erc e-Mars

Laboratoire de Géologie de Lyon
Terre Planètes Environnement

UNIVERSITÉ DE LYON

M2020

The Second Landing Site Workshop

From primitive Martian crust to Hesparian sulfate-rich sediments in Coprates Chasma, Valles Marineris

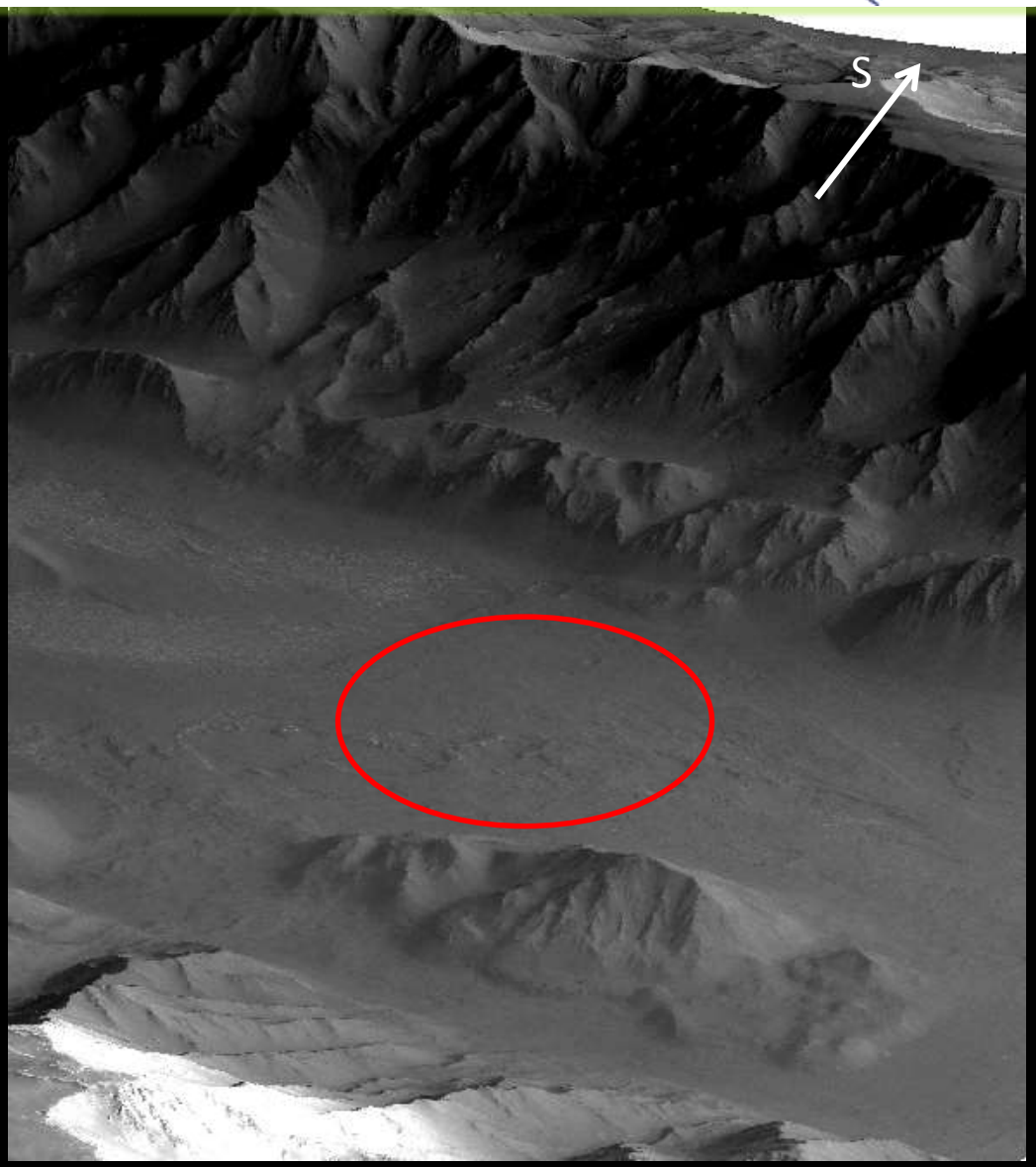
C. Quantin-Nataf, B. Bultel, J. Carter, J. Flahaut, A. Ody, D. Loizeau, L. Lozac'h, P. Thollot, M. Andreani

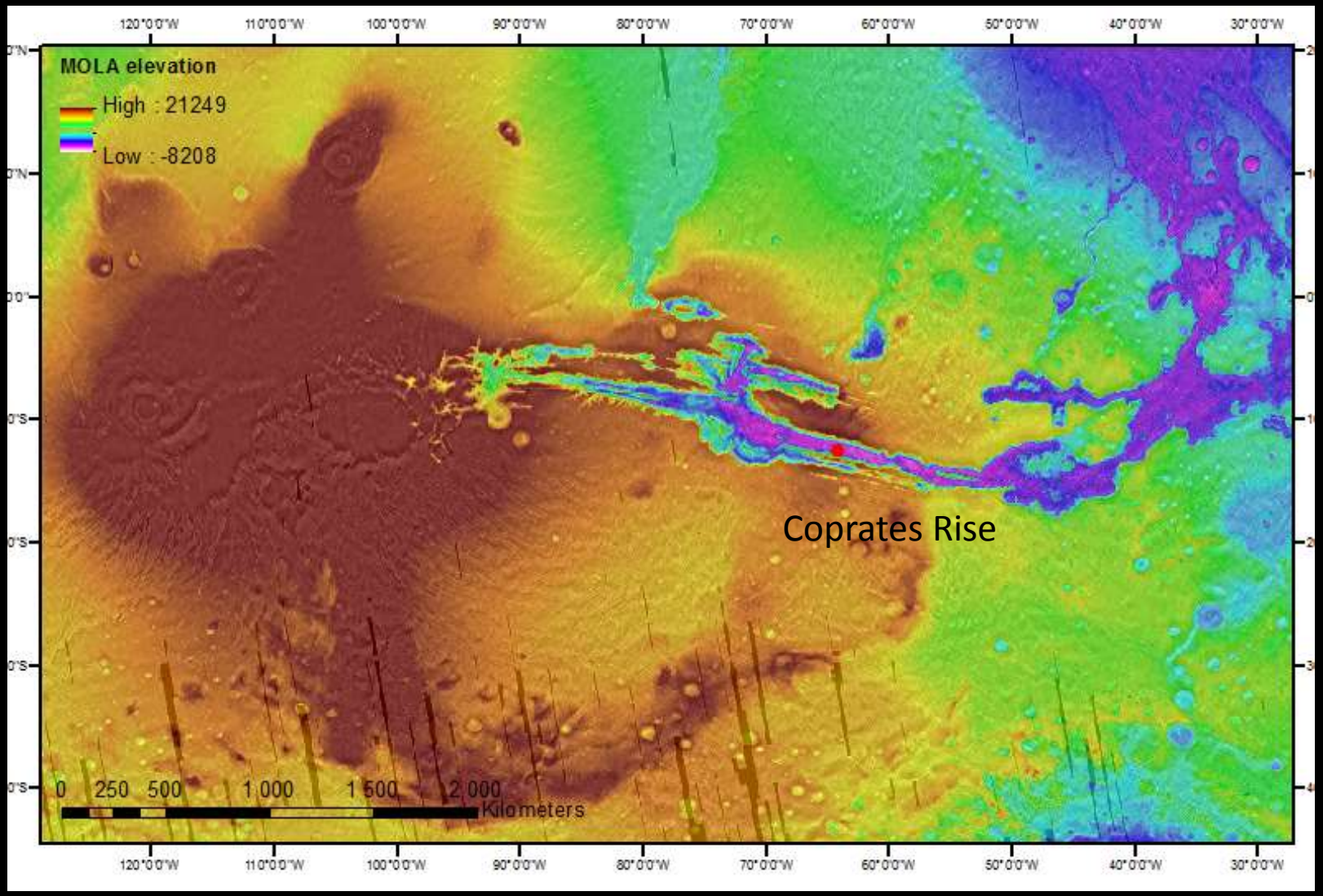
NOTE ADDED BY JPL WEBMASTER: This content has not been approved or adopted by, NASA, JPL, or the California Institute of Technology. This document is being made available for information purposes only, and any views and opinions expressed herein do not necessarily state or reflect those of NASA, JPL, or the California Institute of Technology.

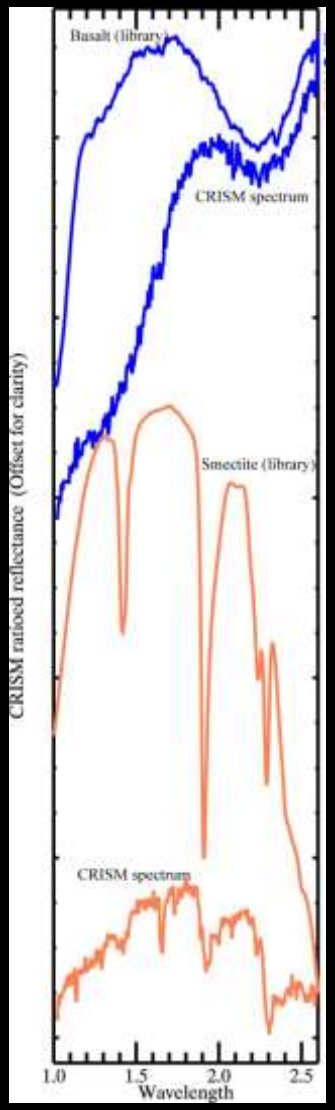
1) Why Coprates Chasma is a key location ?

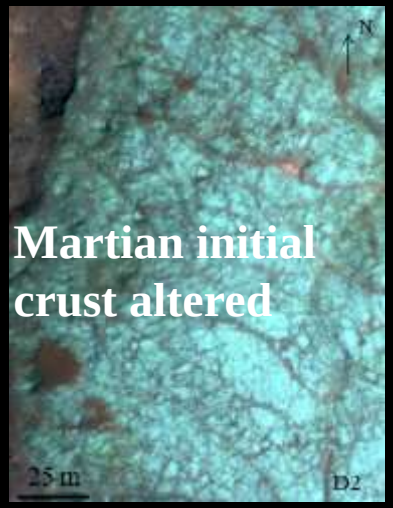
2) Regions of interest inside and around the landing ellipse

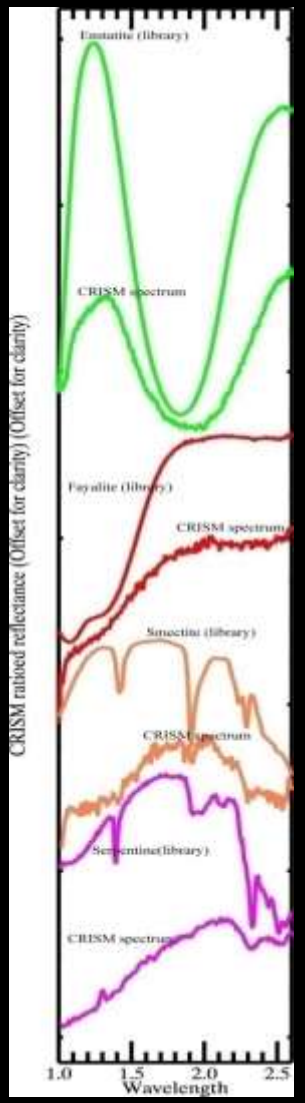
3) Quick survey of the Engineering contrains of the landing site



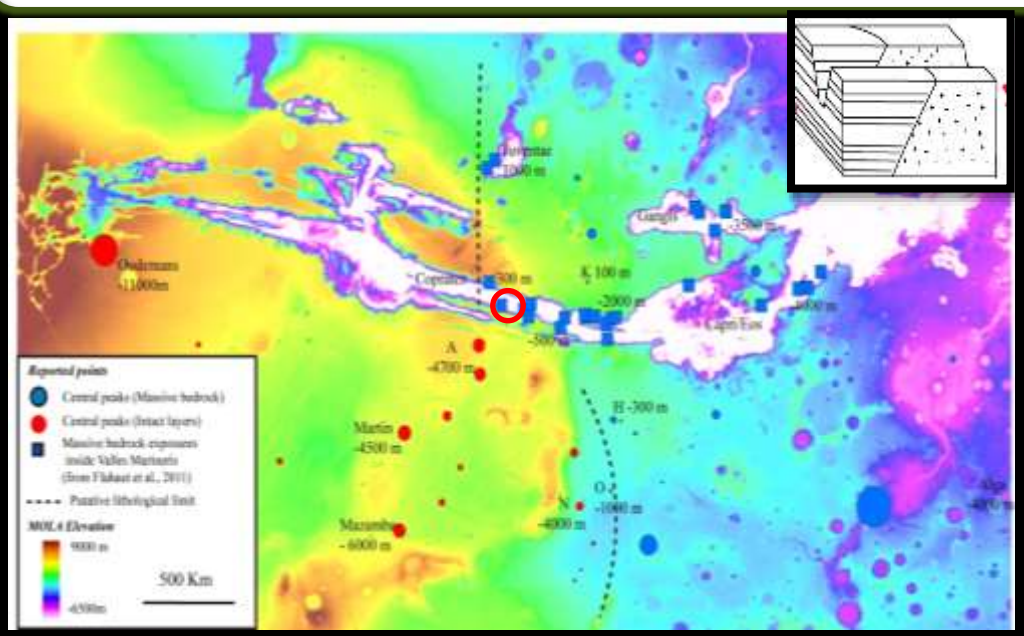

MOLA elevation
High : 21249
Low : -8208
Coprates Rise
0 250 500 1 000 1 500 2 000
Kilometers

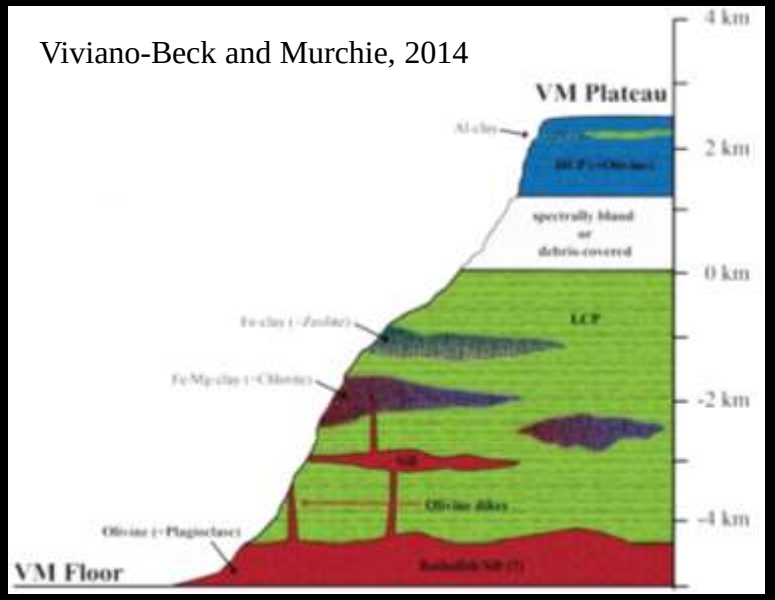


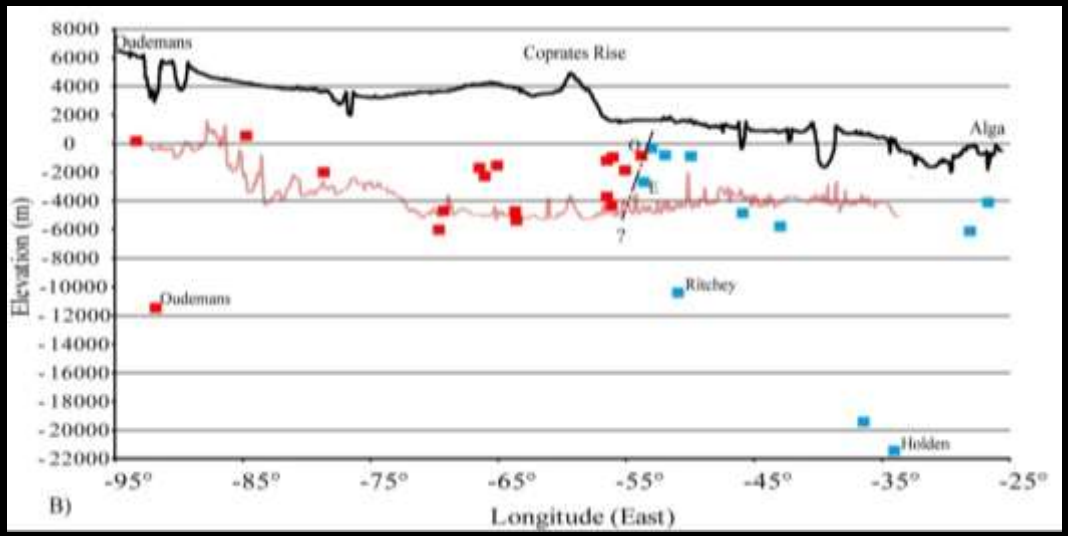




Quantin et al., 2012

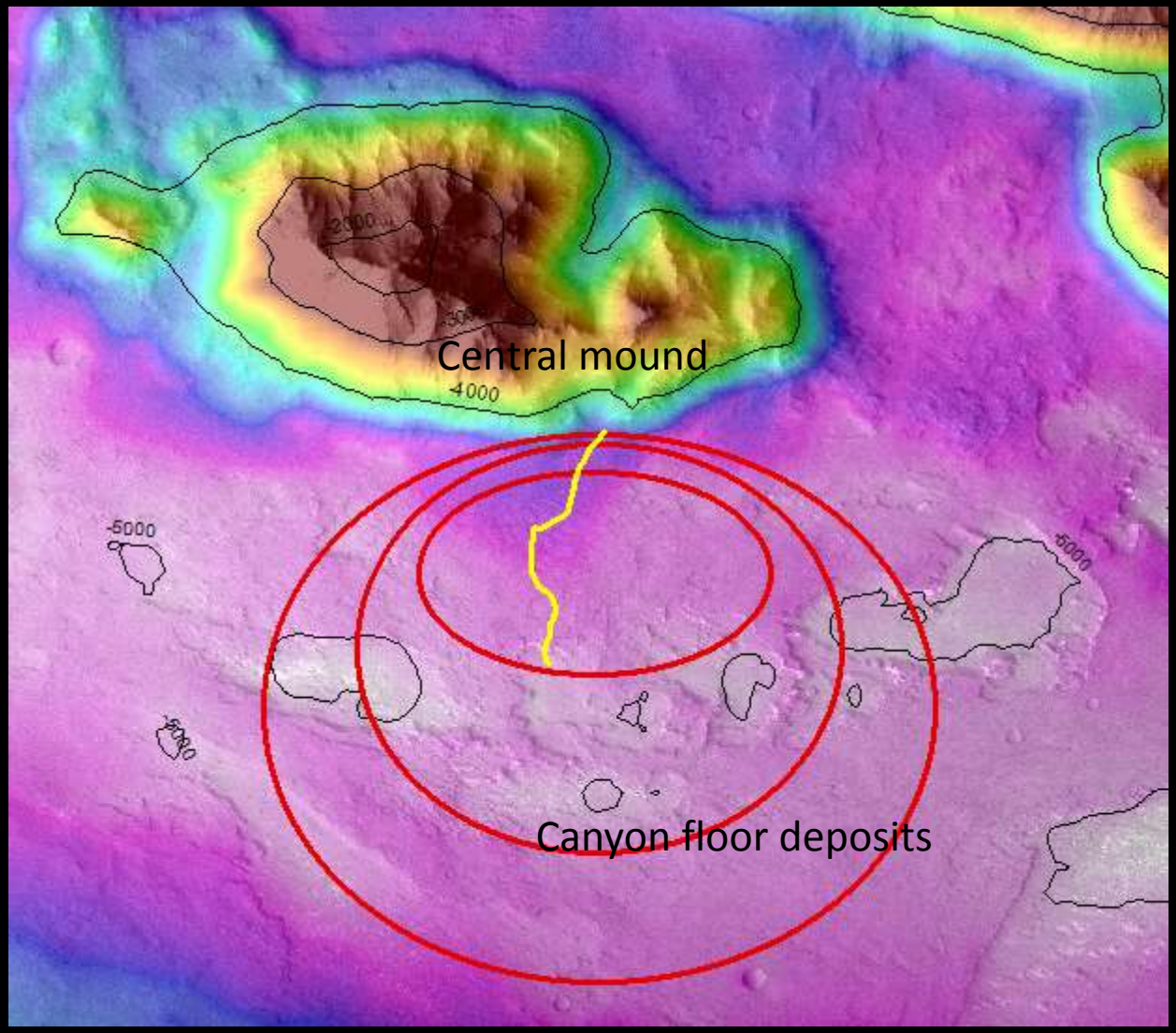






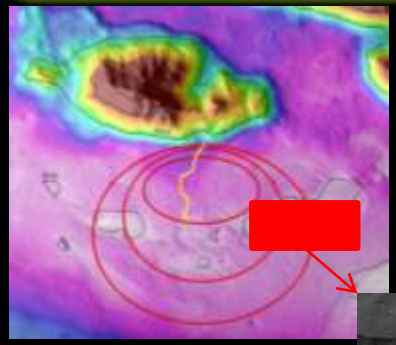
Evidence for hydrothermally altered stratigraphy : Saponite, Chlorite, Zeolite…

Quantin et al., 2012; Flahaut et al., 2012, Murchie et al., 2009 , Viviano-Beck and Murchie, 2014



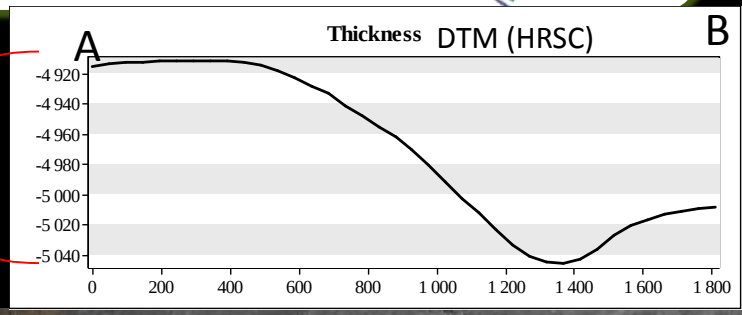
Main Scientific objectives : Land on the canyon floor deposits and go to sample the horst.

Possible route



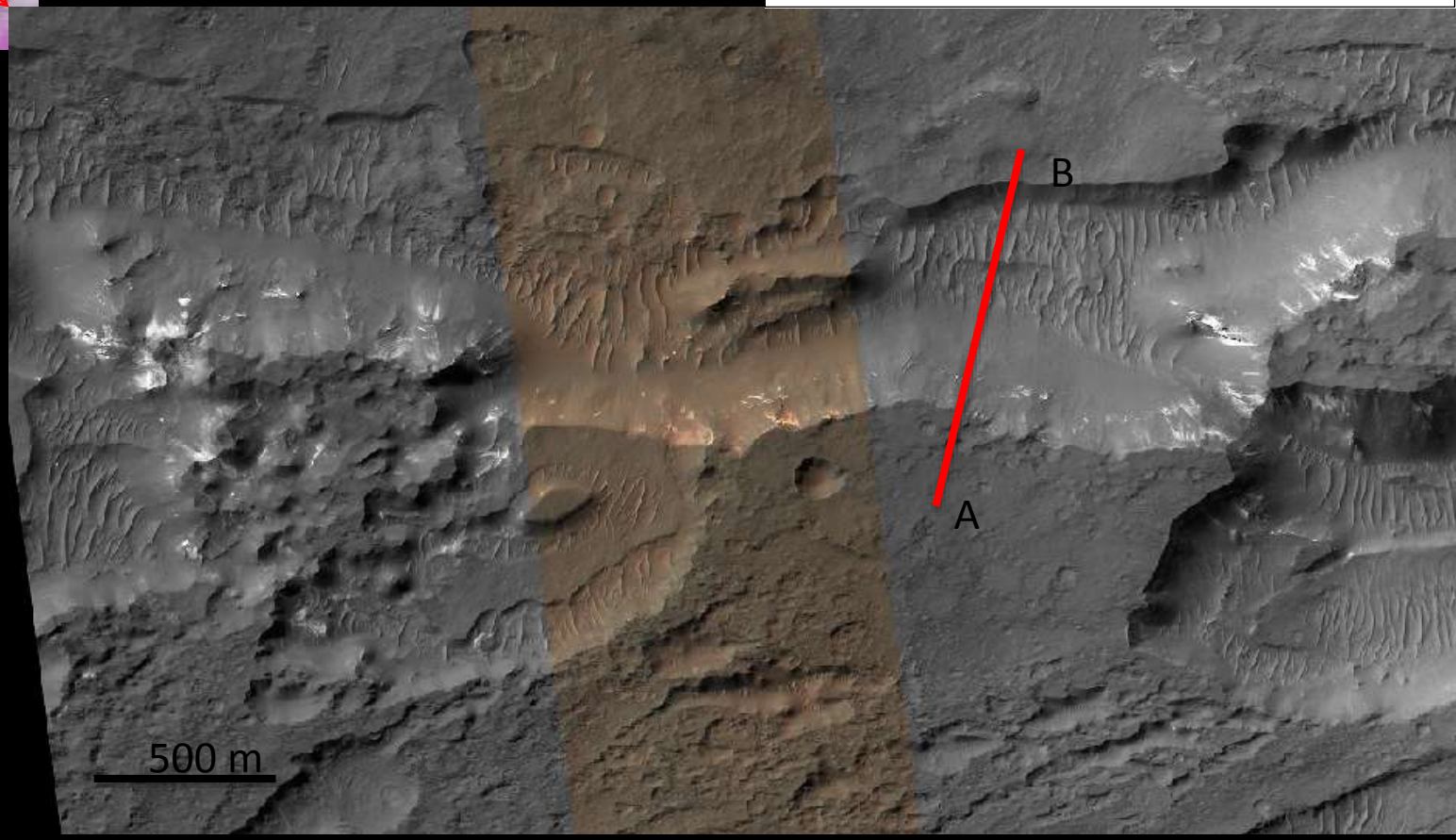
Floor deposits

~100 m

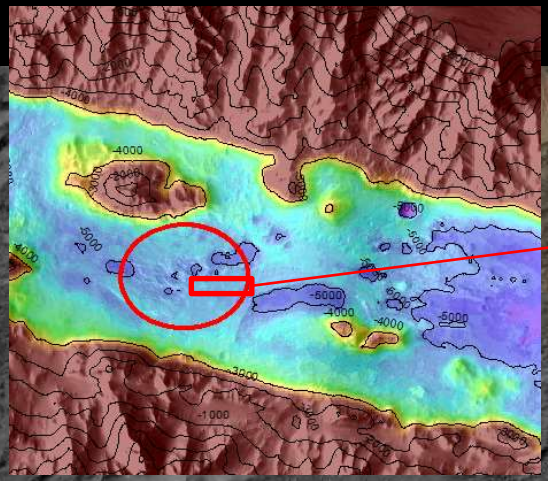


Light toned units exposed on the flanks of the floor deposit

Flat surface,highly impacted and streamlined

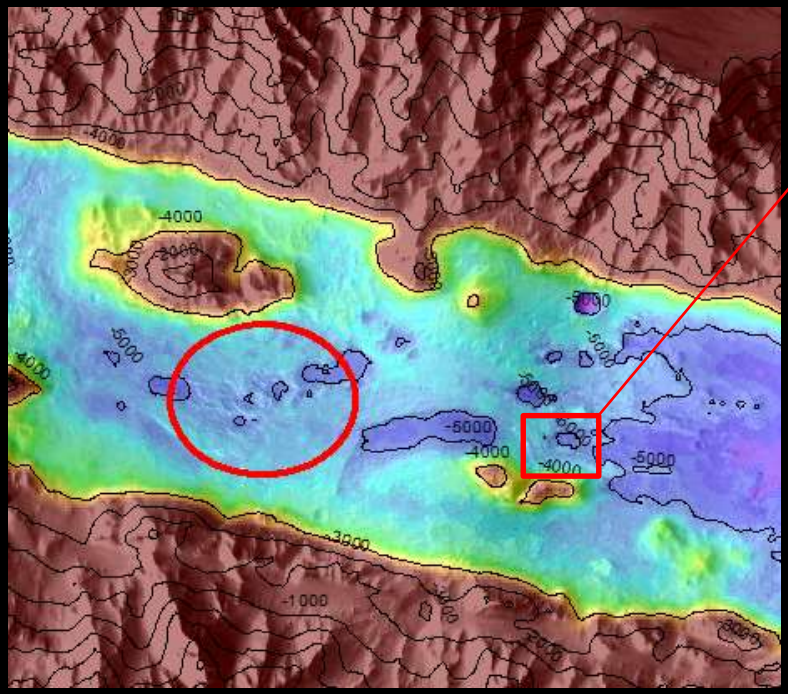


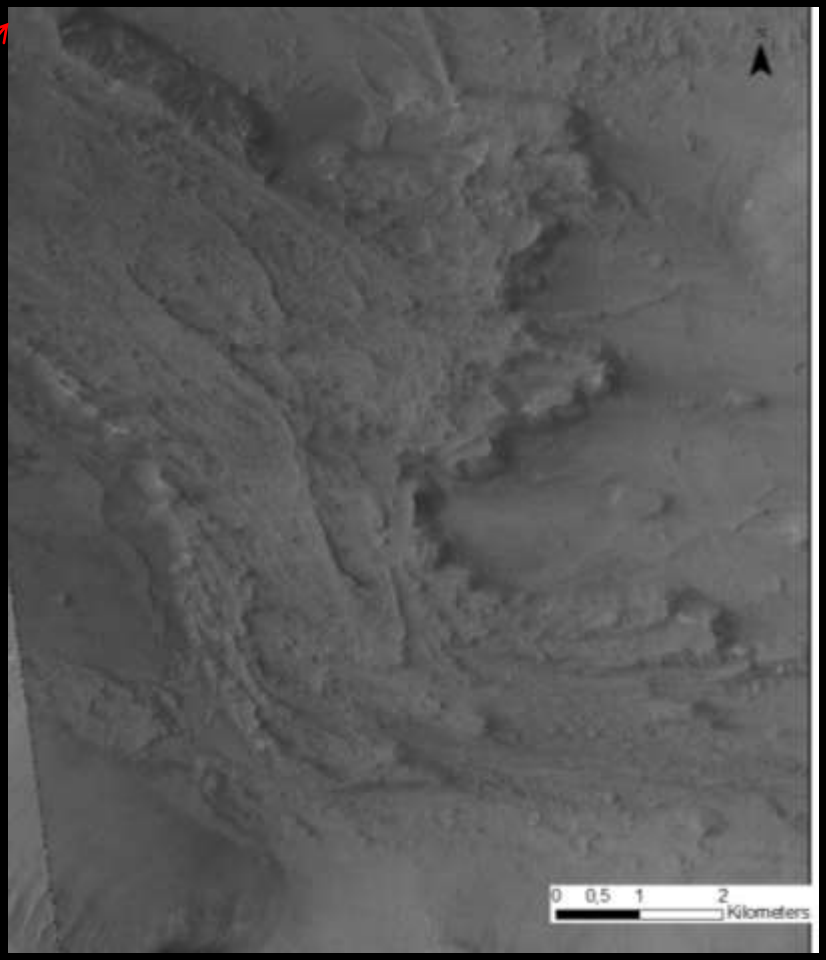
Top of the floor deposits : streamlined, impacted surface



100 m

Top of the floor deposits





Divergent Finger-like terminations

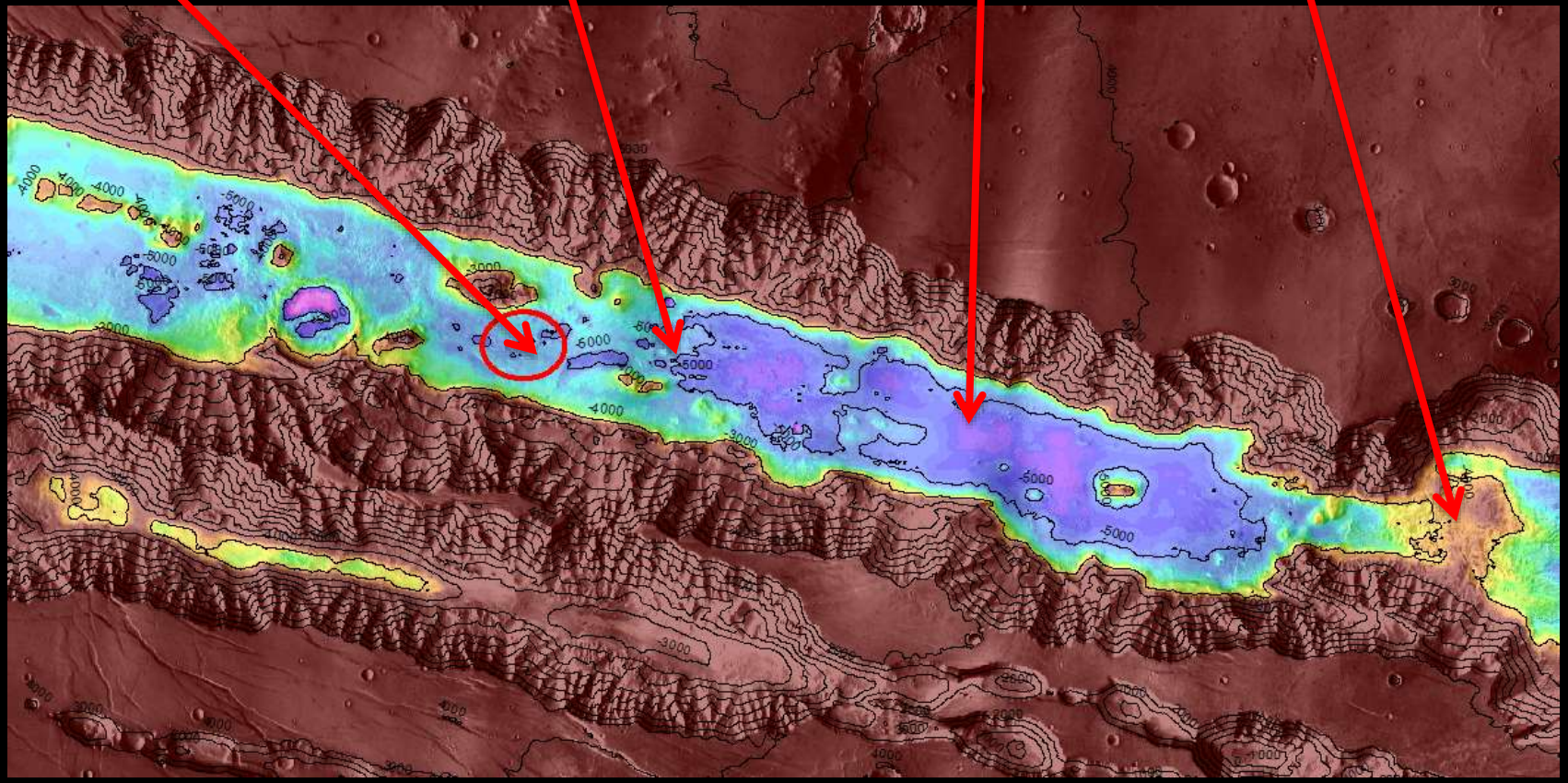
Top of the floor deposits

Steamlined floor

Divergent Finger-like terminations

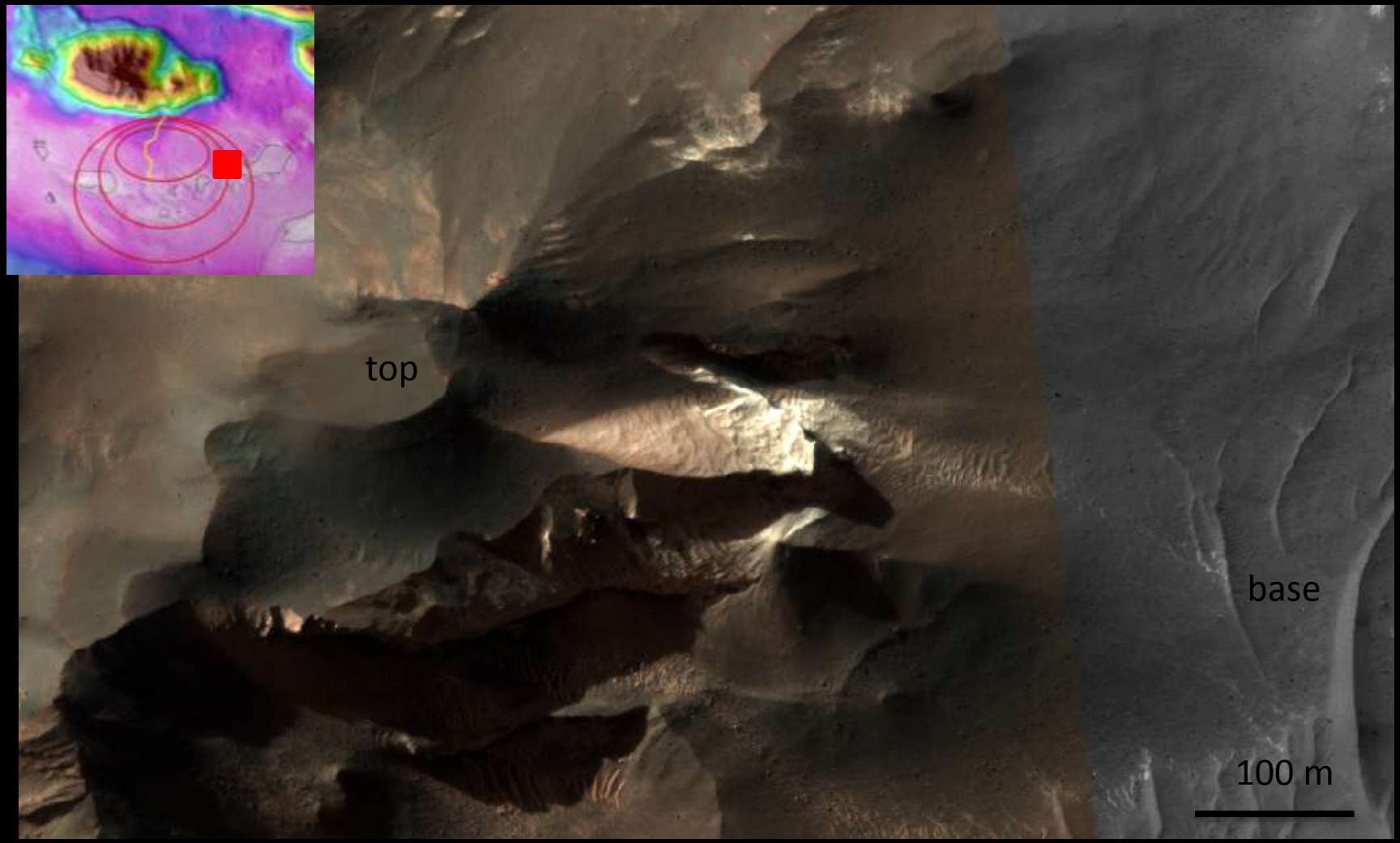
Enclosed depression

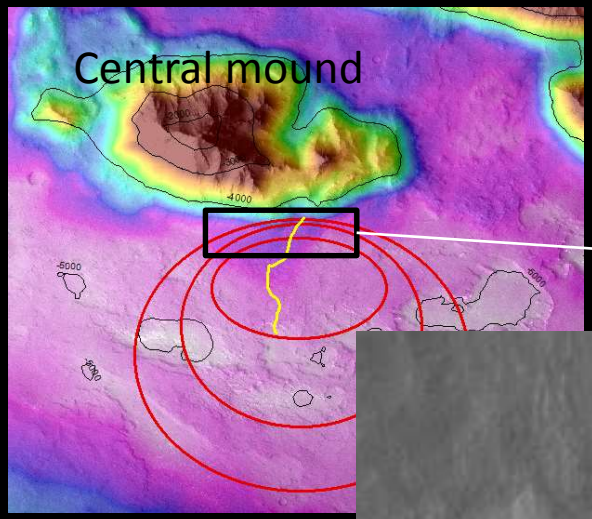
Landslide-Dam



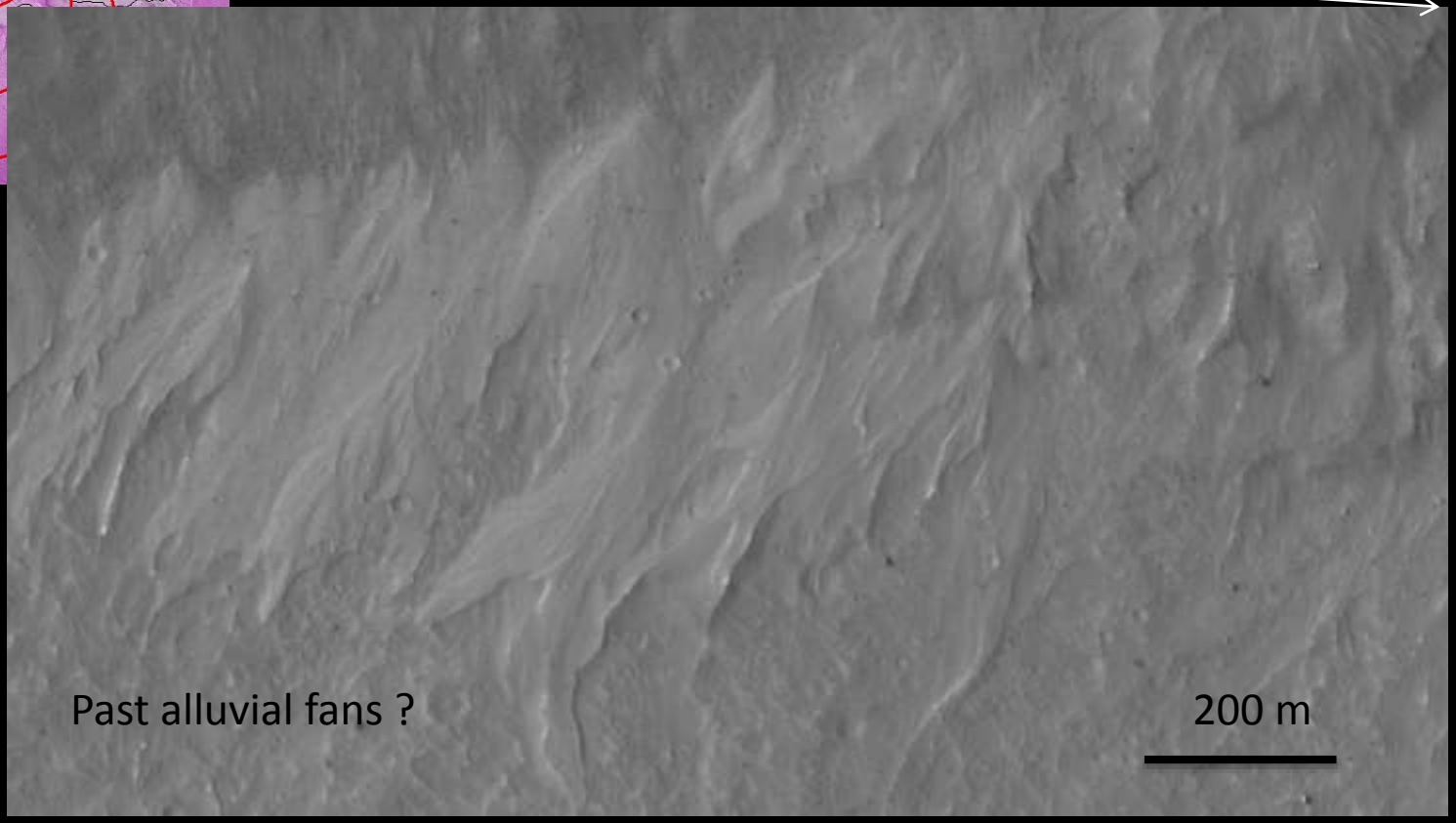
Stratigraphy of the floor deposits : fresh light toned outcrops (100 m)

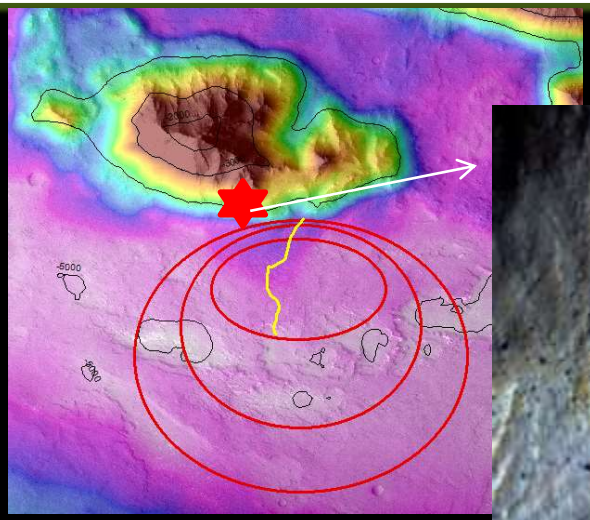
Stratigraphy of the floor deposits : fresh massive light toned outcrops (100 m)



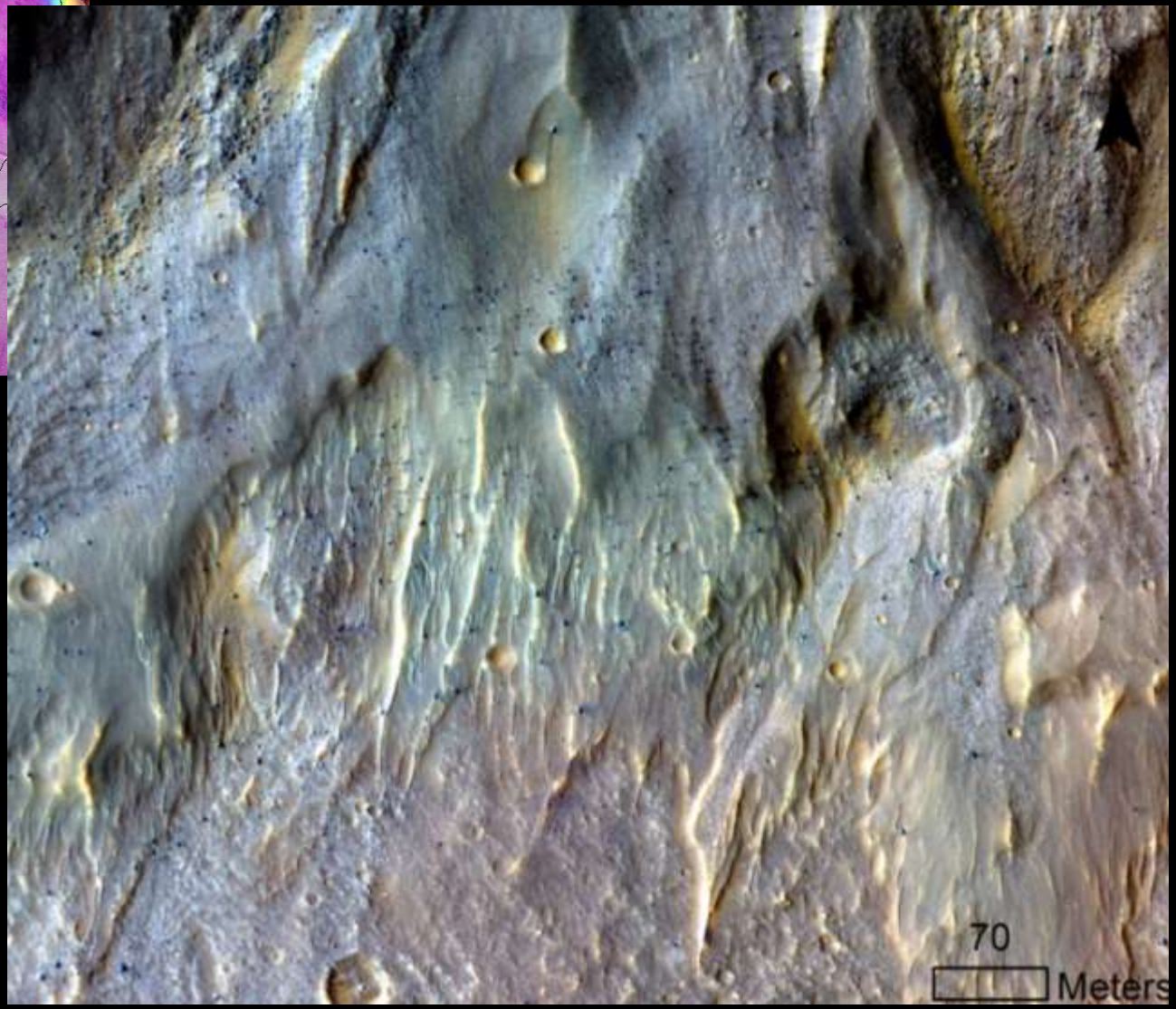


Central mound morphologies : basal part



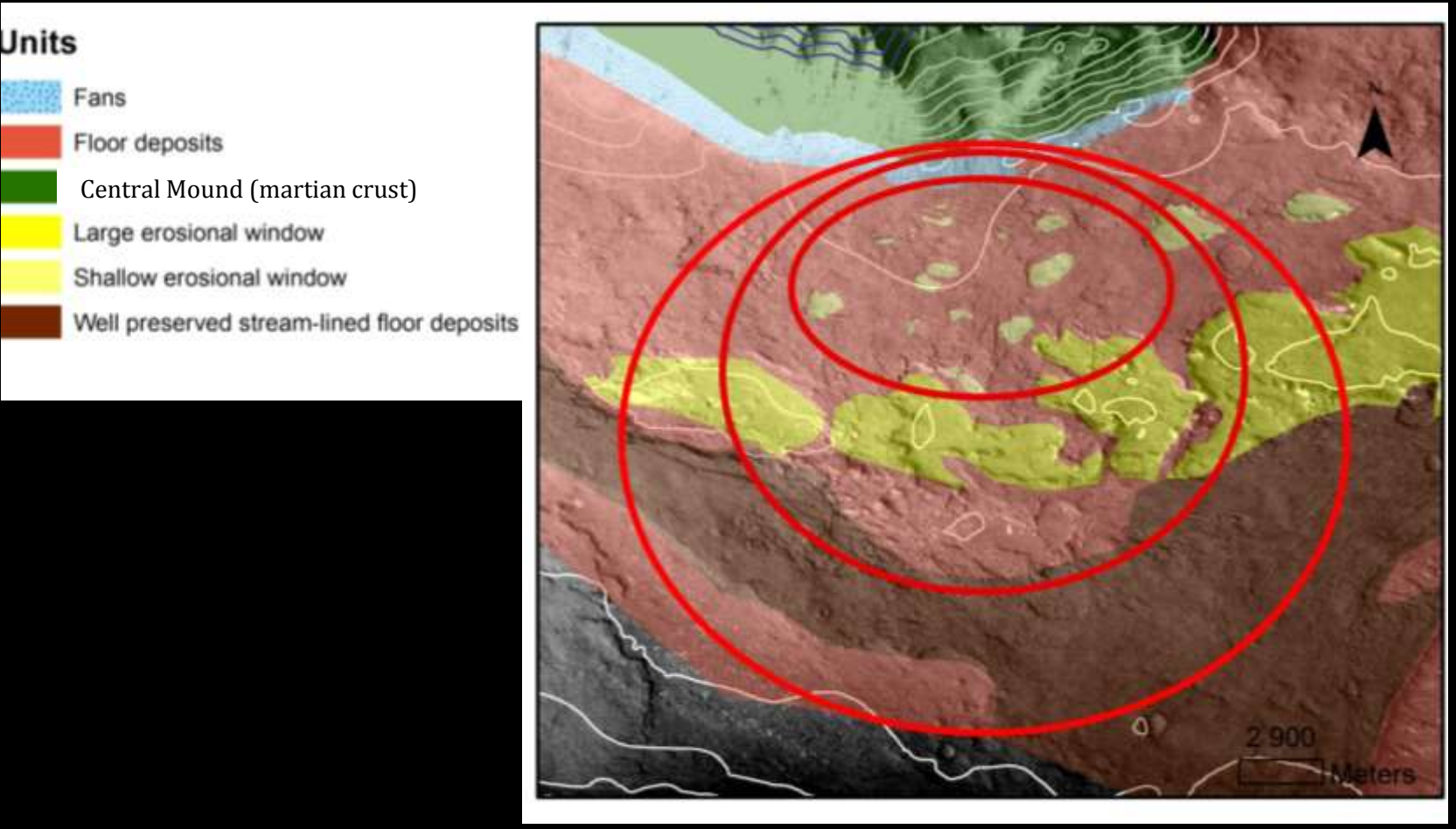


Central mound morphologies : basal part

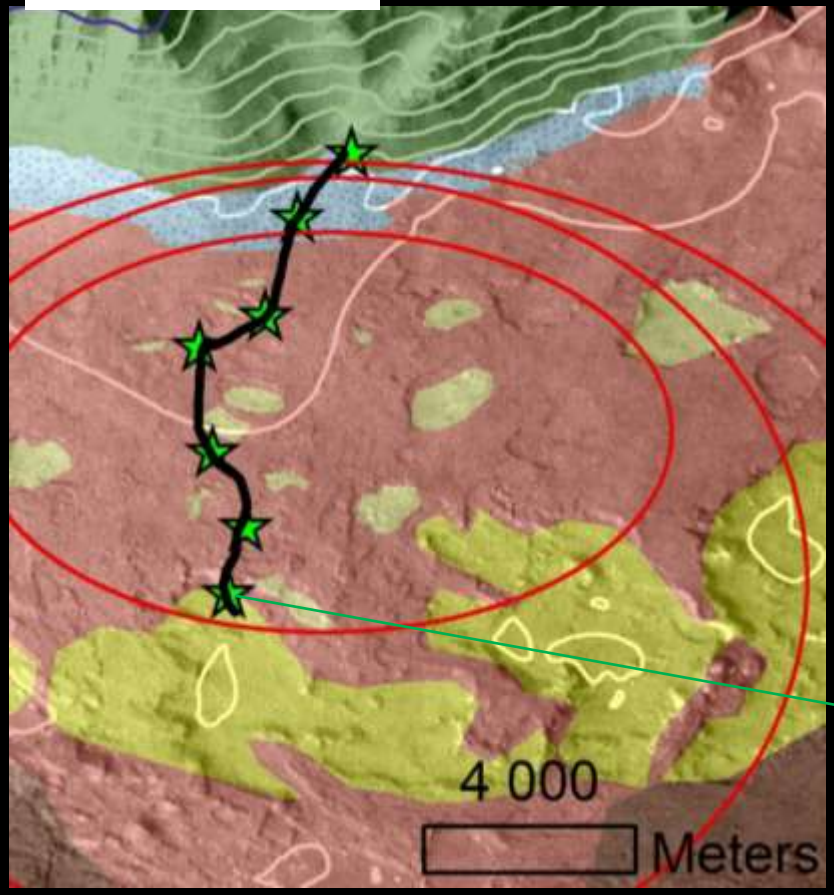


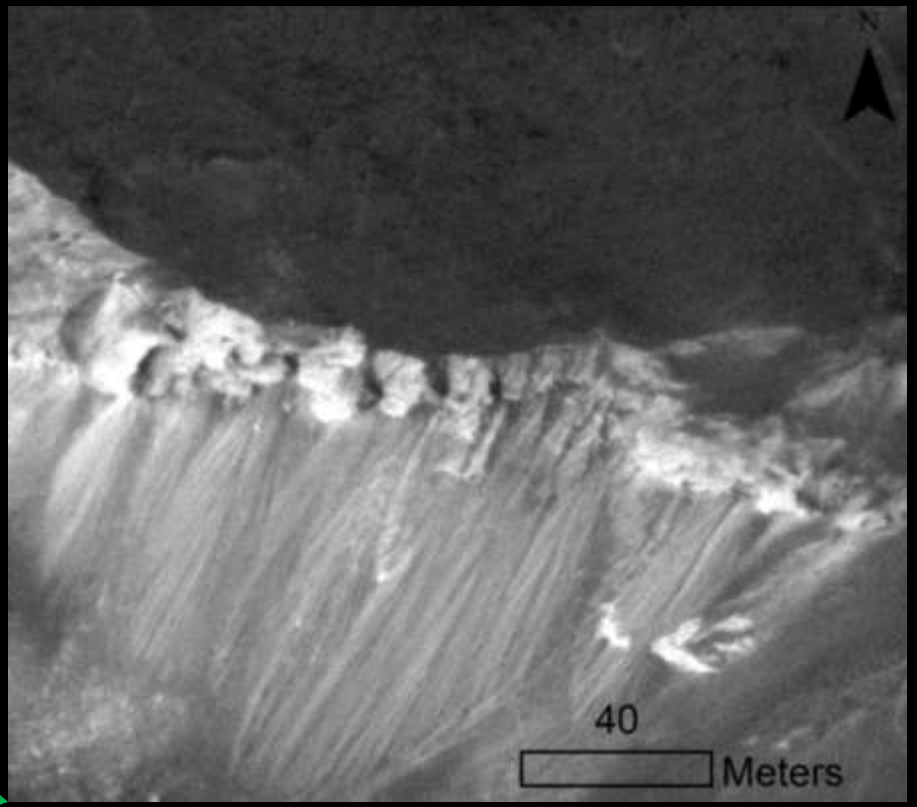
Multiples events

Summary of Region of interest

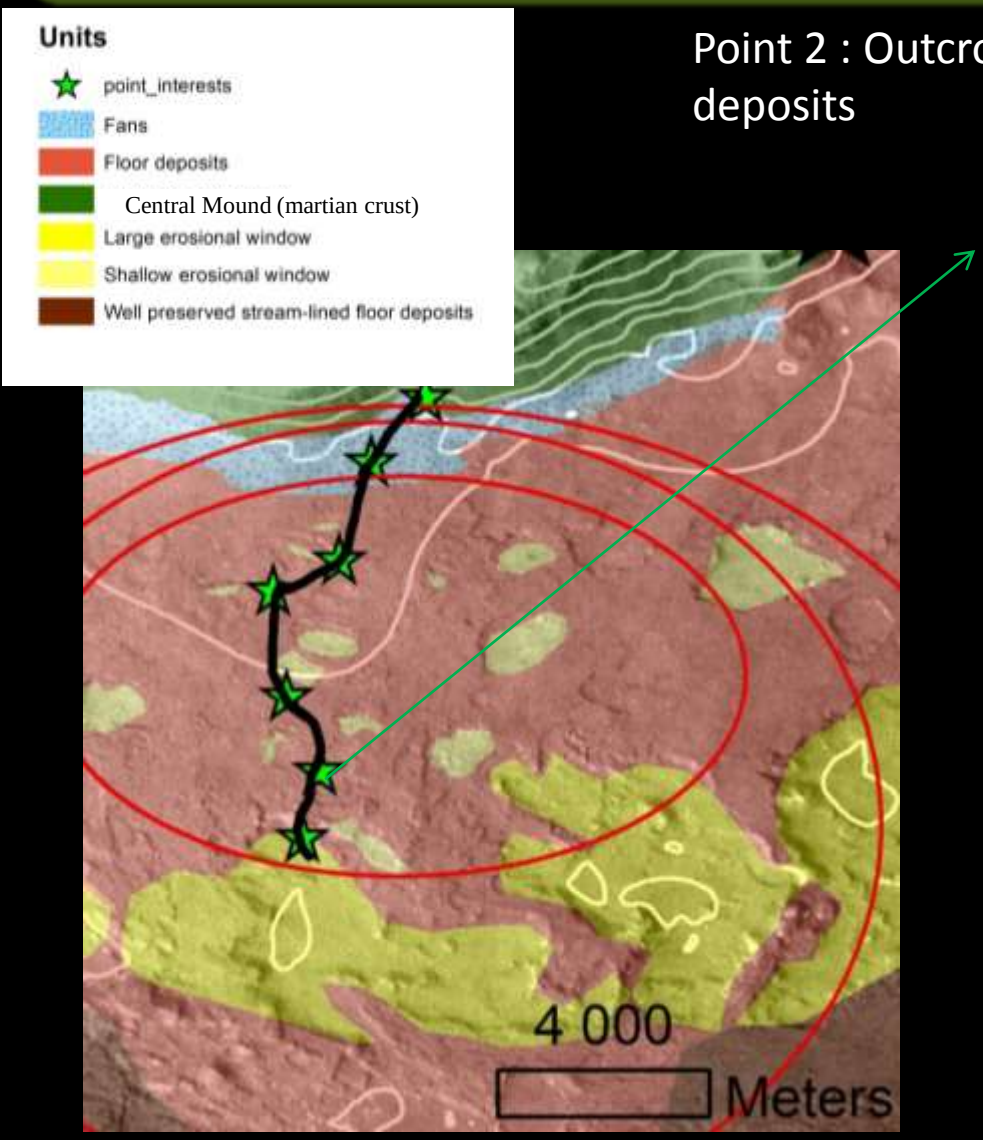


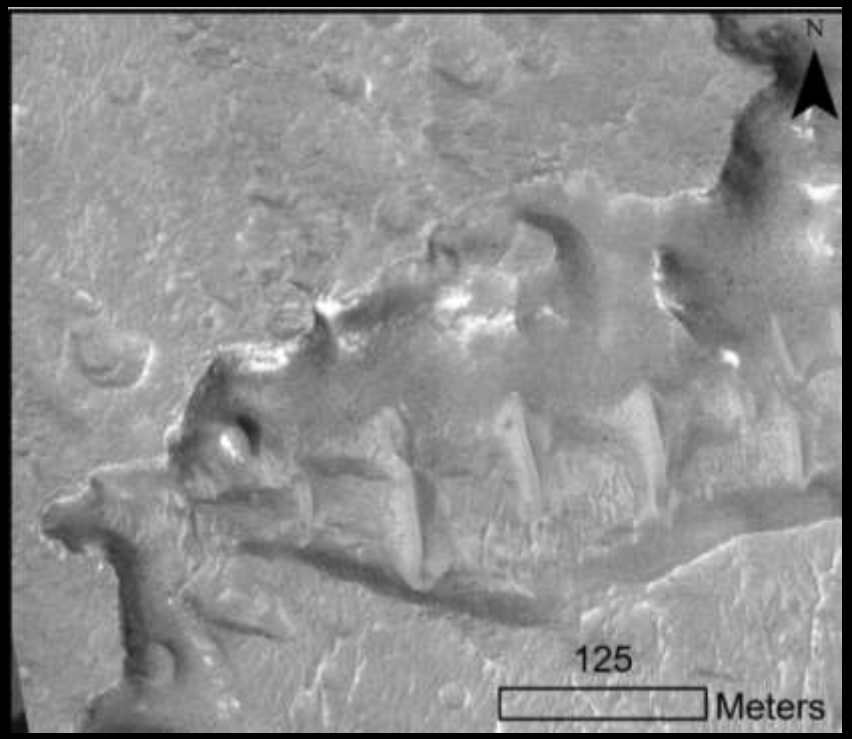
Point 1 : Exposures of Valles Marineris floor deposits





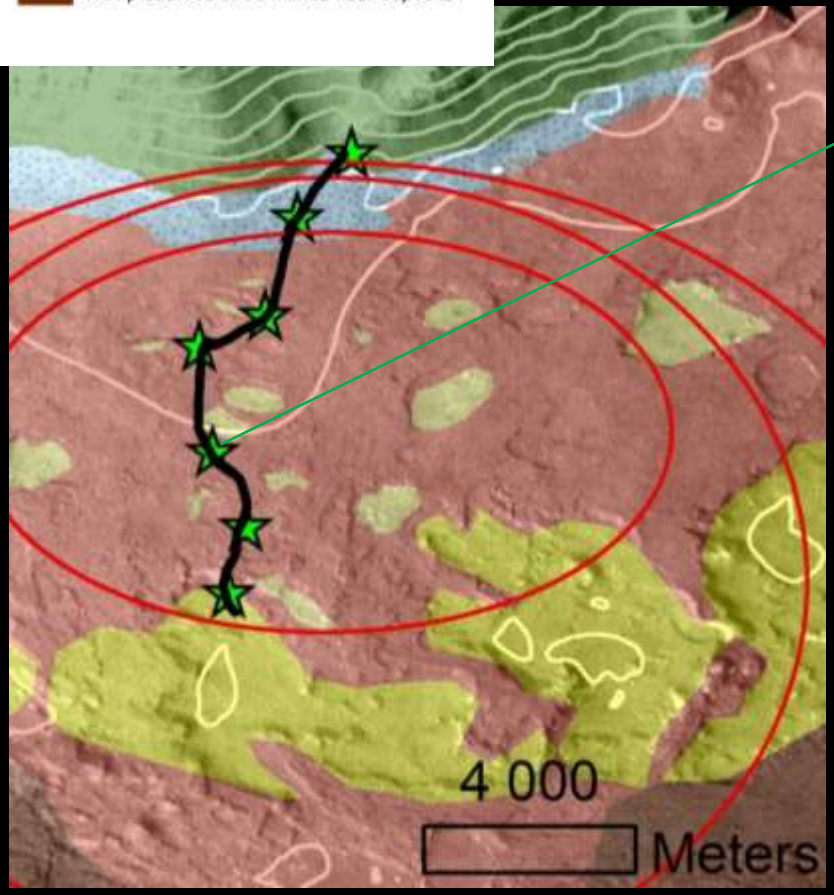
Point 2 : Outcrops of light-toned upper layer of floor deposits

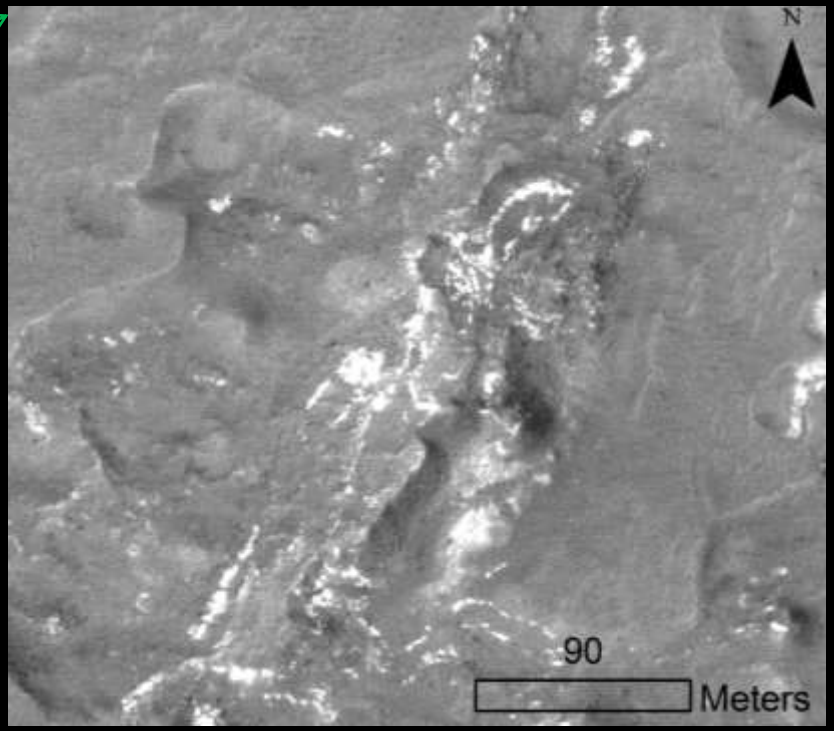




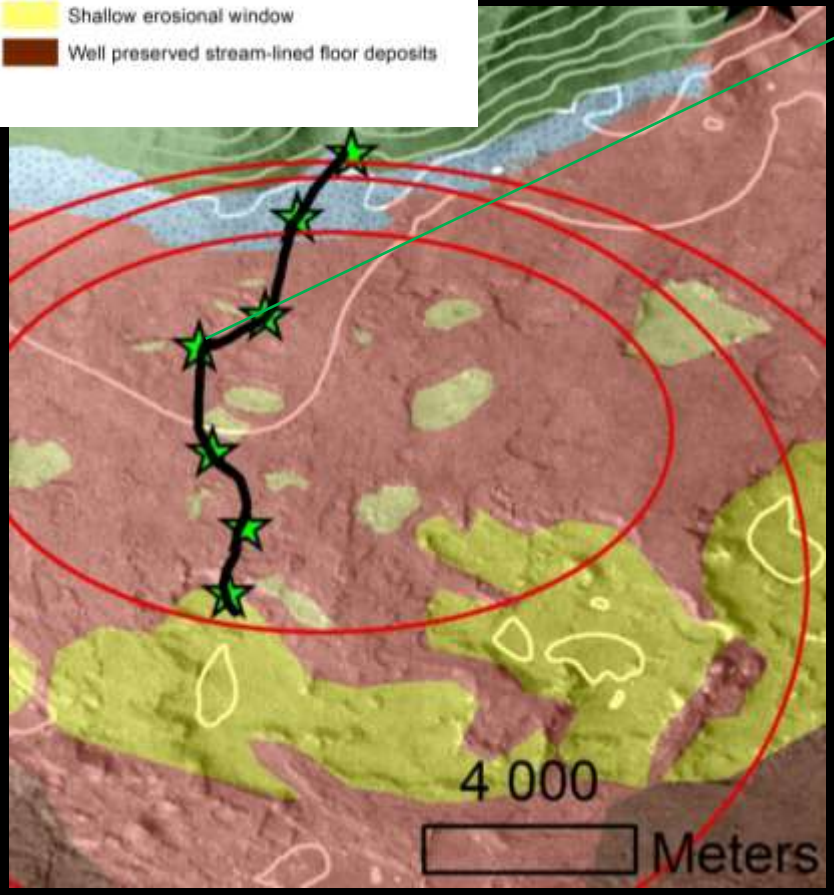
point_interests
Fans
Floor deposits
Horst (martian Crust)
Large erosional window
Shallow erosional window
Well preserved stream-lined floor deposits

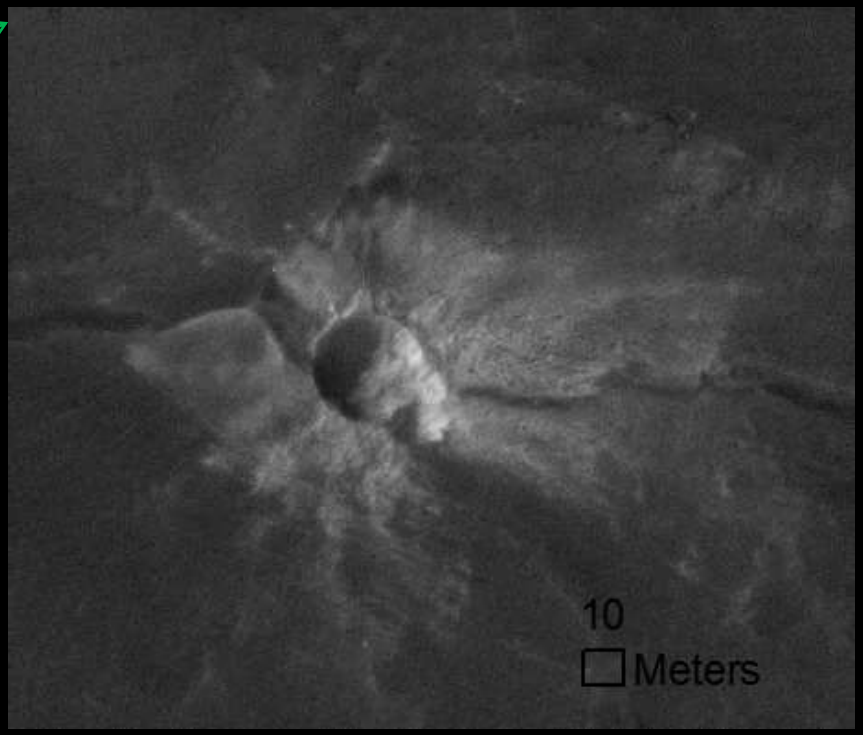
Point 3 : Light toned material outcrops



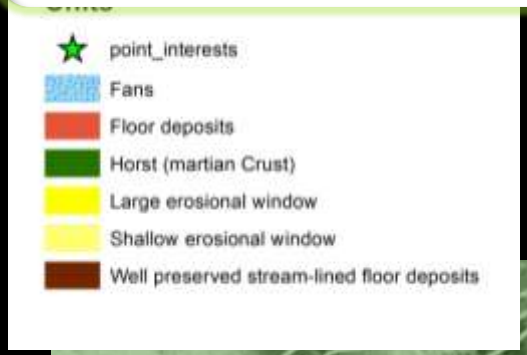


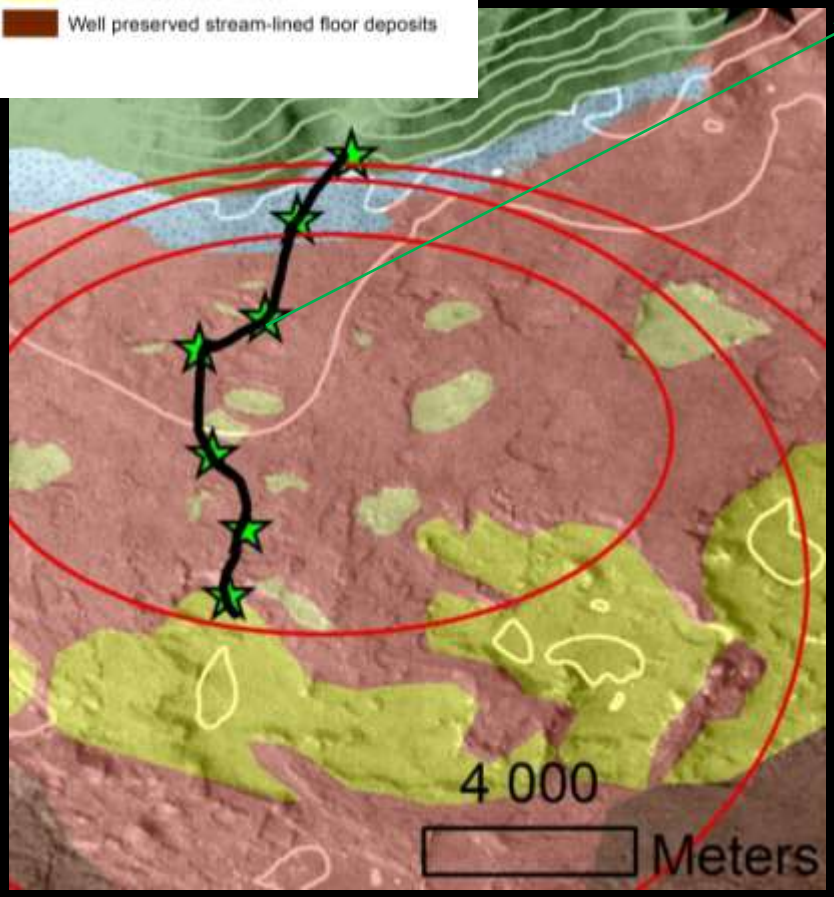
Point 4 : Fresh impact crater

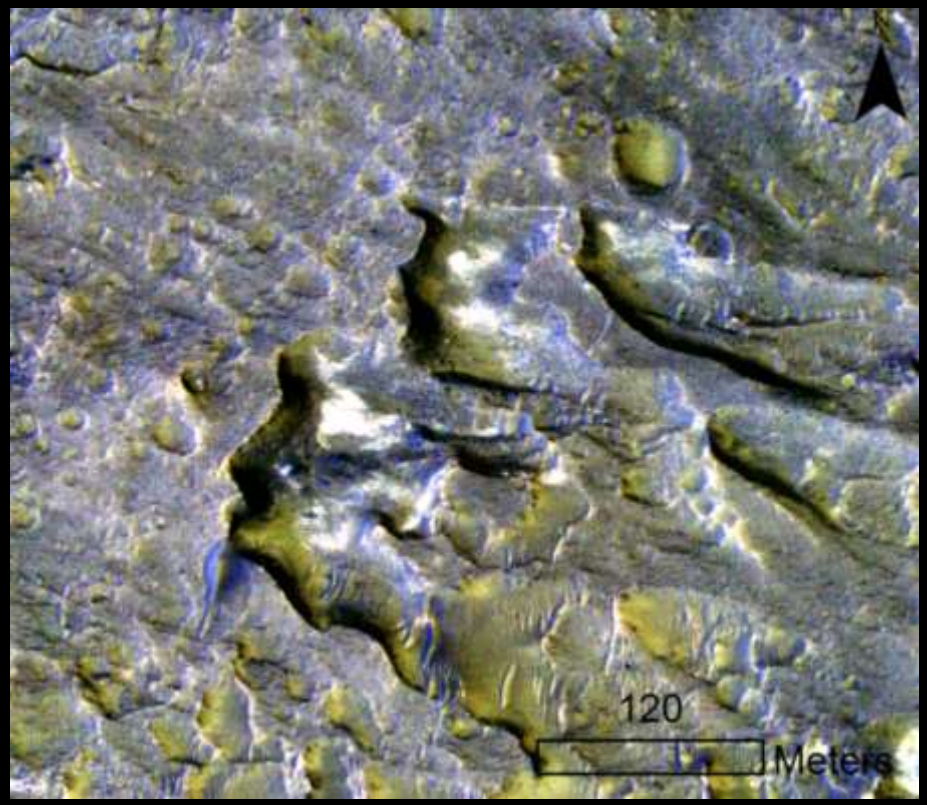




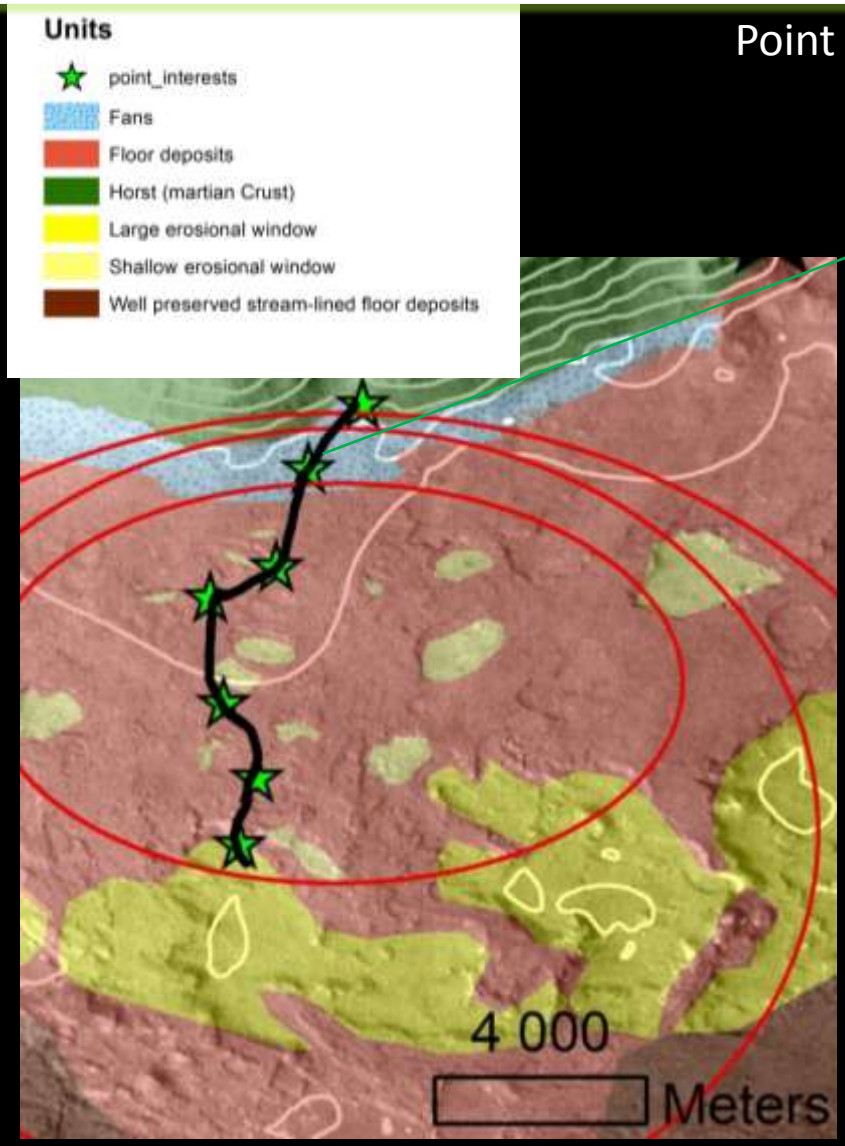
Point 5 : Light toned material within shallow depressions

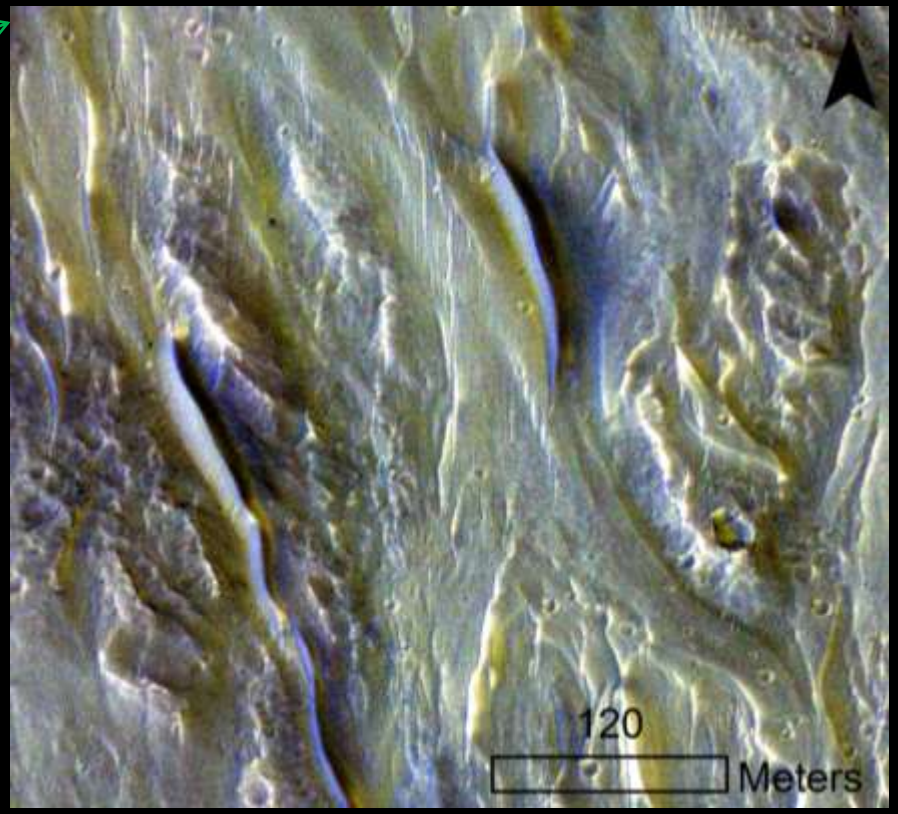




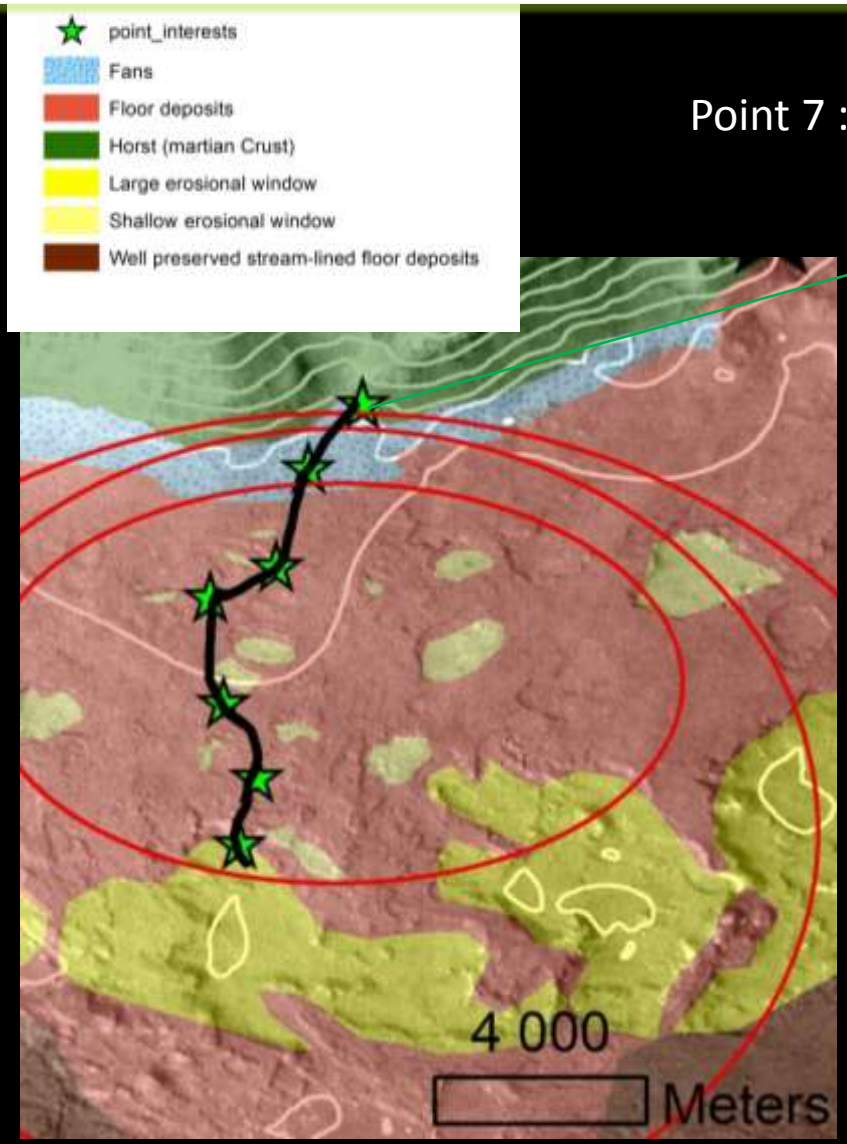


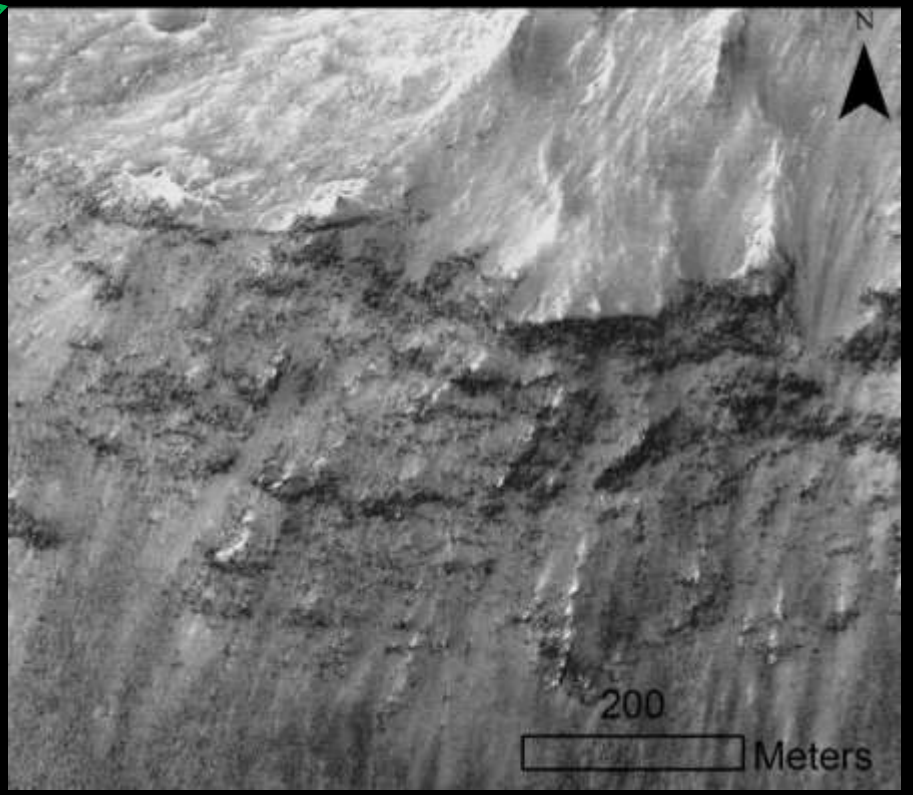
Point 6 : possible alluvial fans

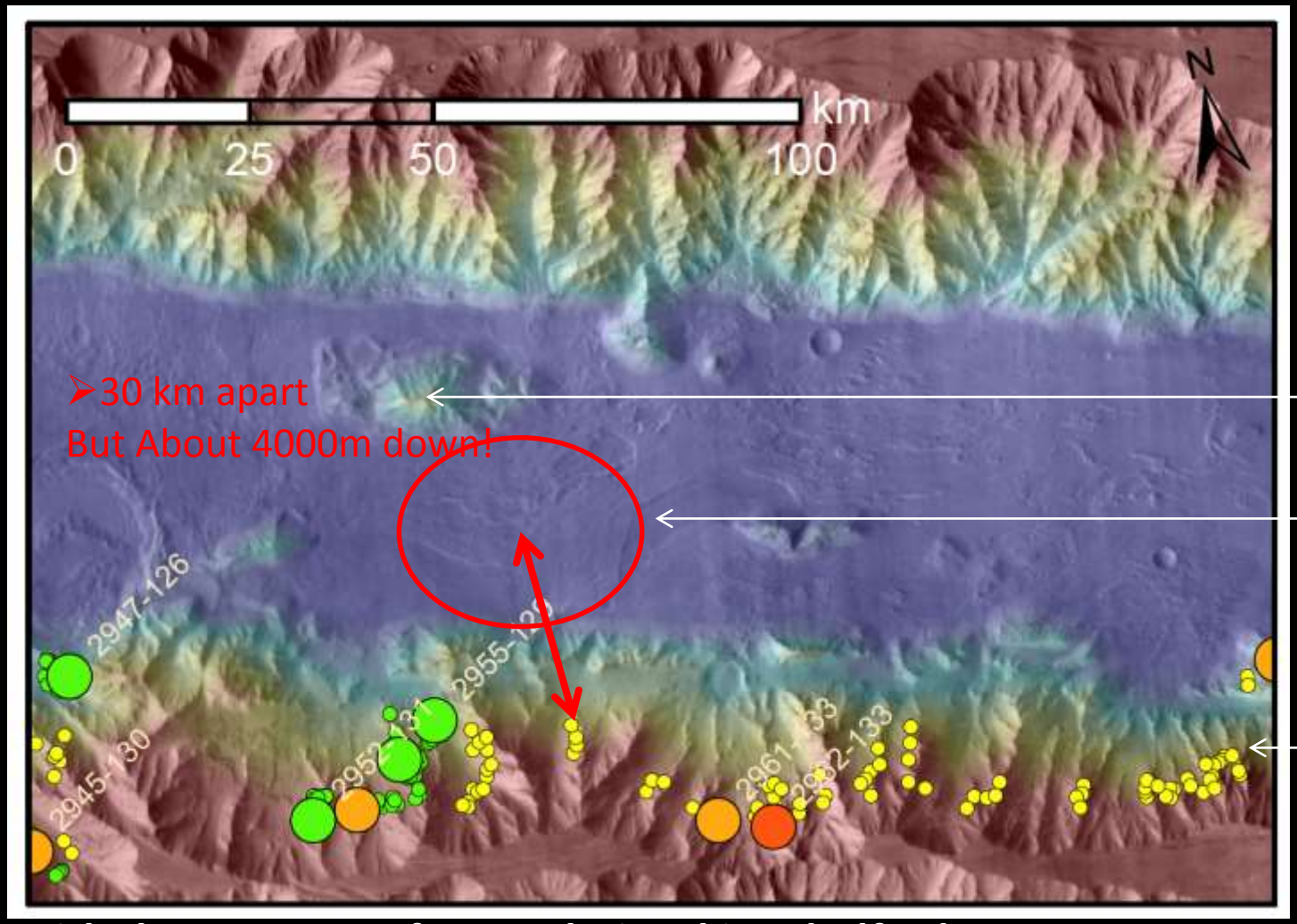




Point 7 : Deep crustal material outcrops





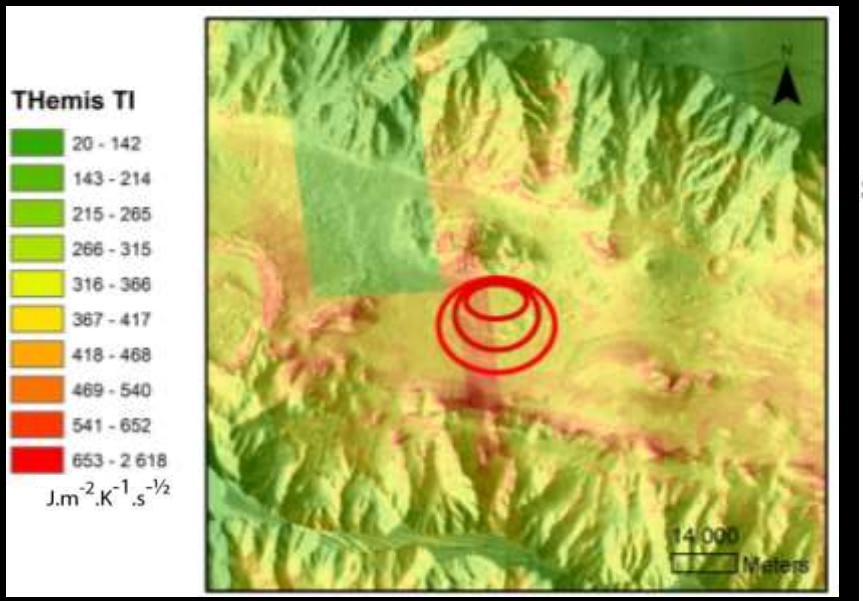


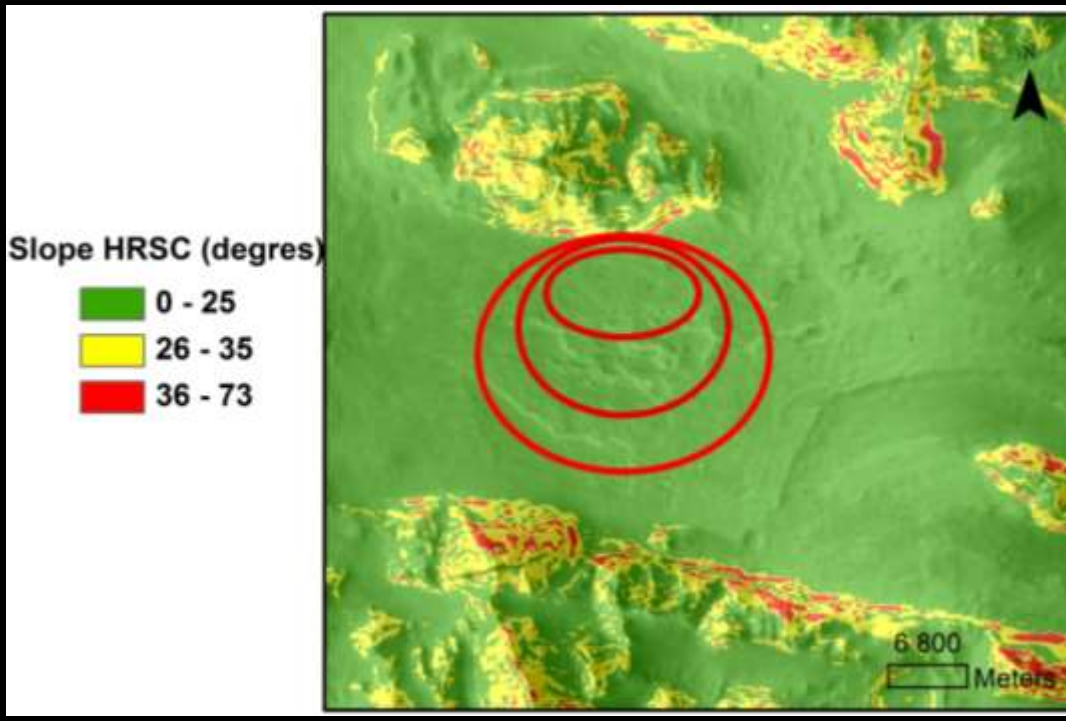
In the neighbourhood : RSL !

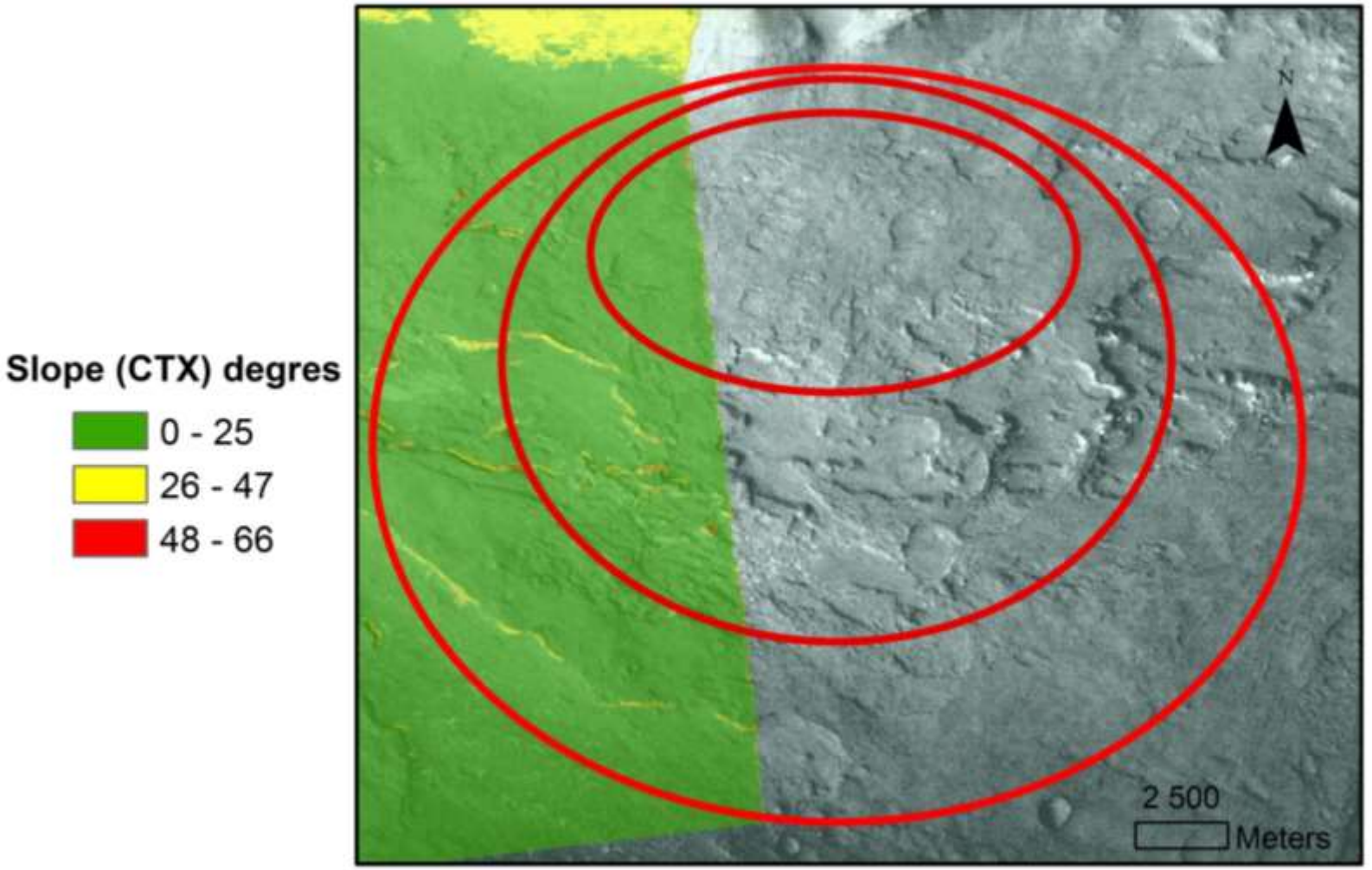
With the Courtesy of Matt Chojnacki and Alfred McEwen

See Chojnacki et al., LPSC 2015

Engineering contrains : high thermal intertia units+ flat floor






Slope (CTX) degres
0 - 25
26 - 47
48 - 66
N
2 500
Meters

M2020
Coprates Chasma landing site

Landing Site Factor	Environmental Setting for Biosignature Preservation and Taphonomy of Organics								Type 1A & 1B Samples: Aqueous Geochemical Environments indicated by Mineral Assemblages								Type 2 Samples: Igneous		Context: Martian History Sampled, Timing Constraints				
	Deltaic or Lacustrine (perennial)	Lacustrine (evaporitic)	Hydrothermal (<100°C) surface	Hydrothermal (<100°C) subsurface	Pedogenic	Fluvial/Alluvial	No diagenetic overprinting	Recent exposure	Crustal phyllosilicates	Sedimentary clays	All clays in stratigraphy	Carbonate units	Chloride sediments	Sulfate sediments	Acid sulfate units	Silica deposits	Ferric Ox./Ferrous clays	Igneous unit (e.g. lava flow, pyroclastic, intrusive)	2nd Igneous unit	Pre- or Early-Noachian Megabreccia	Oldest stratigraphic constraint	Youngest stratigraphic constraint	Stratigrapy of units well-defined	Dateable surface, volcanic (unmodified crater SFD)
Coprates	~	~		●		●	●	●	●			~		●	?			●	?	●	eN ?	H	●	?

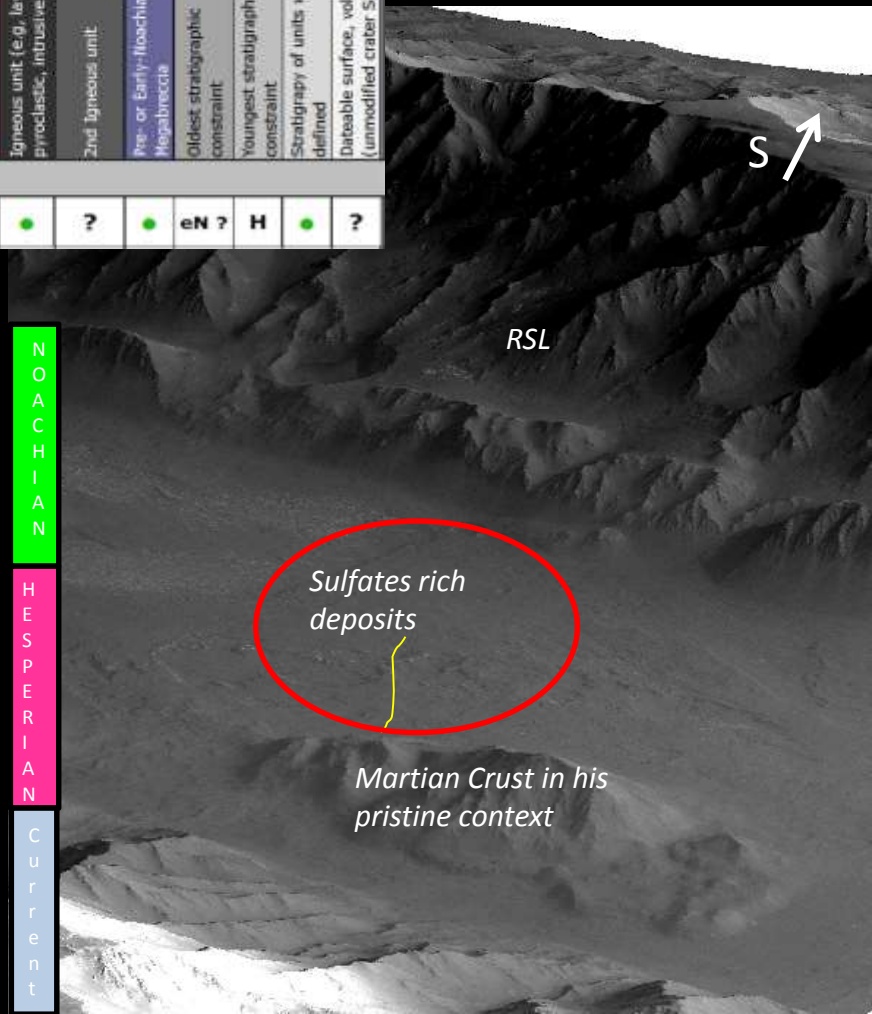
Why Coprates Chasma ?

-Primitive Martian crust

- Hydrothermal alteration of the martian crust (life emergence ?)

-Tectonics (VM opening)

-Sulfates rich floor deposit recently exhumed (conservation)

-Water -related morphologies (canyon floor+ alluvial fans)

-Active RSL (not too close but in a key place)