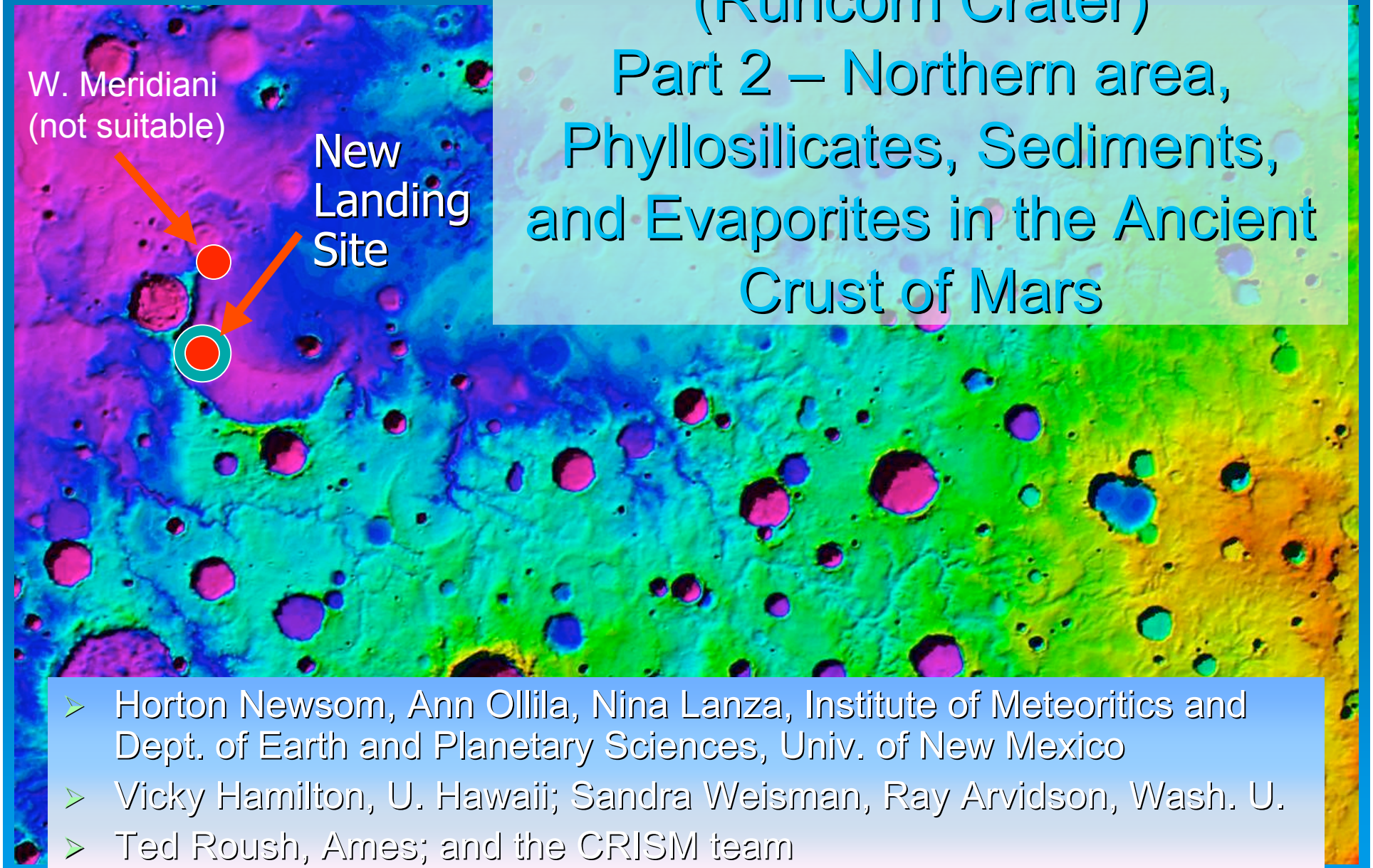
Southwest Meridiani Planum (Runcorn Crater) Part 2 – Northern area, Phyllosilicates, Sediments, and Evaporites in the Ancient Crust of Mars

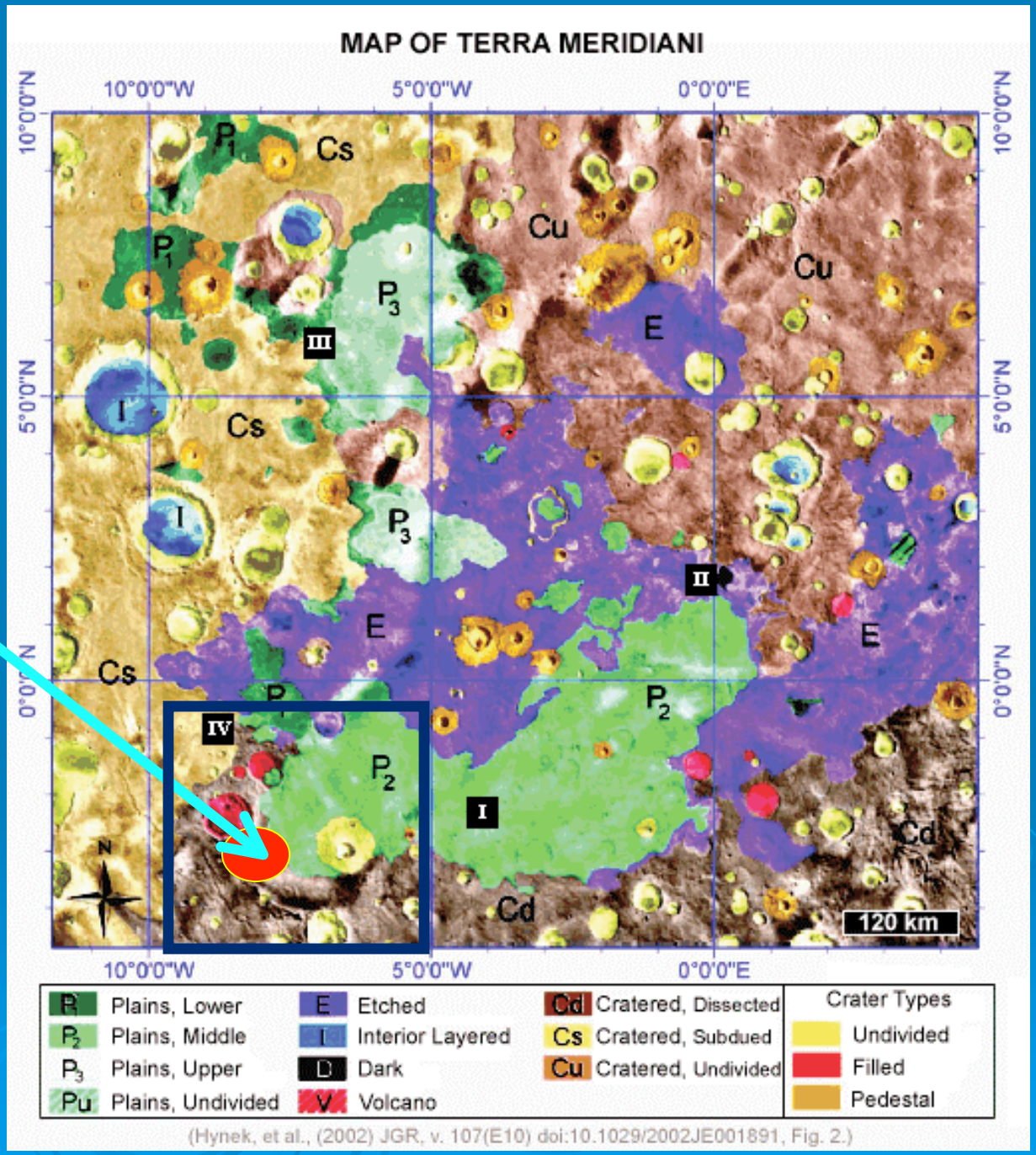


- Horton Newsom, Ann Ollila, Nina Lanza, Institute of Meteoritics and Dept. of Earth and Planetary Sciences, Univ. of New Mexico
- Vicky Hamilton, U. Hawaii; Sandra Weisman, Ray Arvidson, Wash. U.
- Ted Roush, Ames; and the CRISM team

Geologic terrains

(Hynek et al., 2002)

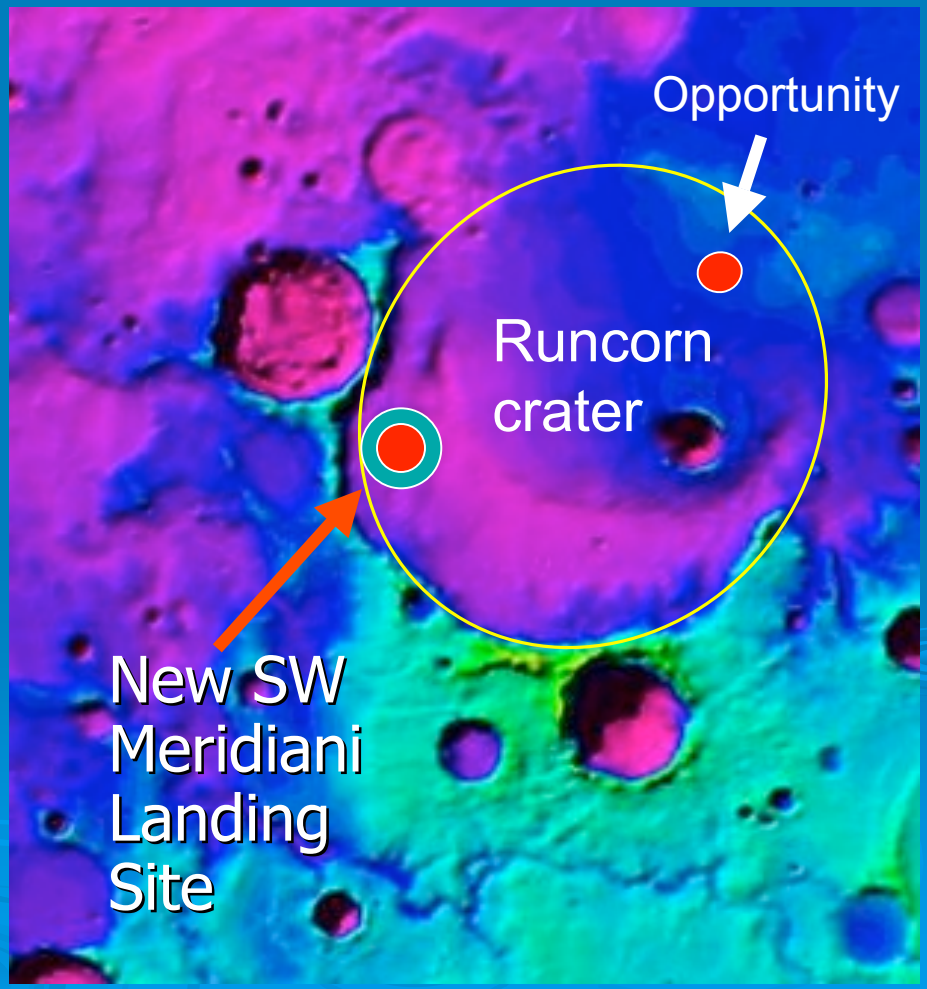
- Landing site located in cratered, dissected terrain (Cd), South West of hematite bearing plains (P2)



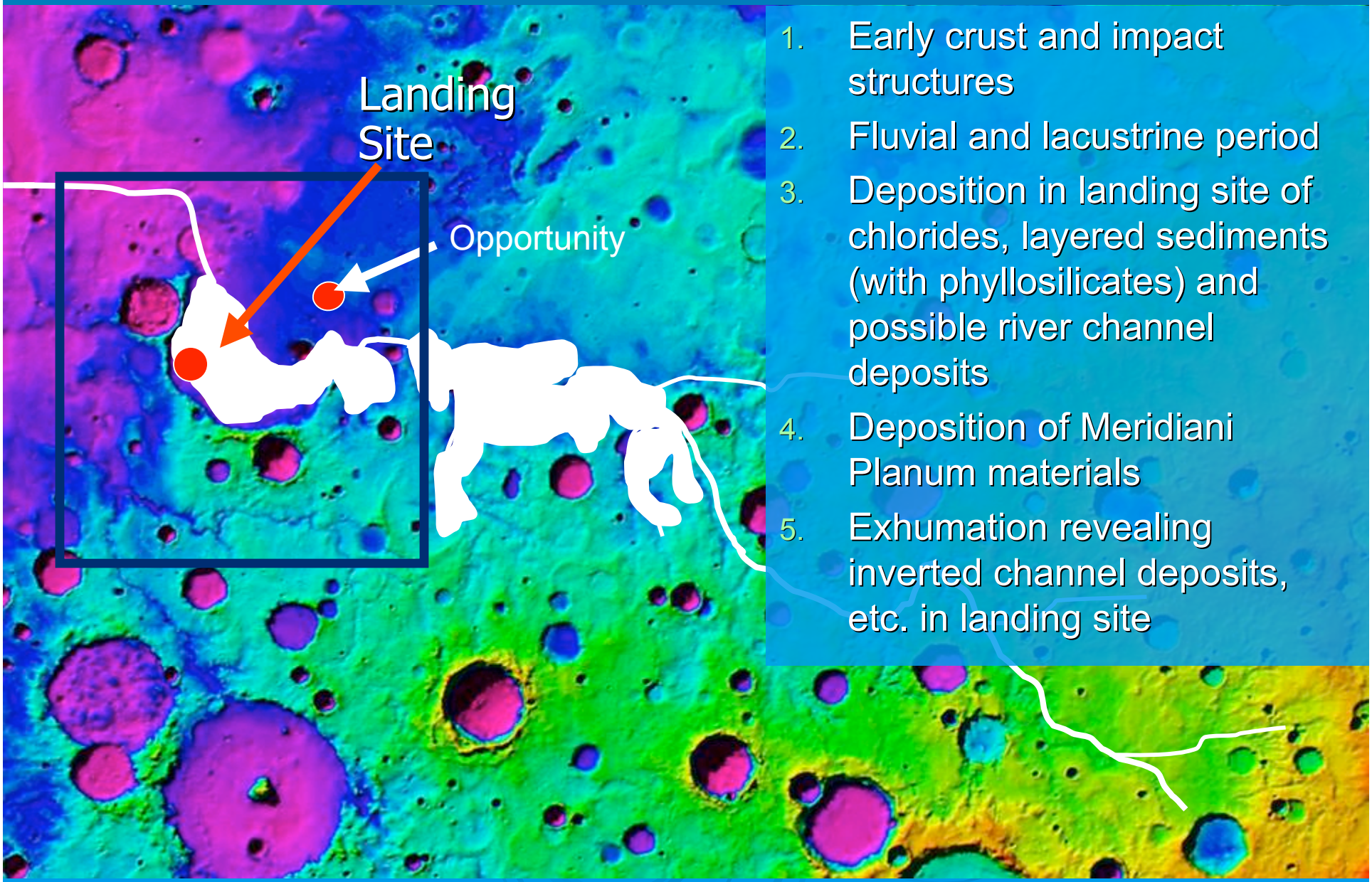
(Hynek, et al., (2002) JGR, v. 107(E10) doi:10.1029/2002JE001891, Fig. 2.)

Locations in Runcorn Crater (proposed name)

- New site in SW Meridiani
- Phyllosilicates, sedimentary geology, chloride-bearing deposits (halite?)
- Area history previously examined in detail by Newsom et al., (2001)



Regional geological history

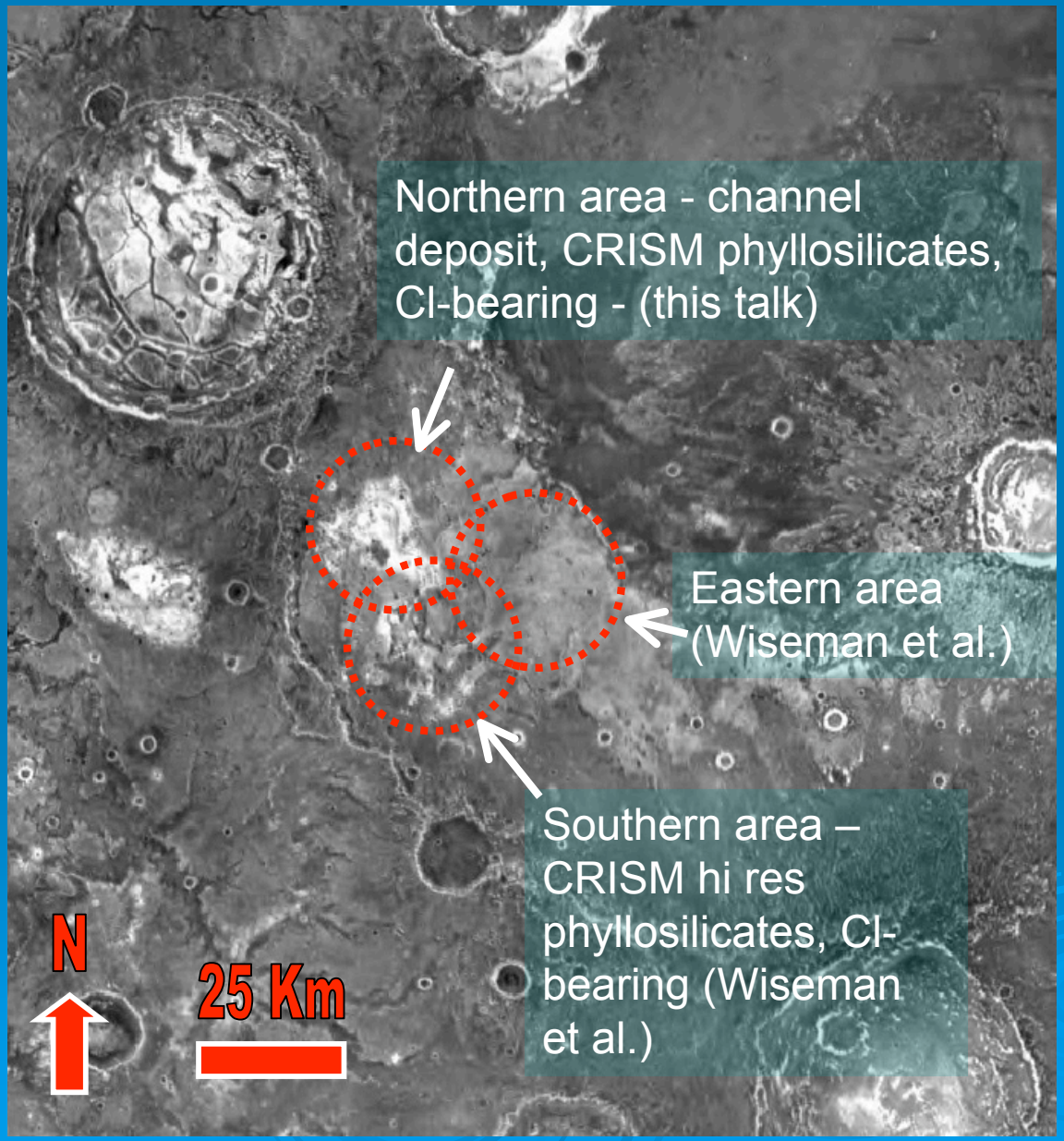


1. Early crust and impact structures
2. Fluvial and lacustrine period
3. Deposition in landing site of chlorides, layered sediments (with phyllosilicates) and possible river channel deposits
4. Deposition of Meridiani Planum materials
5. Exhumation revealing inverted channel deposits, etc. in landing site

Runcorn crater (SW Meridiani) new sites

Higher TI

Lower TI



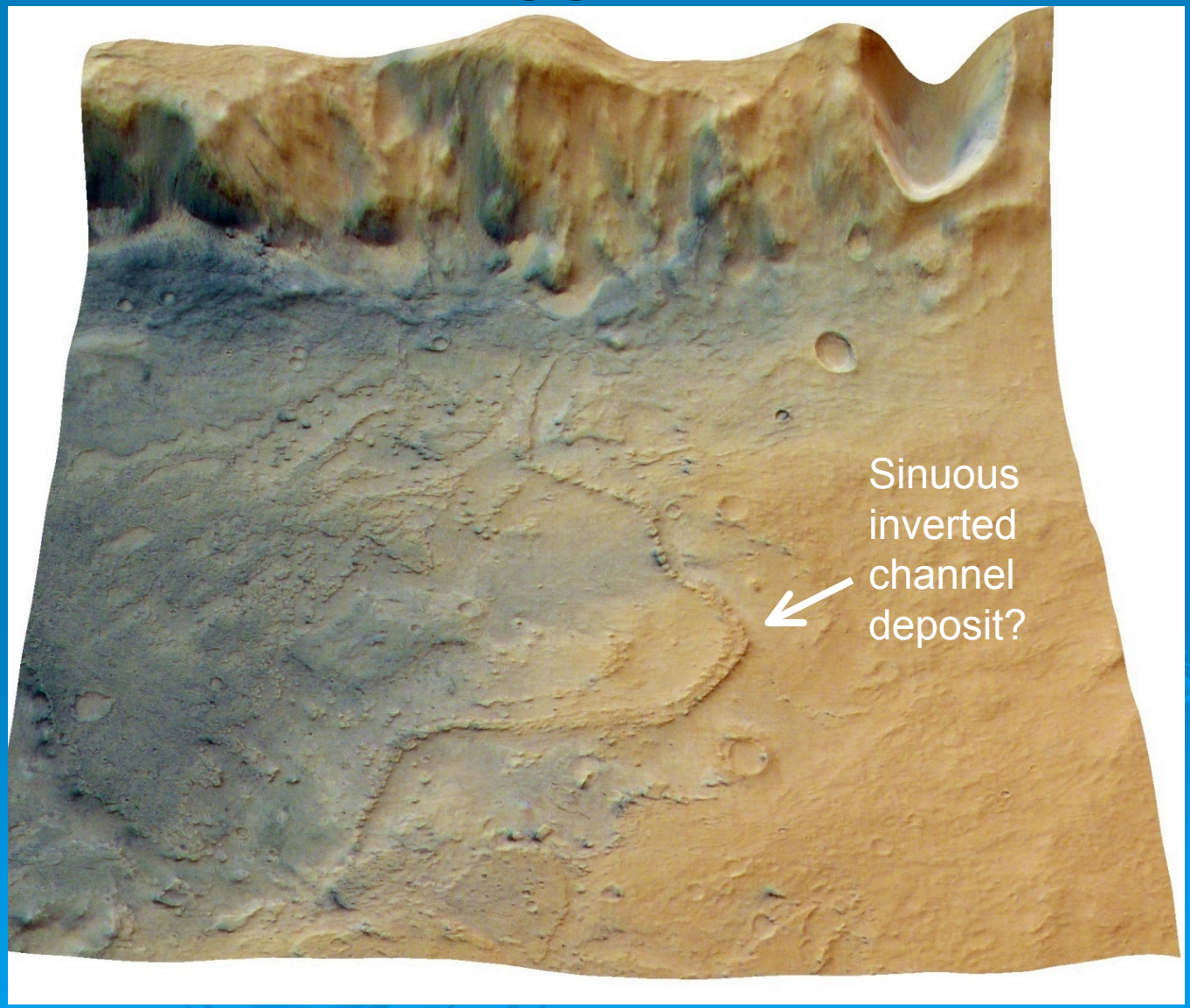
Night THEMIS IR

—

Proxy for Thermal Inertia (TI)

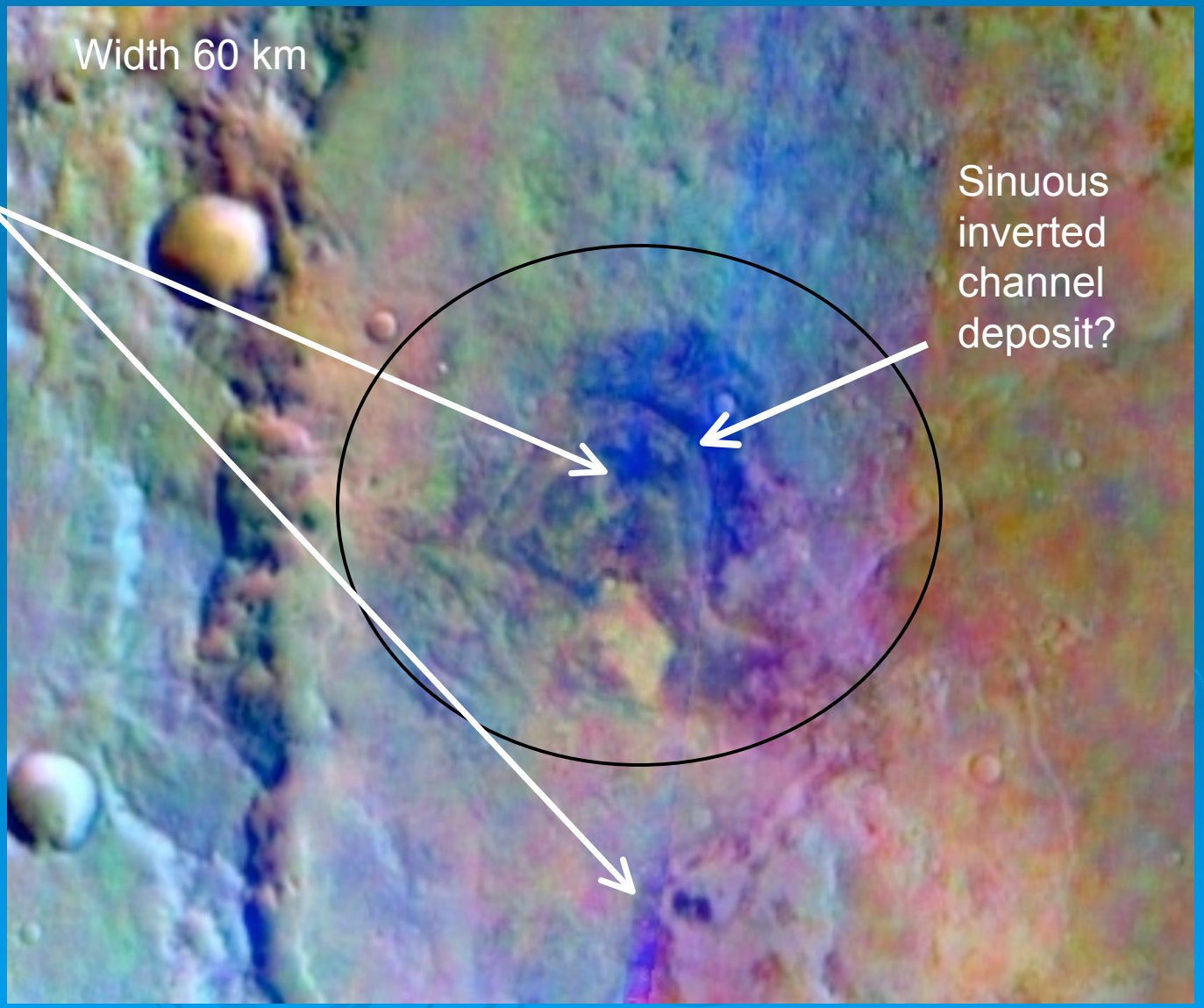
HRSC perspective view looking West, 8X vertical exaggeration

- Flat area with complex geology
- Floor of 150 km diam. crater
- Inverted channel deposits?



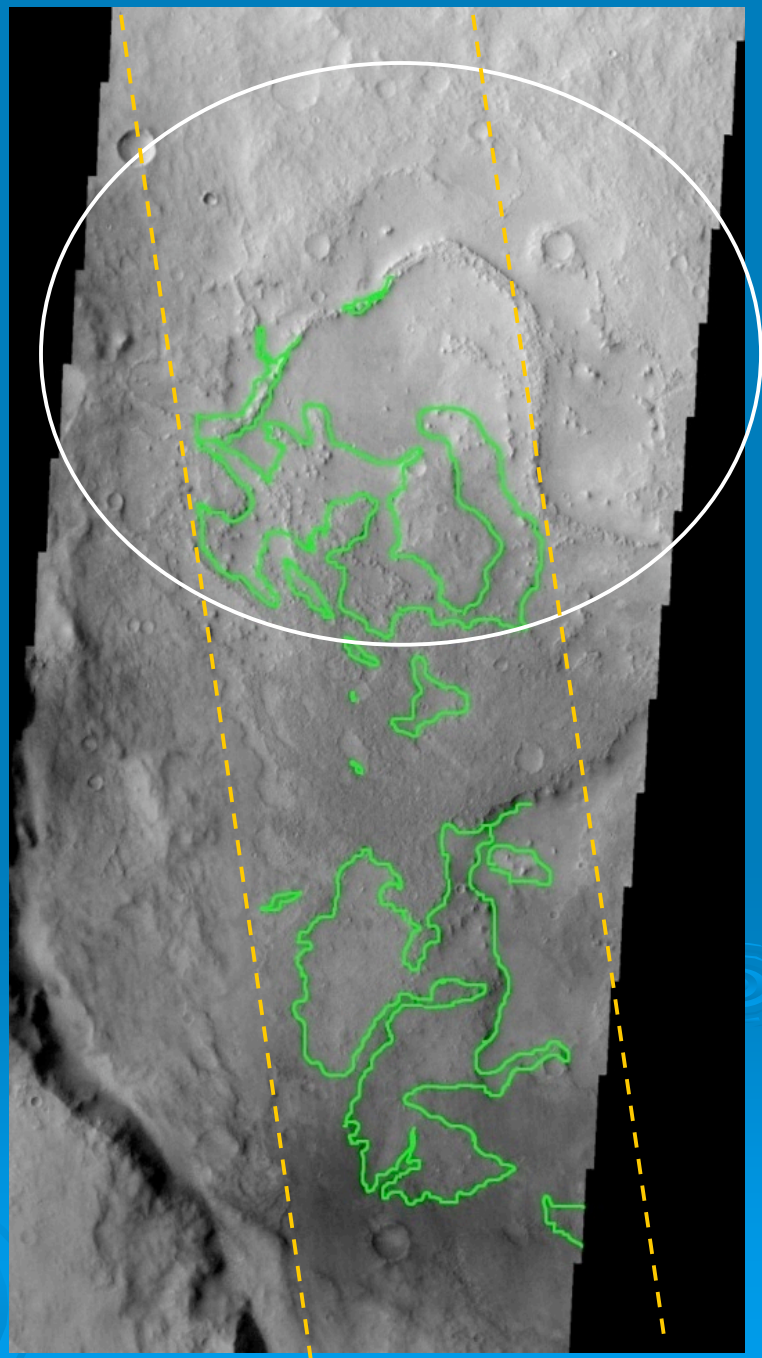
Runcorn crater (SW Meridiani)
THEMIS decorrelation stretch (V. Hamilton)

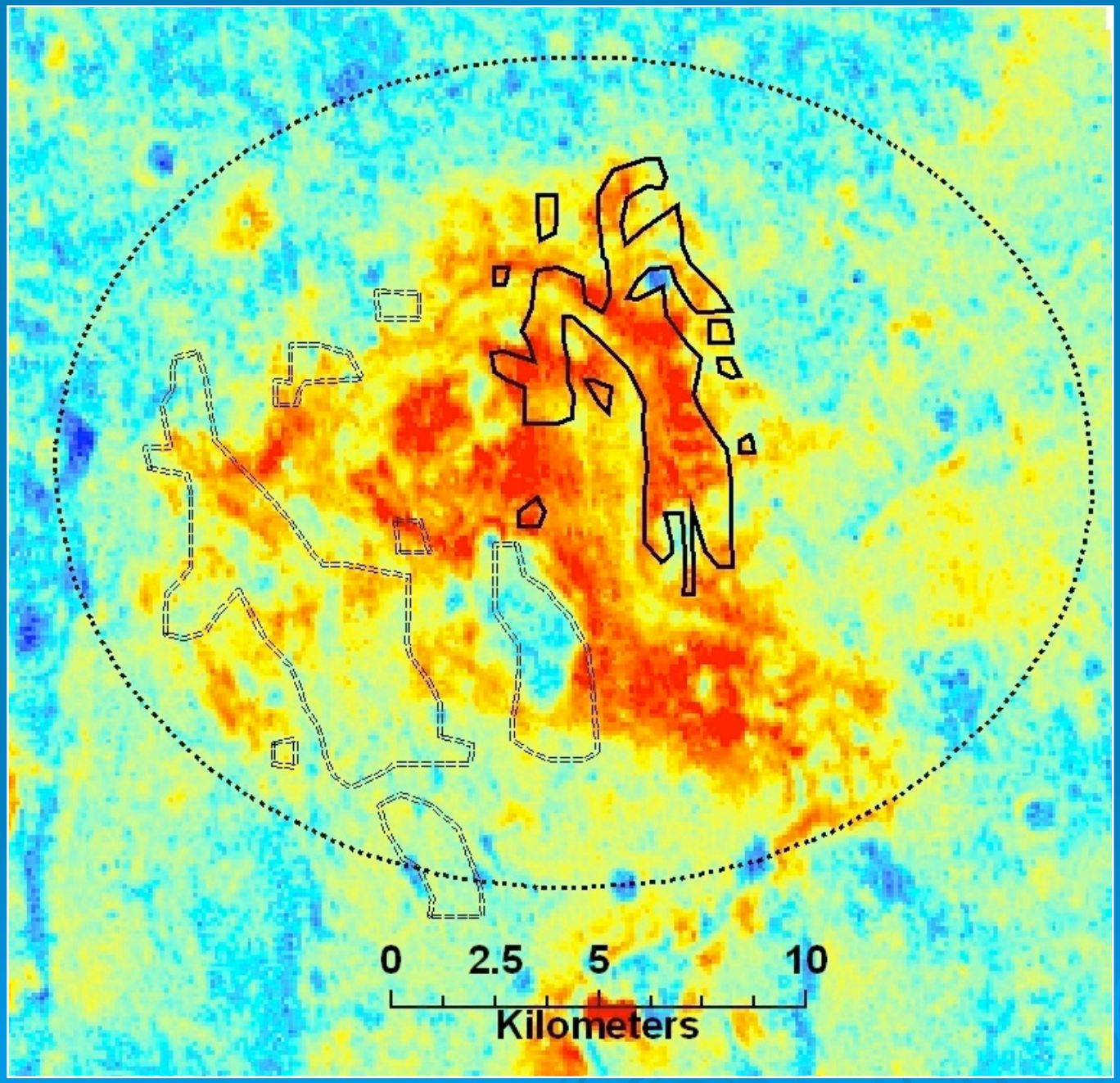
- Evidence for chloride deposits, possibly halite (blue area) *Osterloo et al.*, submitted
- These materials are relatively bright-toned, meters thick and polygonal fracturing in some locations



Phyllosilicate locations - Low res. CRISM data (Sandra Wiseman)

- D2300 signature of Mg/Fe phyllosilicates is outlined by green





THEMIS night IR

I13063003

195 K

159 K

Chloride-bearing Phyllosilicates

Runcorn crater (SW Meridiani) - geomorphology

- Exhumed crater floor deposits
- Inverted channel deposits
- Bedrock materials?

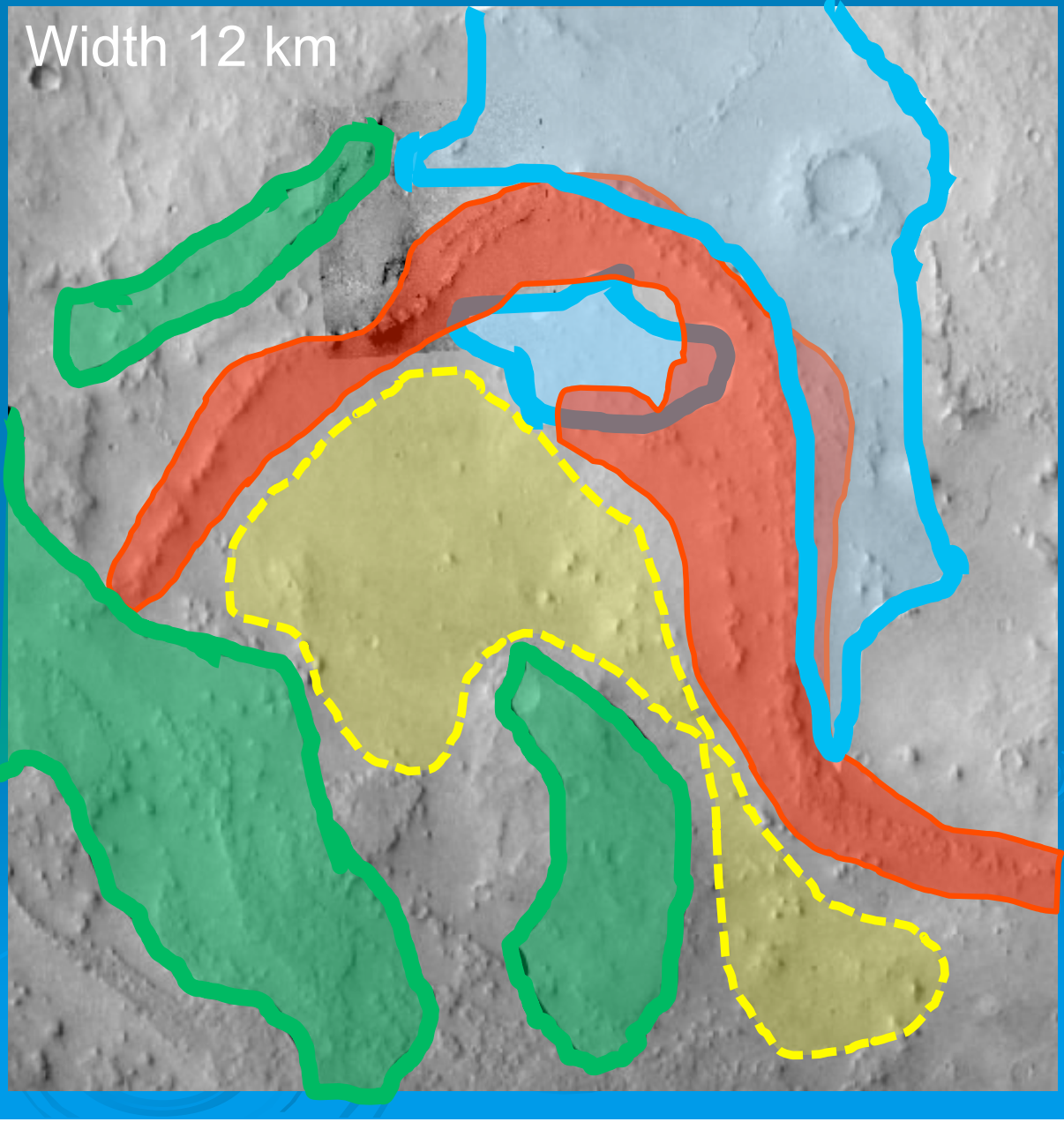
Multiple geological units in center of site

Channel deposits and sedimentary layers?

Phyllosilicate-bearing

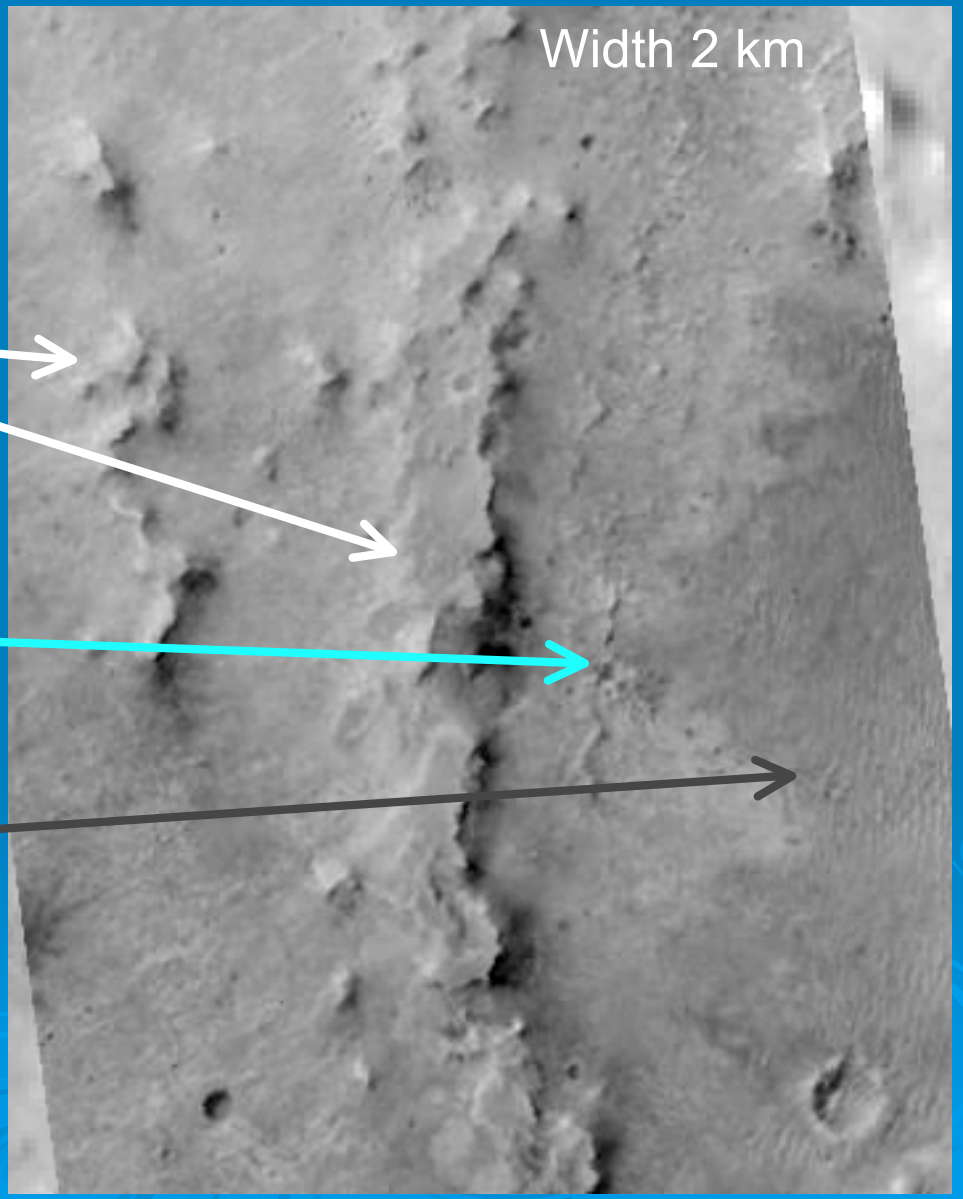
Chloride bearing with high thermal inertia

Other high thermal inertia deposits



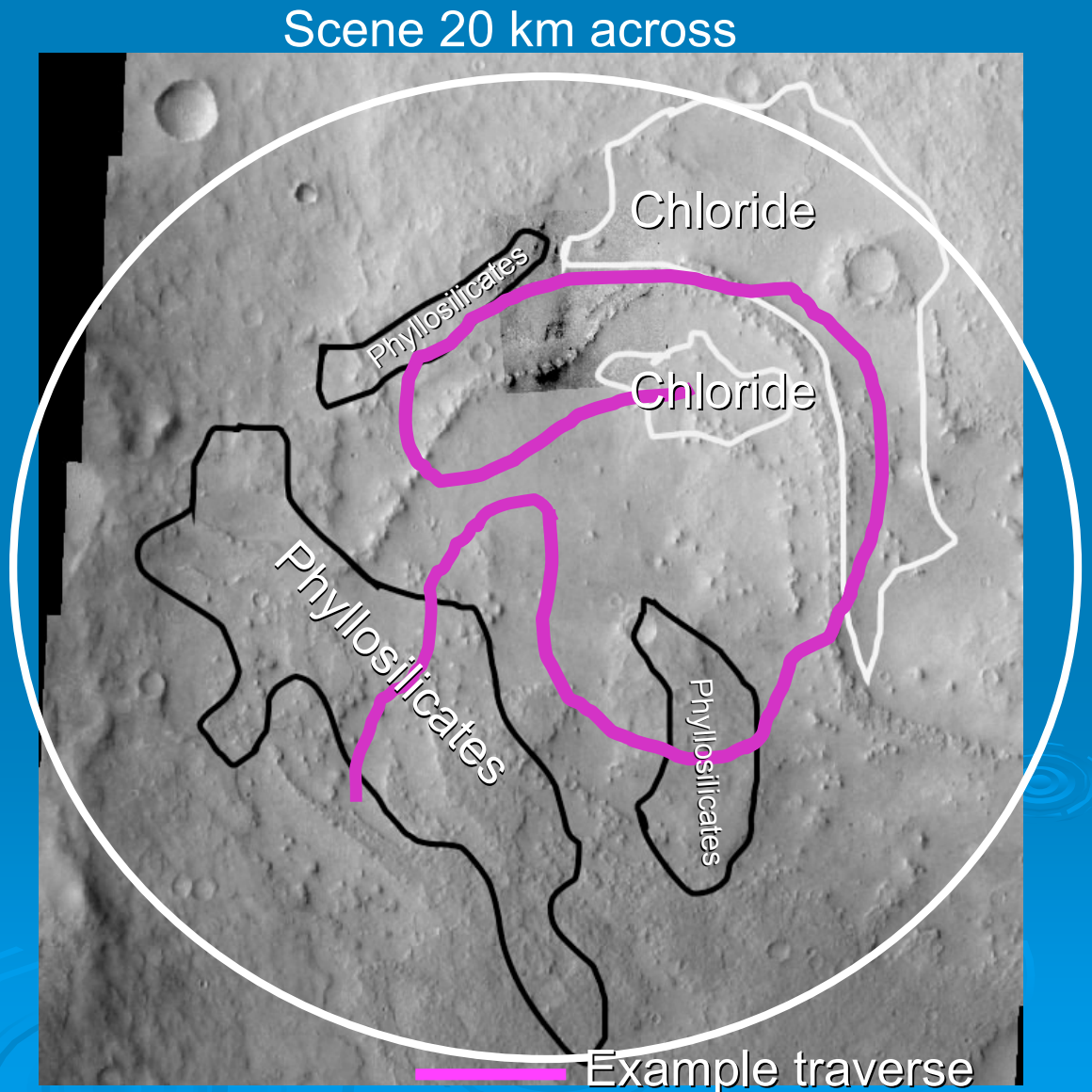
MOC close up of channel deposits

- Inverted channel deposits
- Chloride-bearing (layered)
- Aeolian dunes



Landing site traverse

- Not a go-to site!
- From any location all types of material can be accessed in a 10 km traverse
- Extended mission opportunities include
  - Contact with hematite deposits to east
  - Crater wall to west
  - More Cl-bearing deposits and phyllosilicates to south



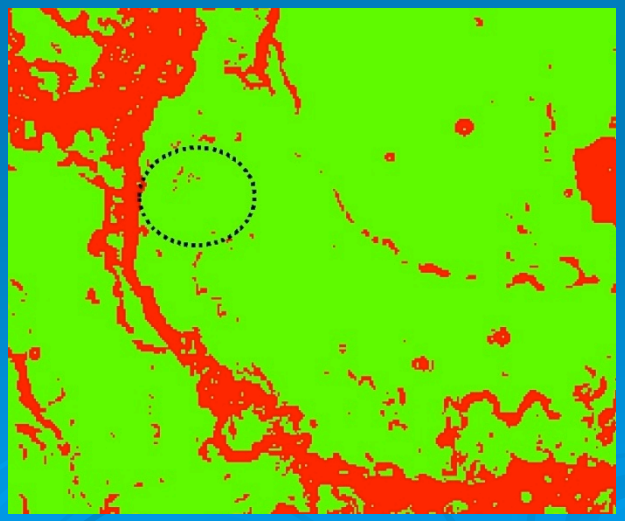
Engineering constraints

- Ellipse location can be adjusted if needed
- Green parameters: albedo, thermal inertia, elevation, latitude
- Only a few small areas at 920 m length scale potentially violate slope criteria, but this is a low elevation site
- Unknown: rock abundance, 2-5 m scale relief (but very low elevation site)

Slopes at length scale 460m

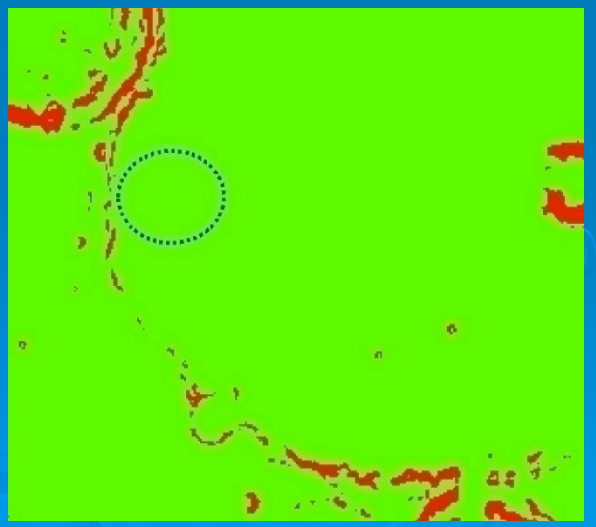
< 5.3 □ > 5.3 □

Slopes at length scale 920m



< 2.7 □ > 2.7 □

Slopes at length scale 1380m



< 10.9 □ > 10.9 □

New SW Meridiani site - Conclusions

- Ability to characterize the geological setting
  - Phyllosilicates (Low resolution CRISM), chloride-bearing deposits (THEMIS), sedimentary rocks (channel deposits?)
  - Noachian – ancient cratered crust, buried and later exhumed
- Evidence for habitable environments
  - Fluvial deposits (sedimentary layering), geological setting (low area along extensive channel network)
- Preservation of biosignatures
  - Phyllosilicates, evaporites (halite?), sedimentary deposits
- Ability to asses the biological potential of the site with the MSL payload
  - ChemCam – assess layers for C, H, O etc., SAM - organics
- Engineering – Potential as an Űber-safe haven (-1800 m).
  - Latitude near equator – no thermal issues!