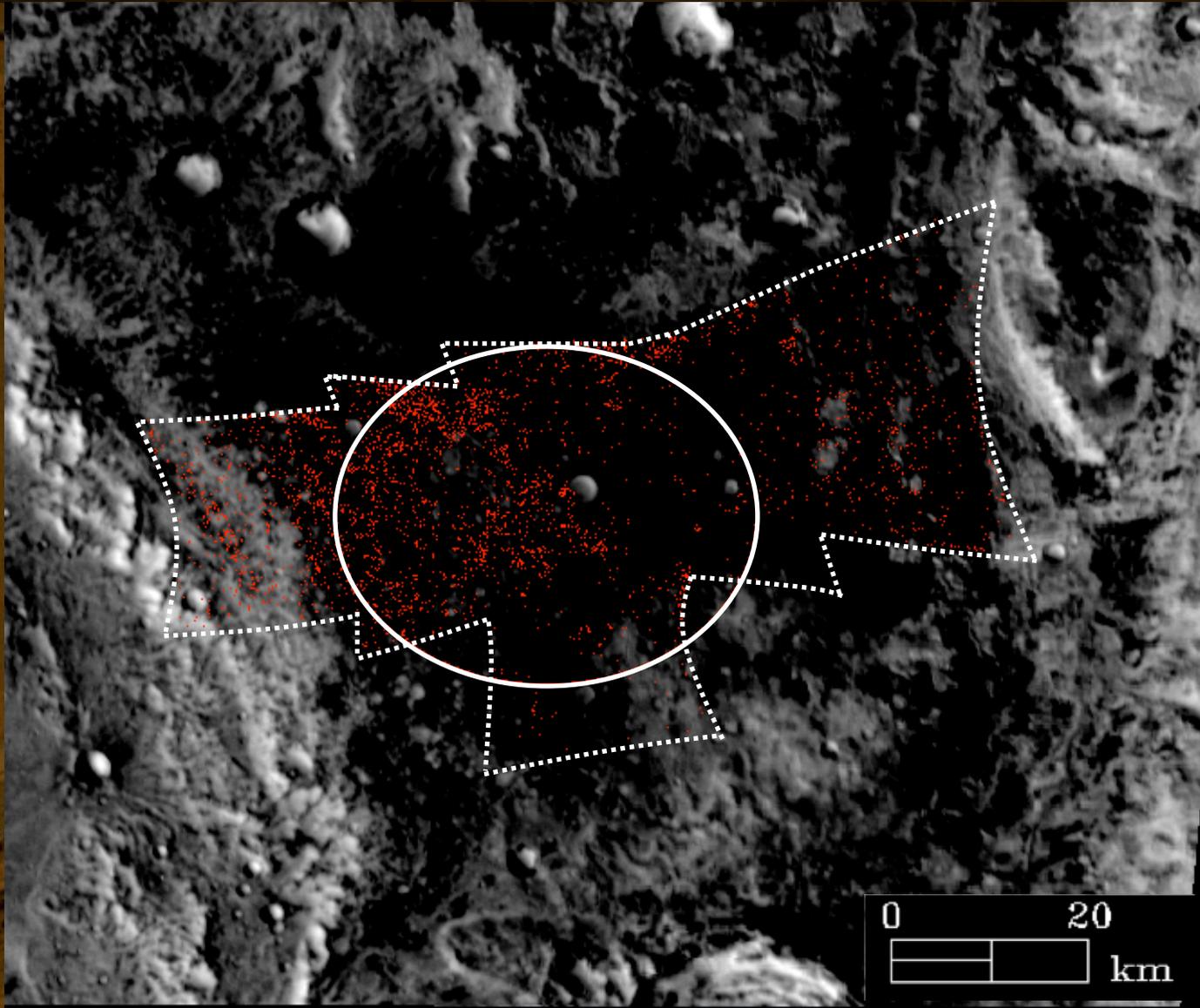
# CRISM-identified Al-clay



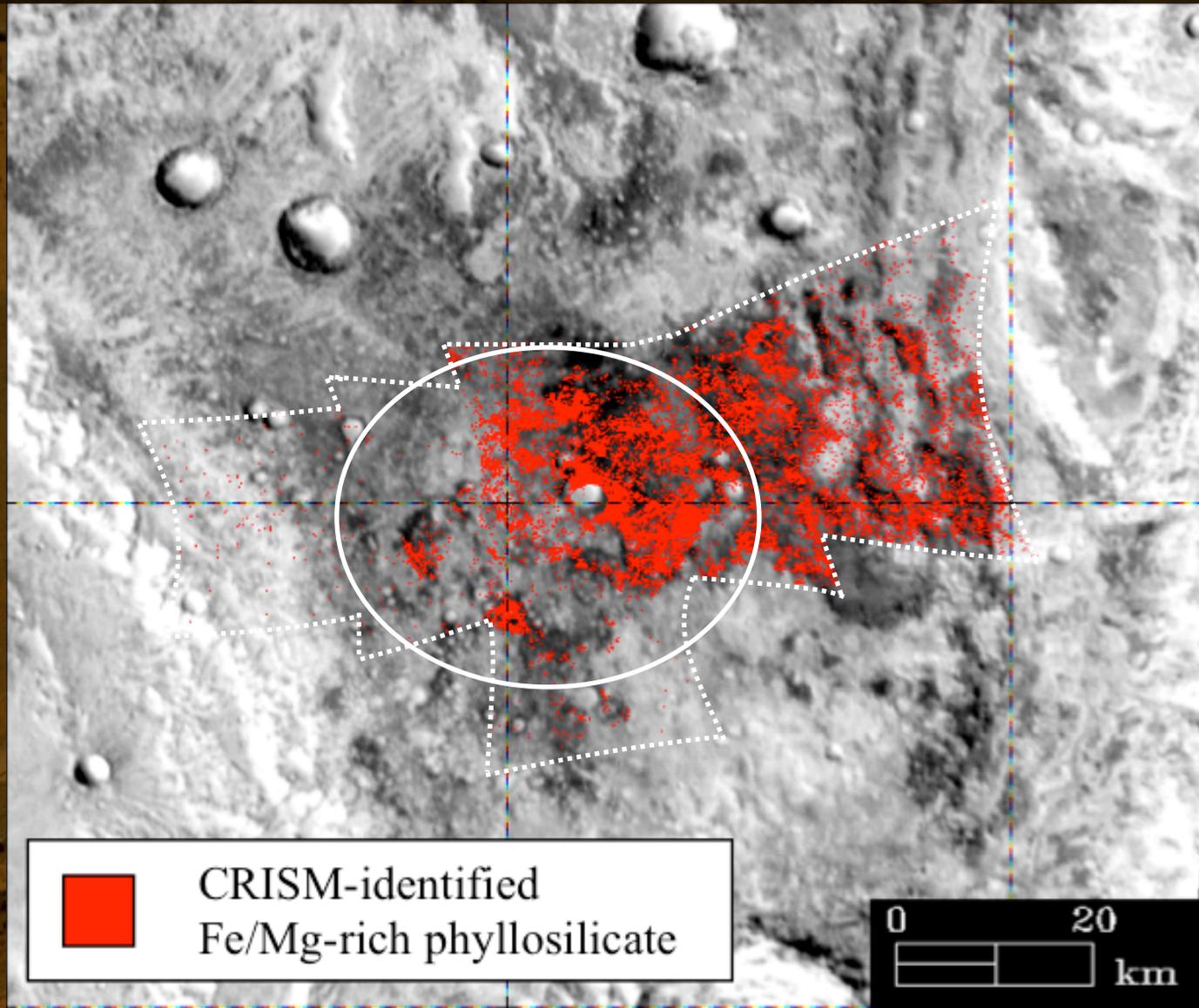
# THEMIS unmixed Al-clay



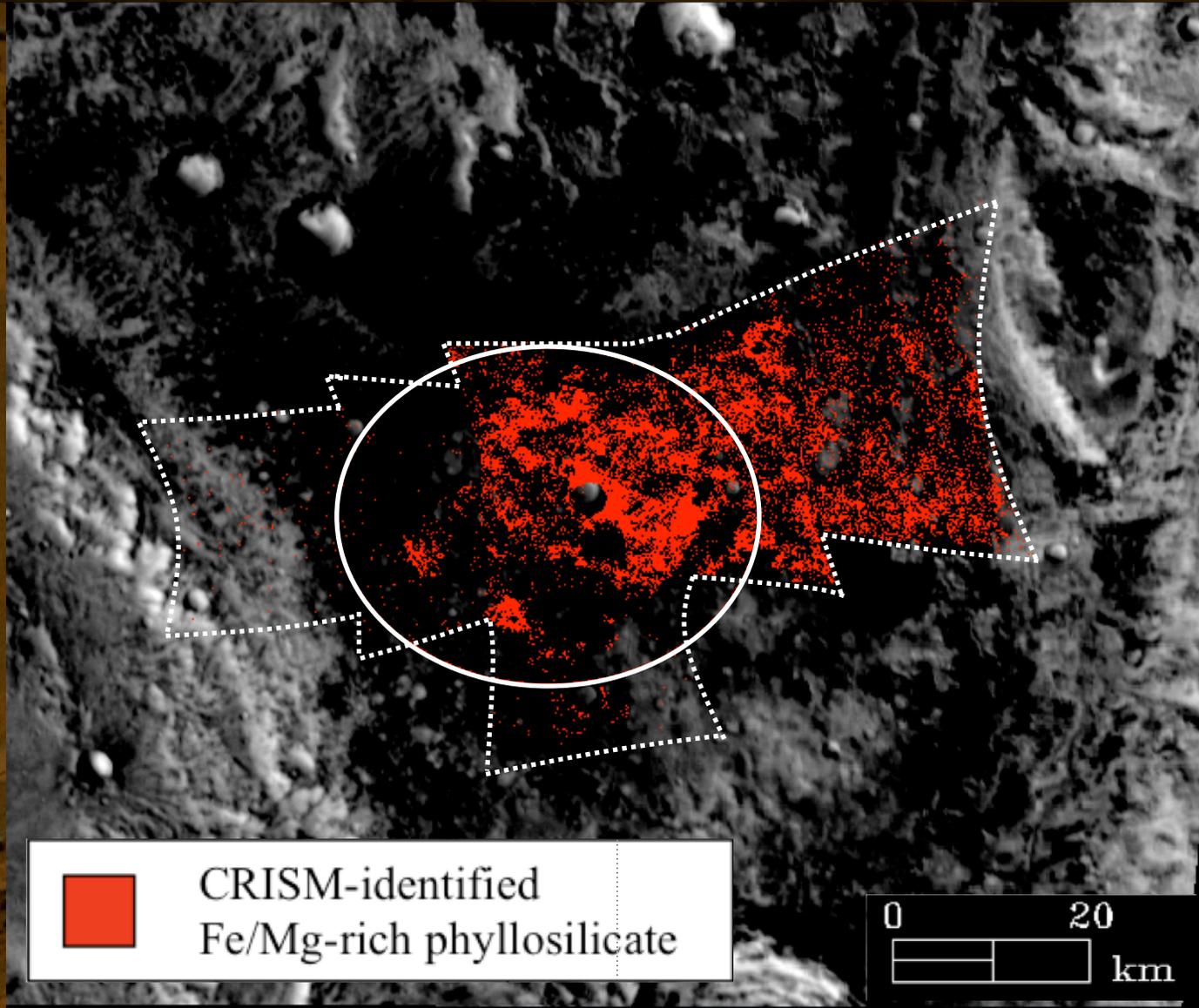
<20%\* Al-clay



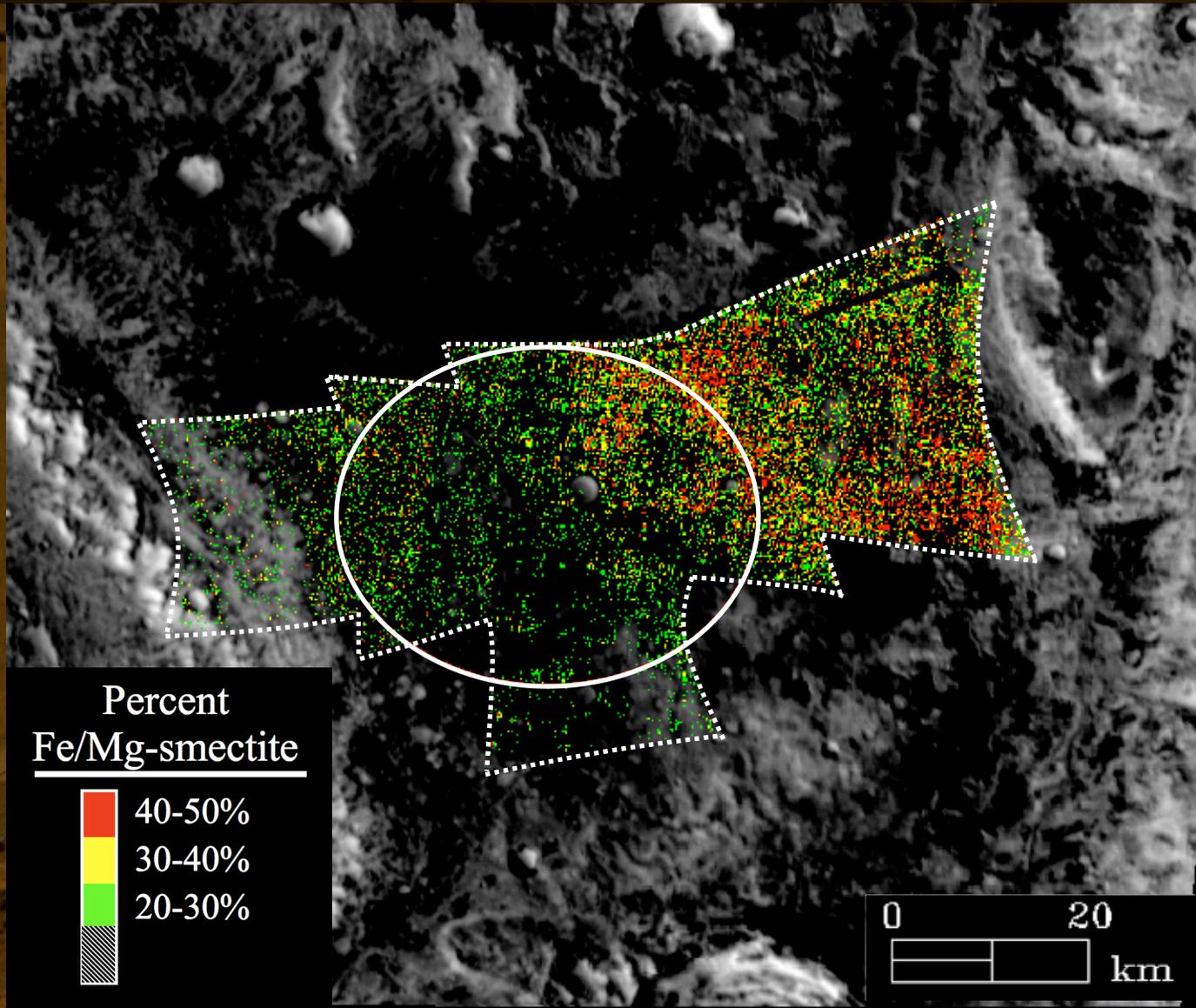
# CRISM-identified Fe/Mg-clay



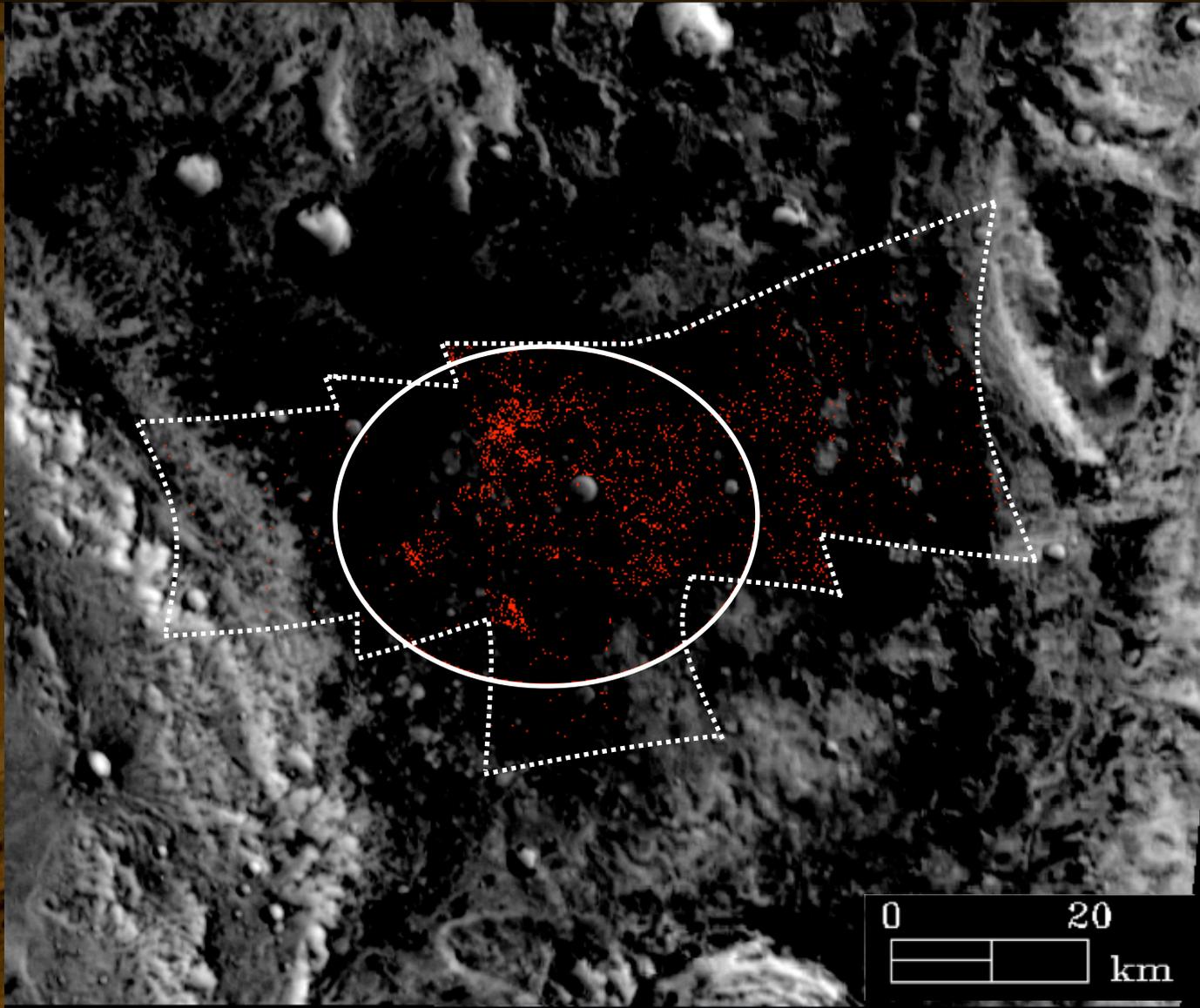
# CRISM-identified Fe/Mg-clay



# THEMIS unmixed Fe/Mg-clay



$<20\%^*$  Fe/Mg-clay



# Summary

- Checkerboard mixing provides a likely explanation for clay abundance discrepancies between OMEGA/CRISM and TES ⇒ THEMIS appears to resolve this
- Al-rich phyllosilicate is widely distributed throughout the ellipse, but mostly in low abundances
- Areas of high abundance Fe/Mg-phyllosilicate are concentrated in the northeastern portion of the landing ellipse
- THEMIS phyllosilicate abundance maps can provide strategic input for traverse planning at Mawrth Vallis