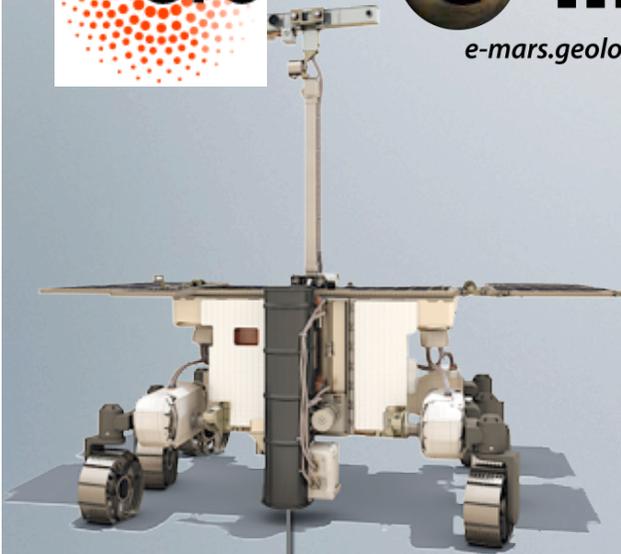


Oxia Planum

C. Quantin¹, J. Carter², P. Thollot¹, A. Ody¹, L. Lozach¹,
P. Allemand¹ and B. Bultel¹

(1) Laboratoire de Géologie de Lyon, France
(2) IAS, France



Oxia Planum

Probe the team

C. Quantin¹, J. Carter², P.Thollot¹, A. Ody¹, L.Lozach¹,
P. Allemand¹ and B. Bultel¹

P. Allemand

P.Thollot

B. Bultel

L. Lozach

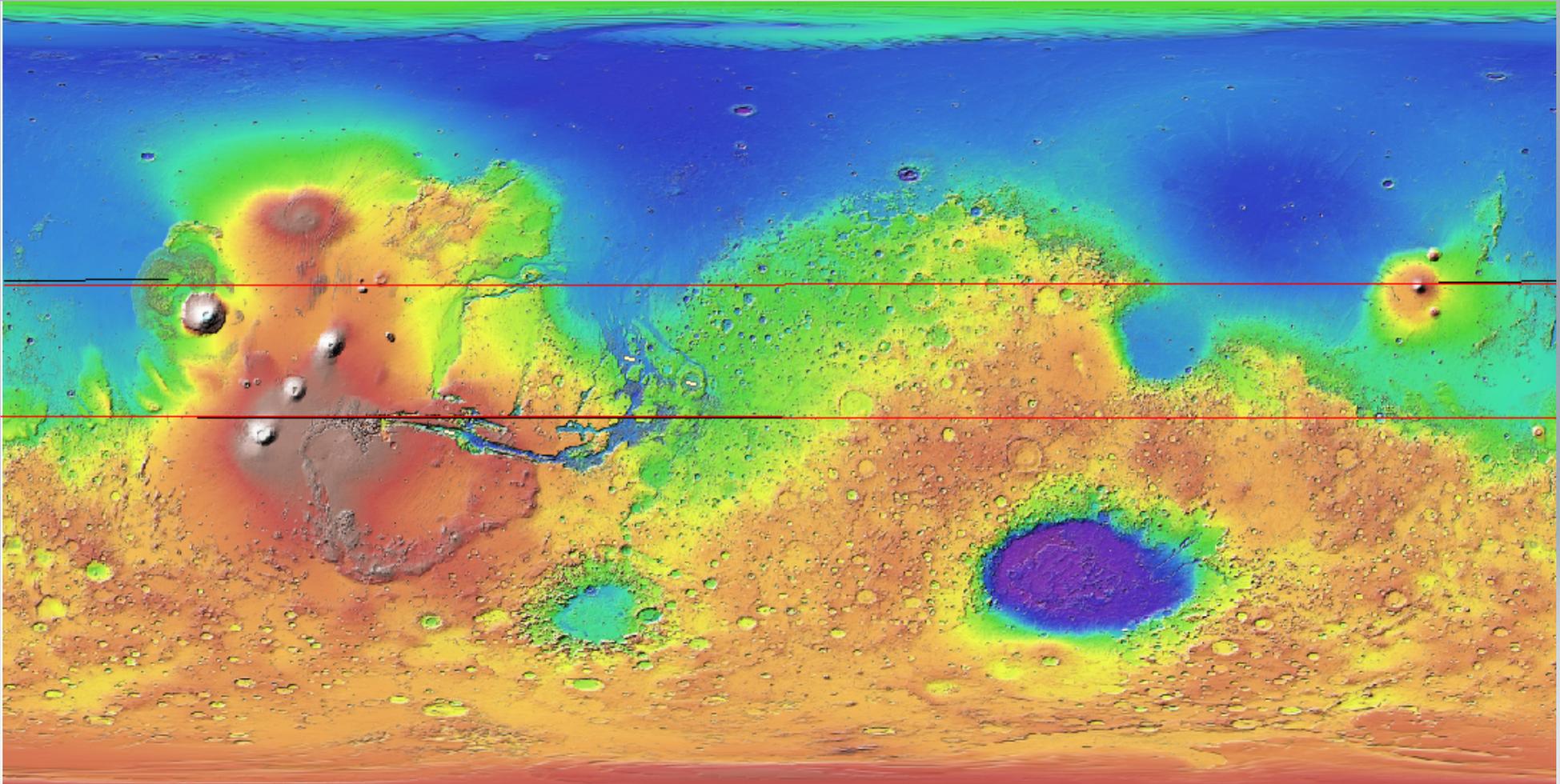
A. Ody

J.Carter



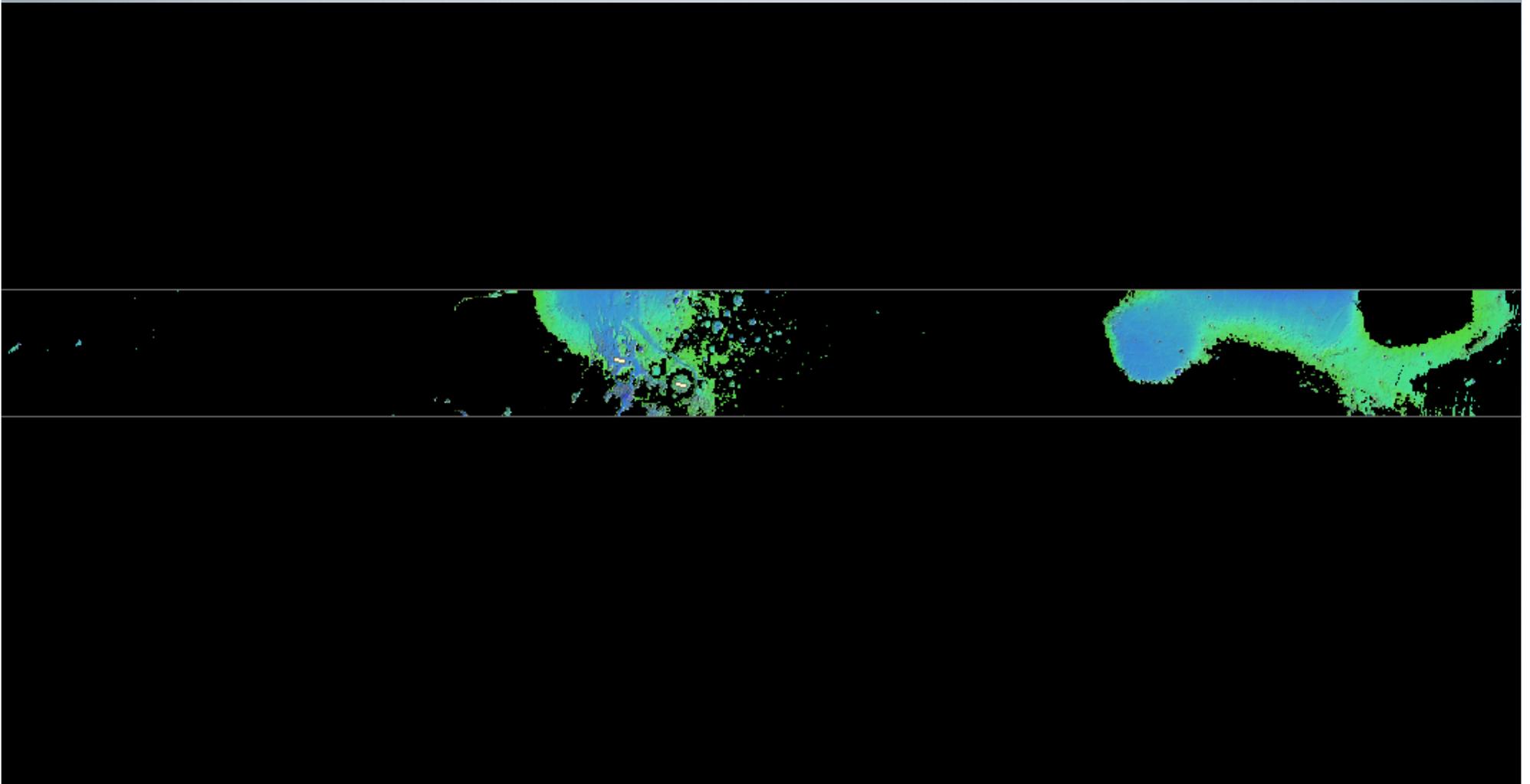
(1) Laboratoire de Géologie de Lyon, France

(2) IAS, France



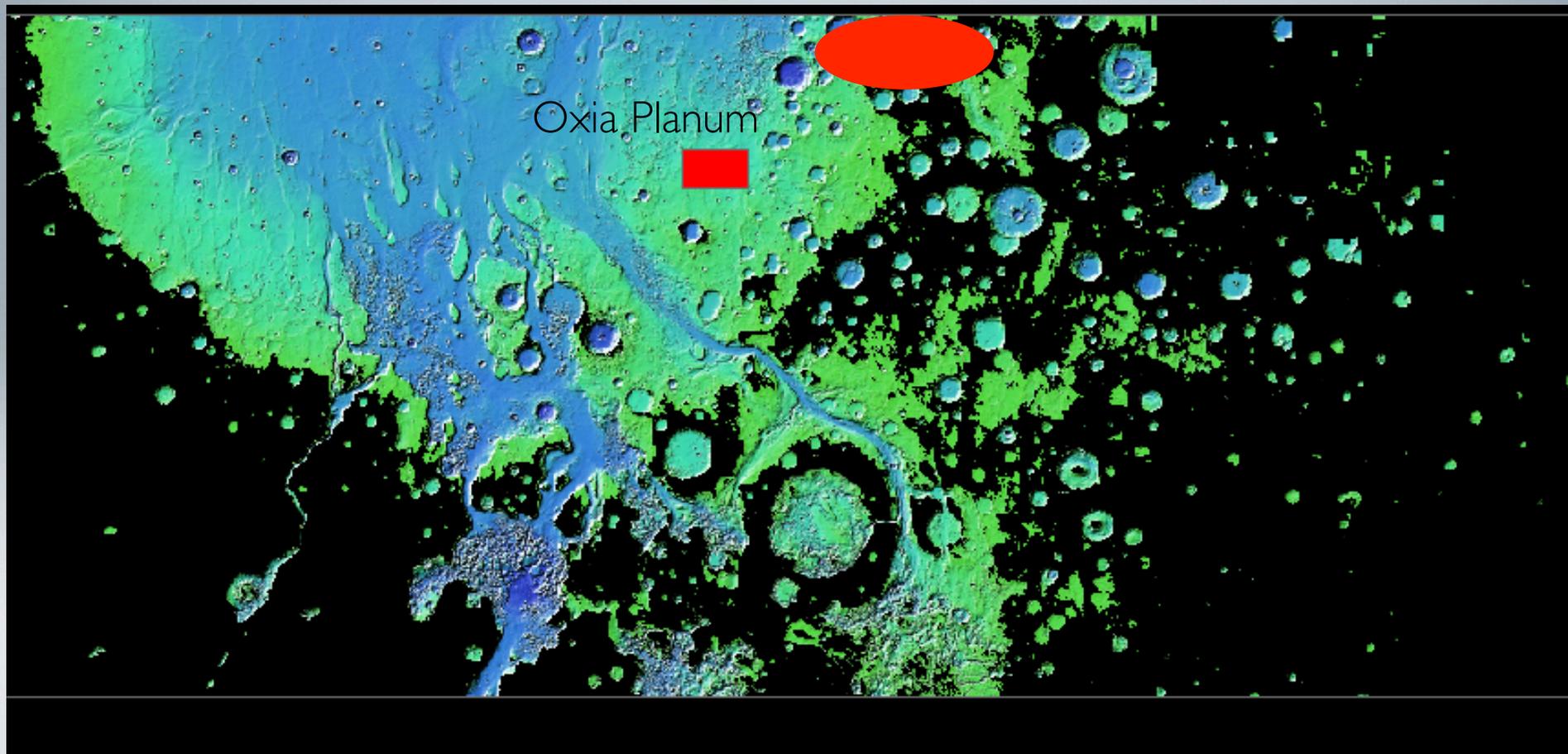
Our approach

Latitude+elevation+TI
constrains

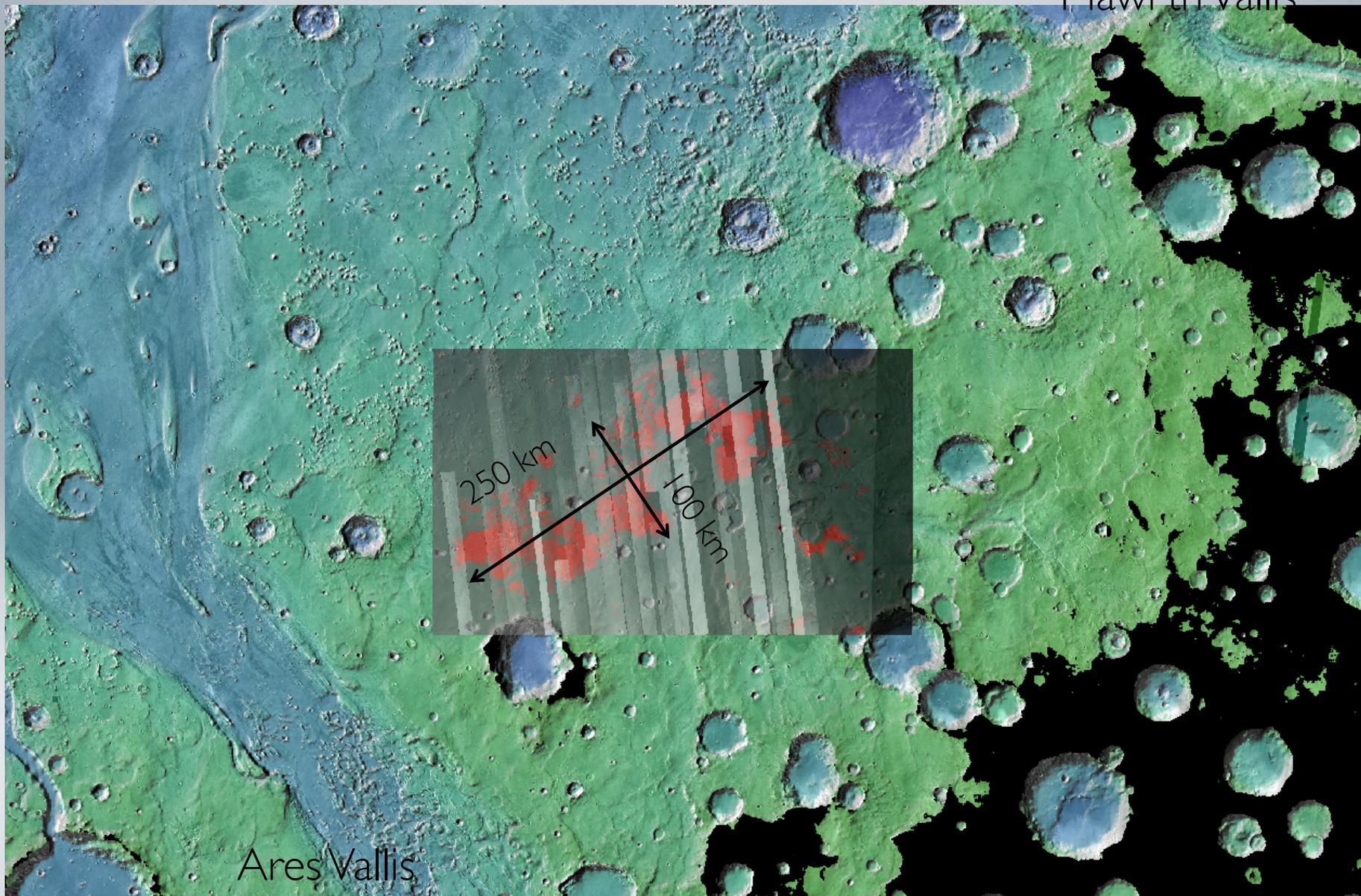


Method :

-systematic survey of OMEGA and CRISM MSP of the
noachian margin of Chryse planitia

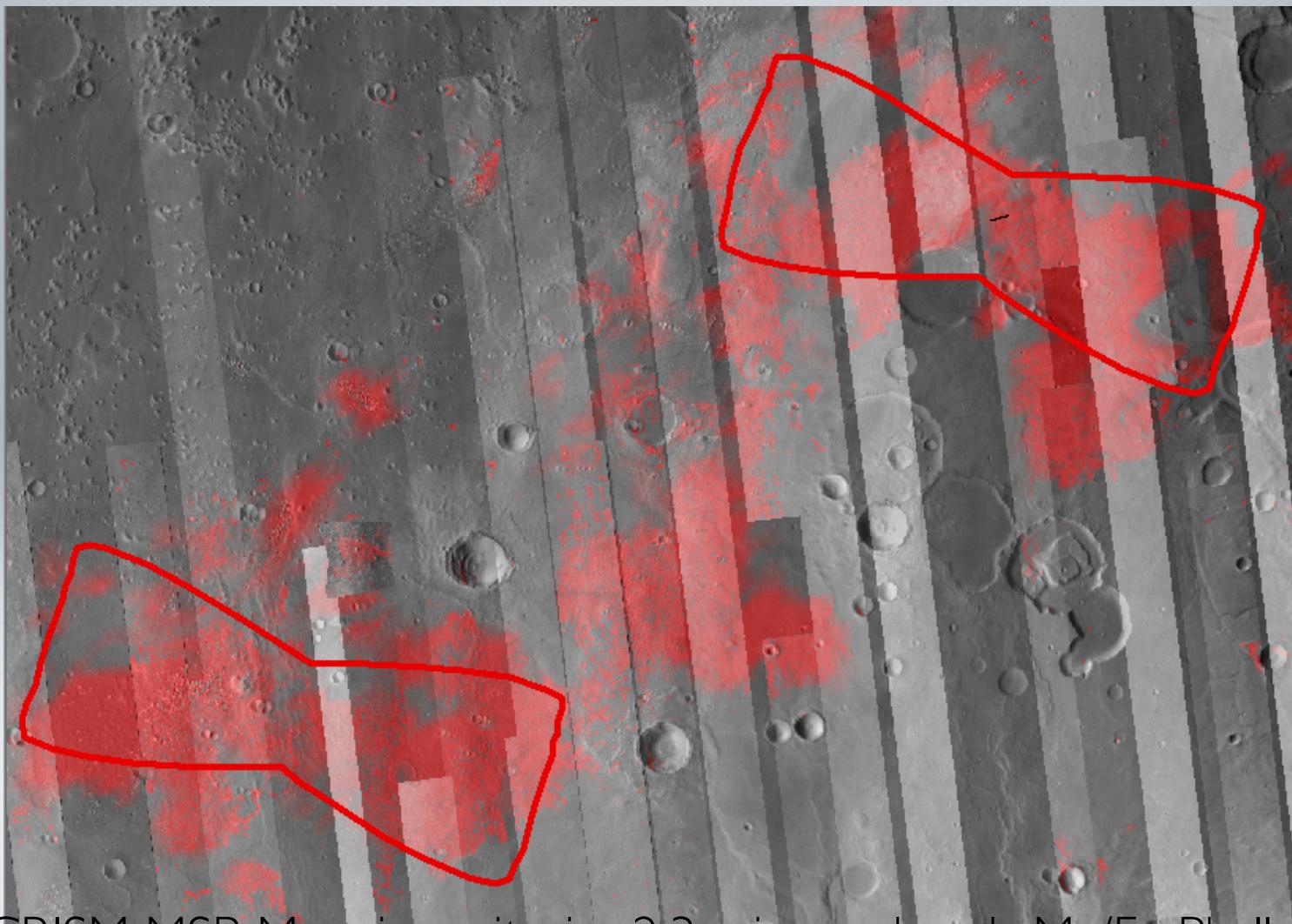


Mawrth Vallis

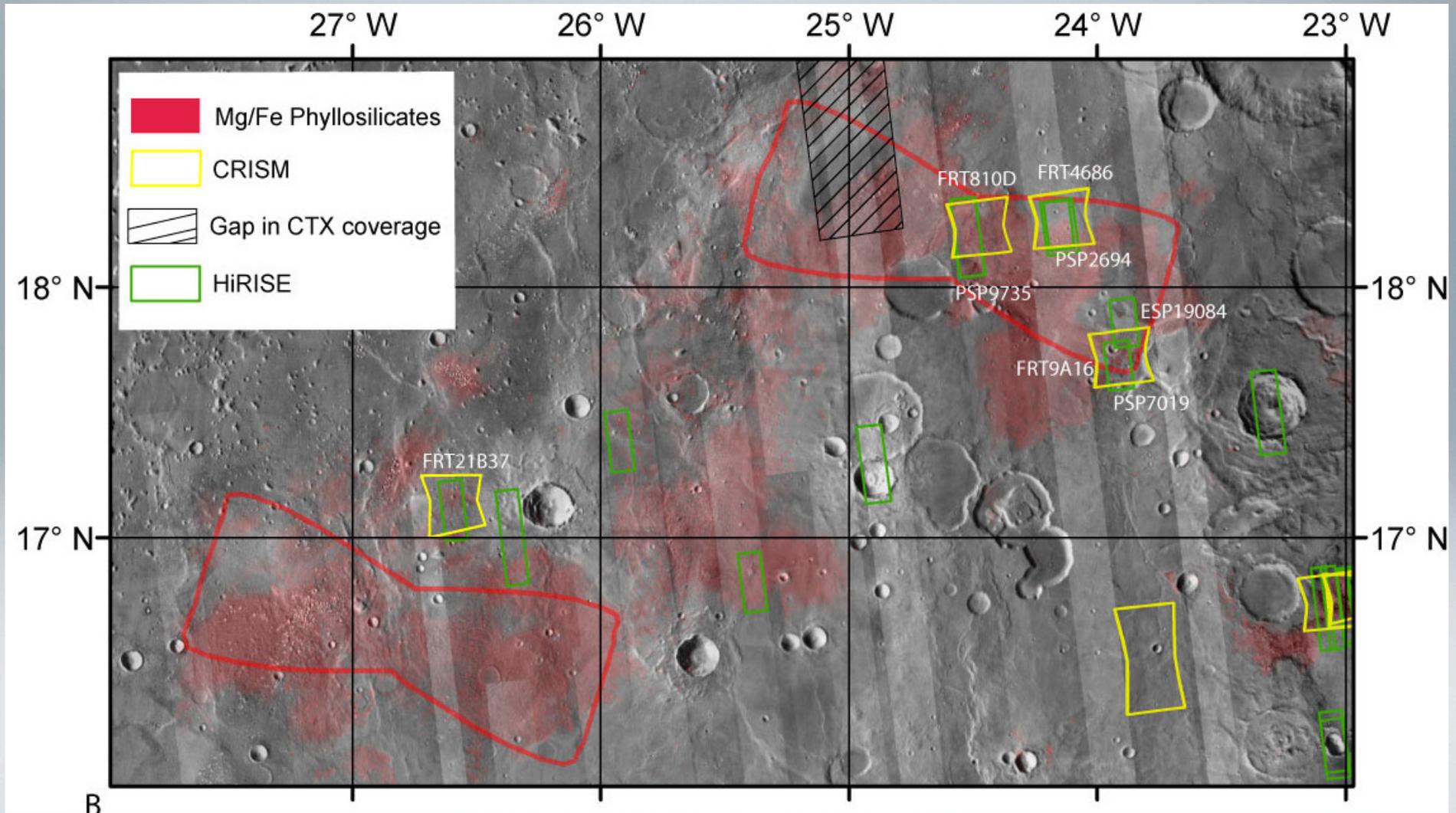


Ares Vallis

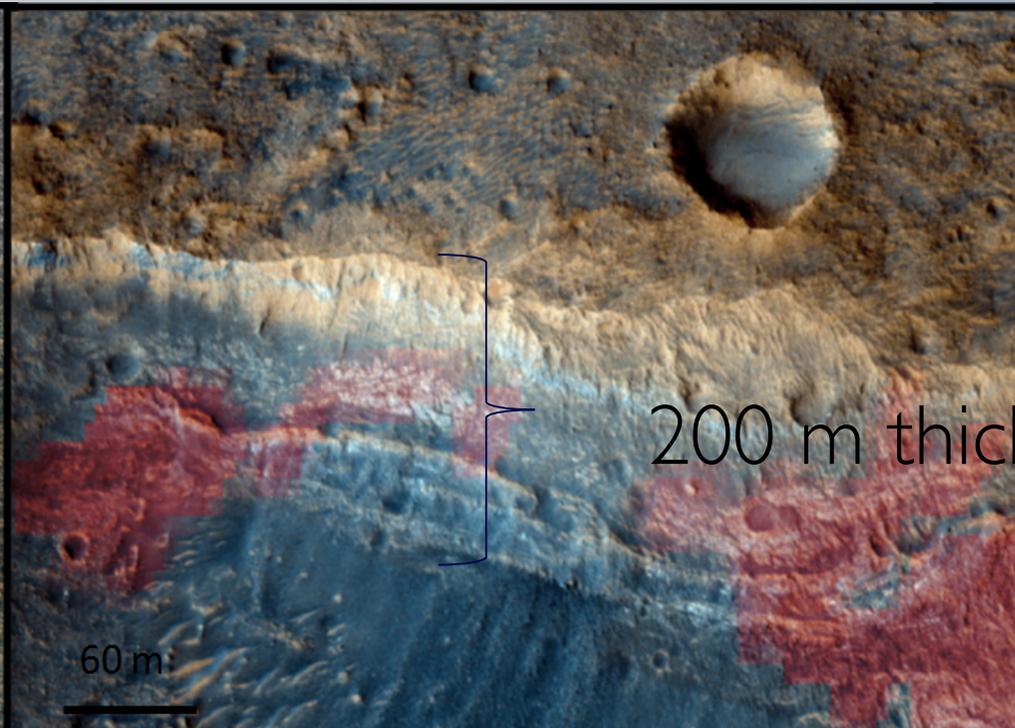
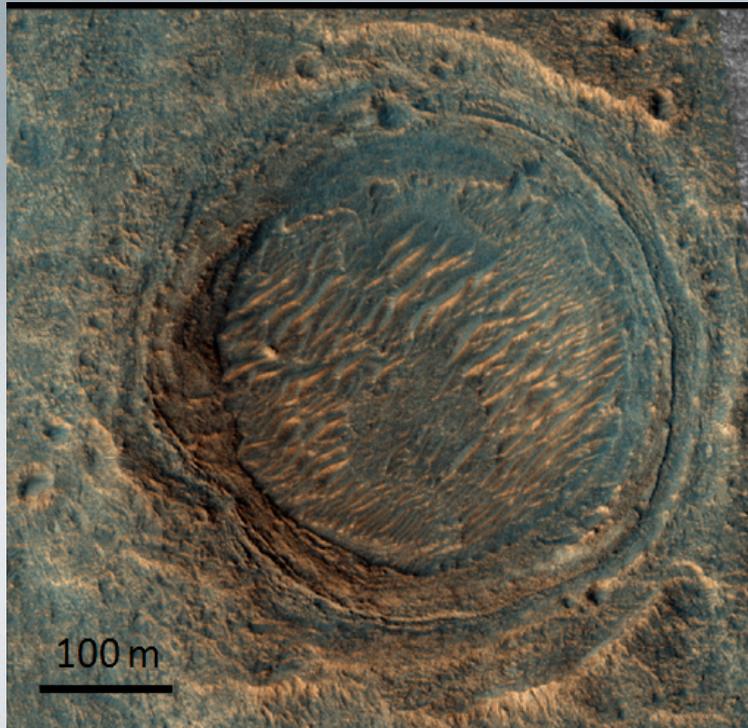
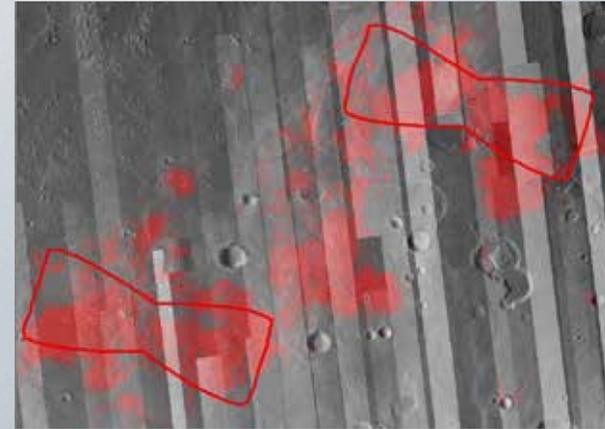
Mapping criteria : 2.3 microns band



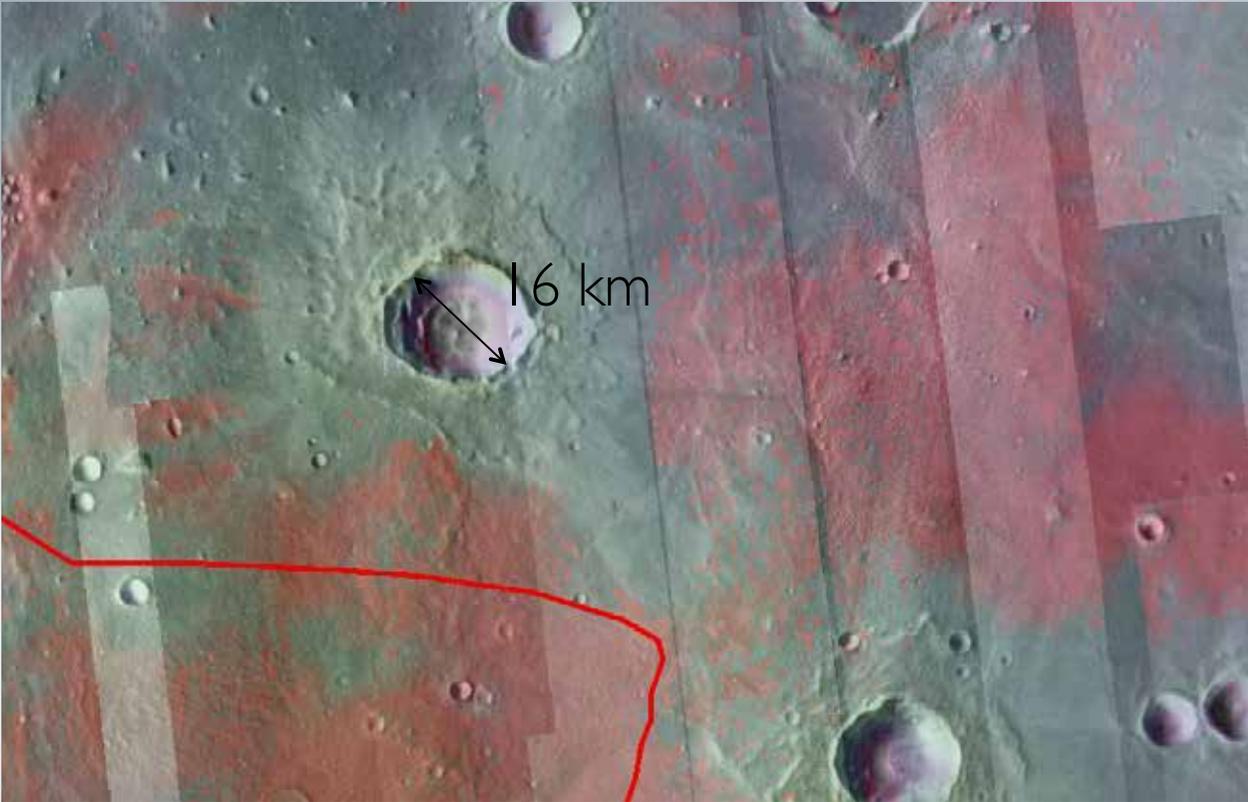
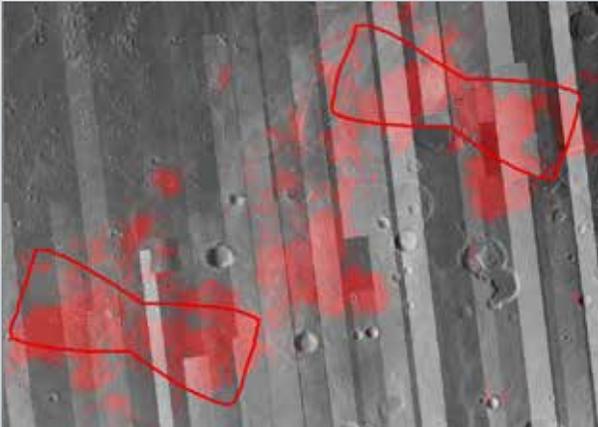
MEGA+CRISM MSP-Mapping criteria : 2.3 microns band , Mg/Fe Phyllosilicates



The phyllosilicate rich unit



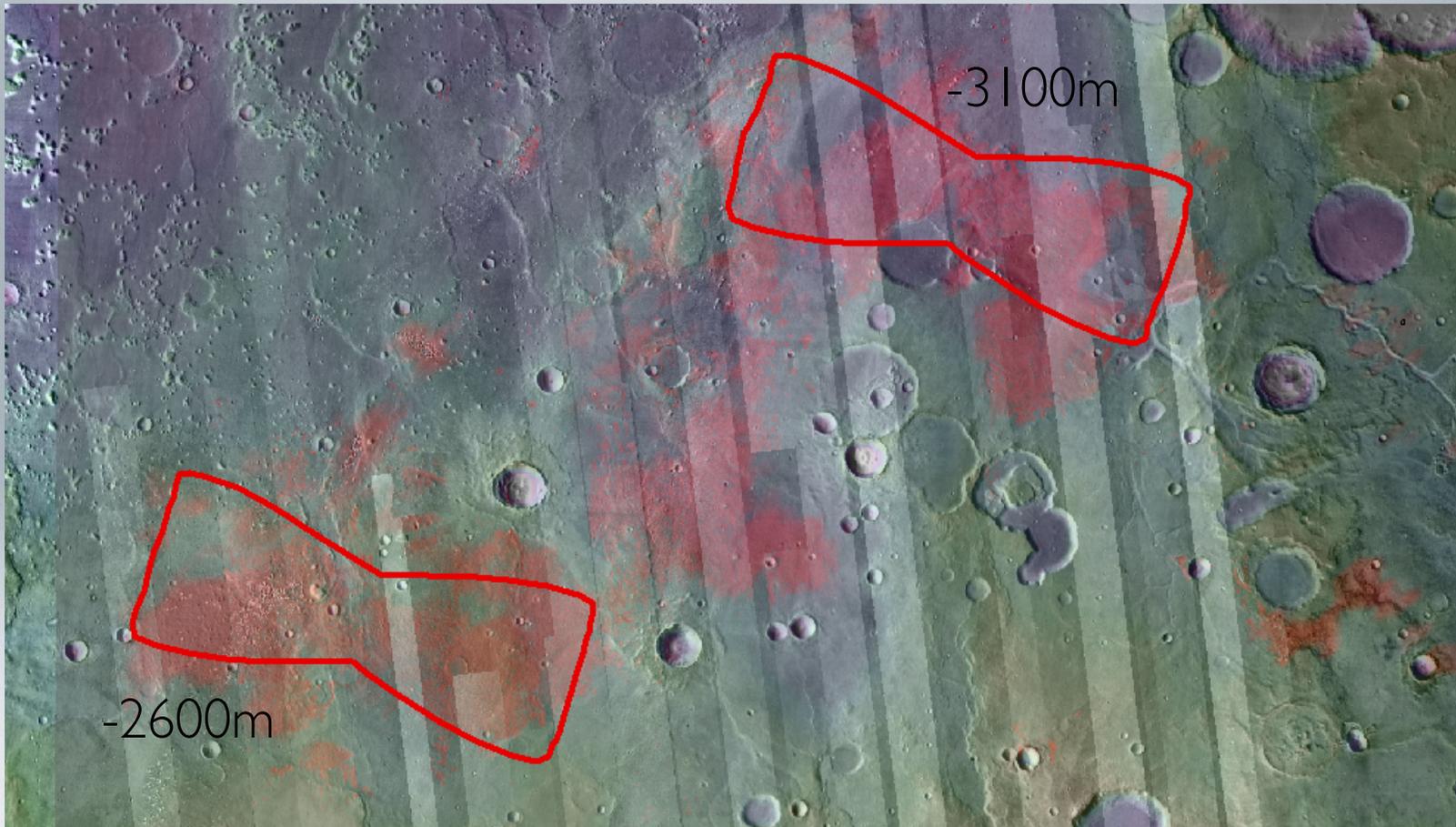
The base of the phyllosilicate rich unit ?



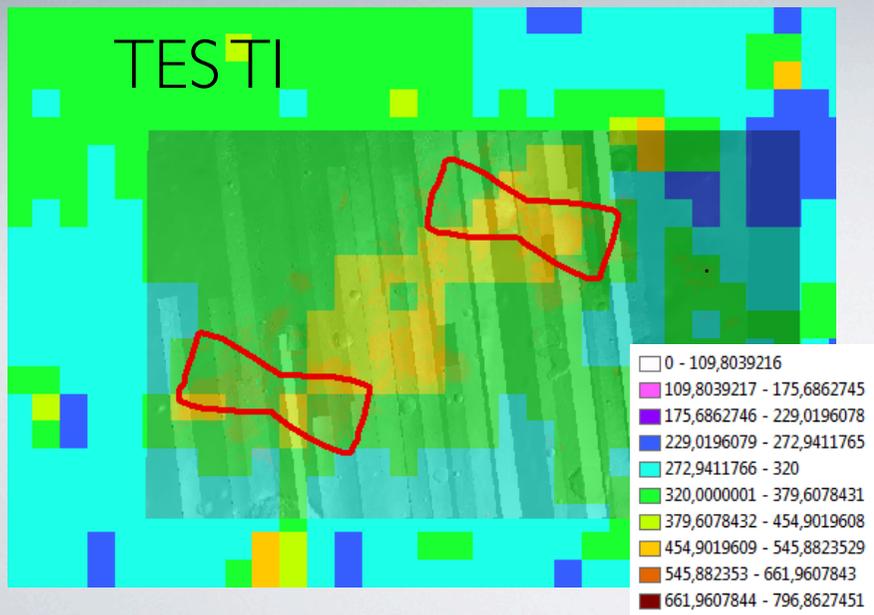
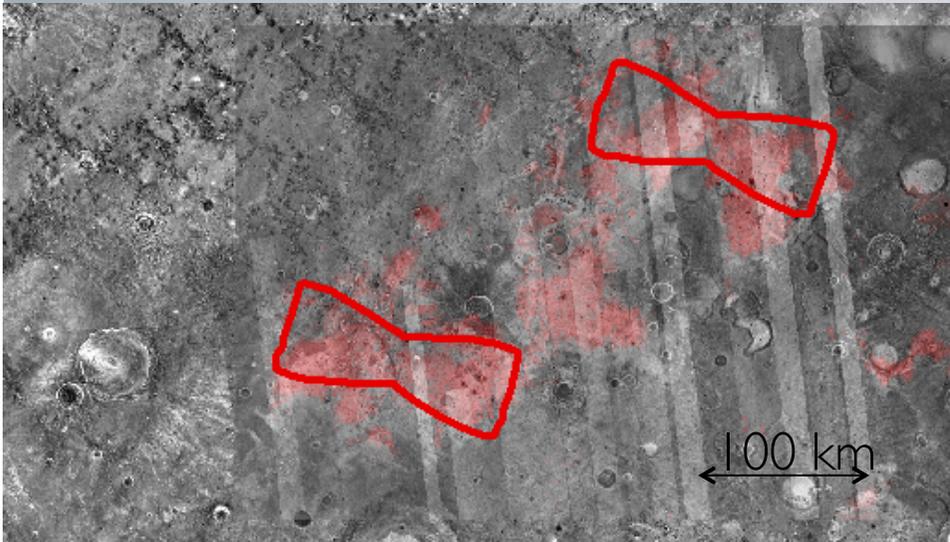
$$ED_j = 0.1 * D$$

ED_j = Exhumation Depth of the ejecta
D = Diameter

Draping phyllosilicate rich layered unit ?

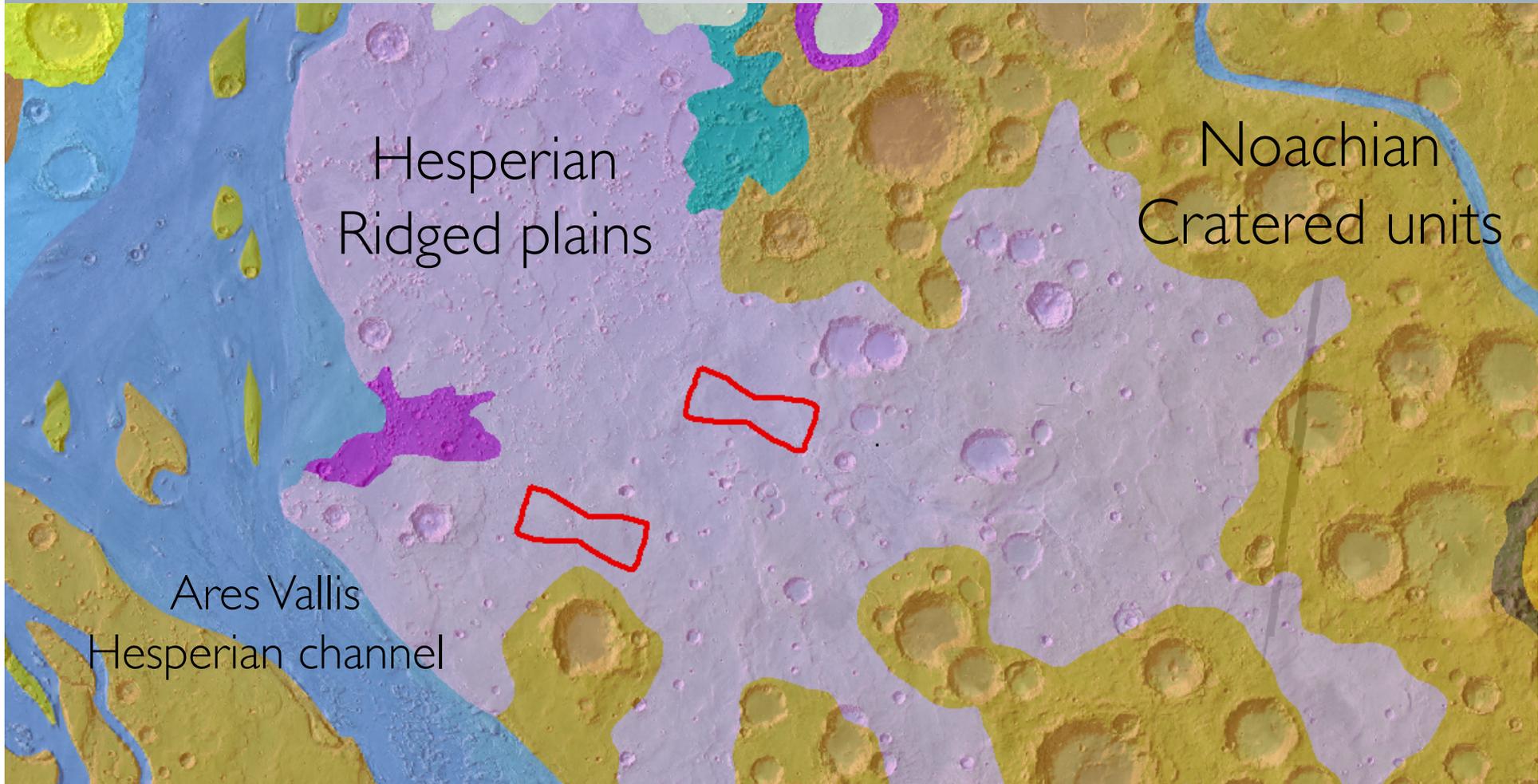


The phyllosilicate rich unit



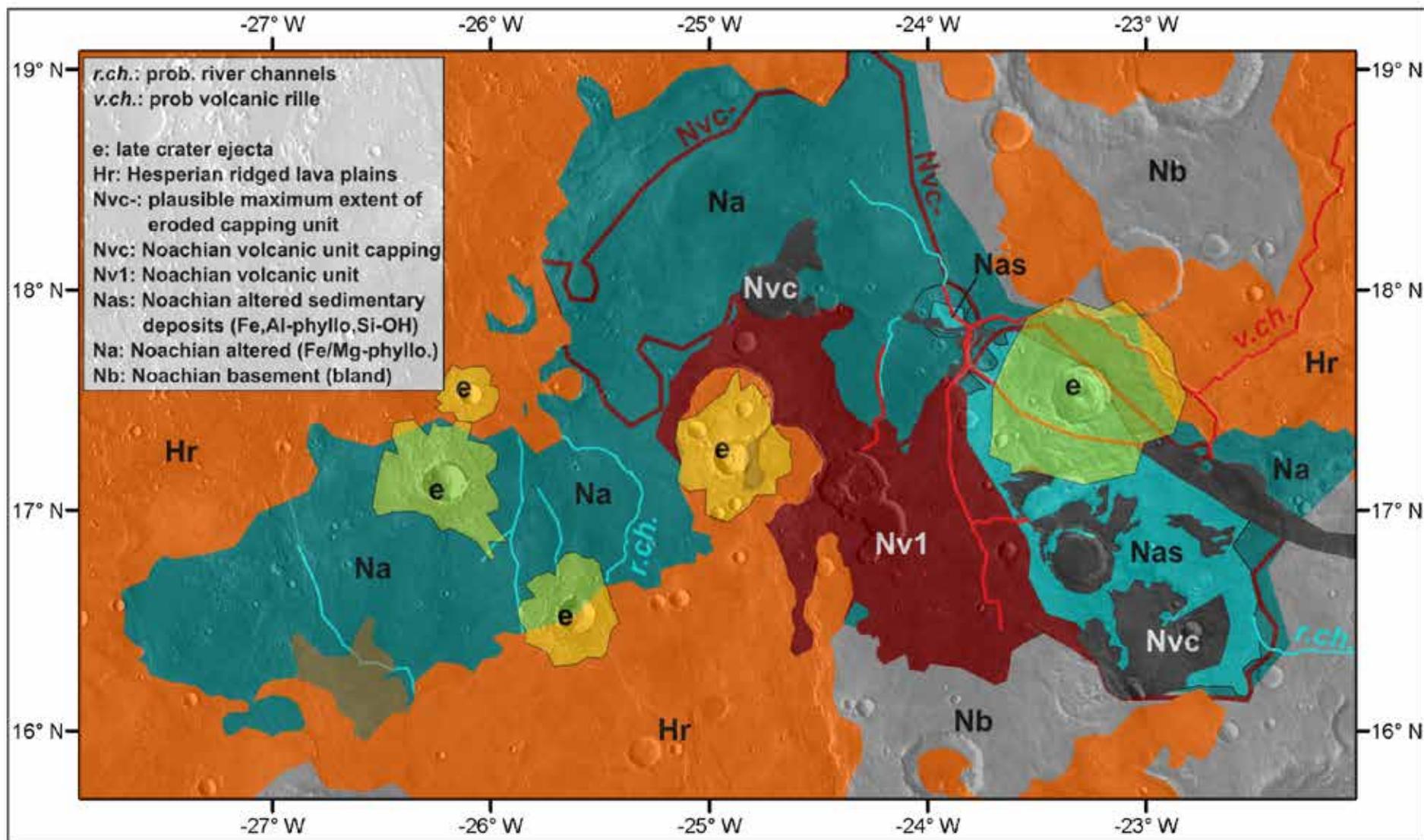
The phyllosilicate rich unit

Mawrth Vallis

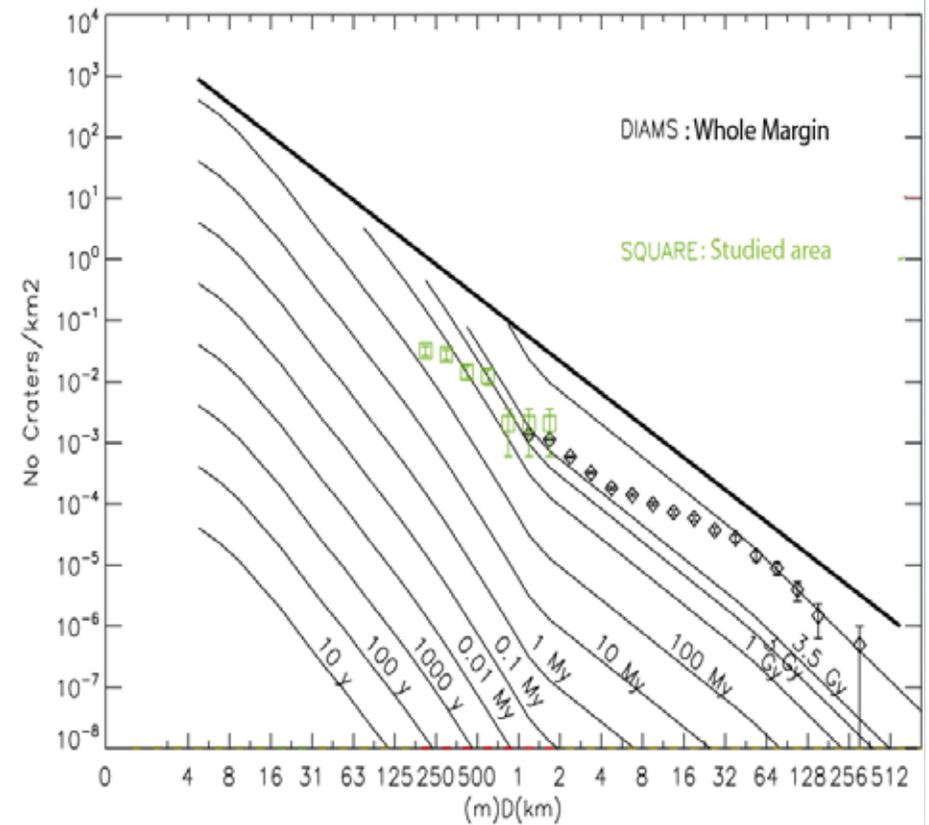
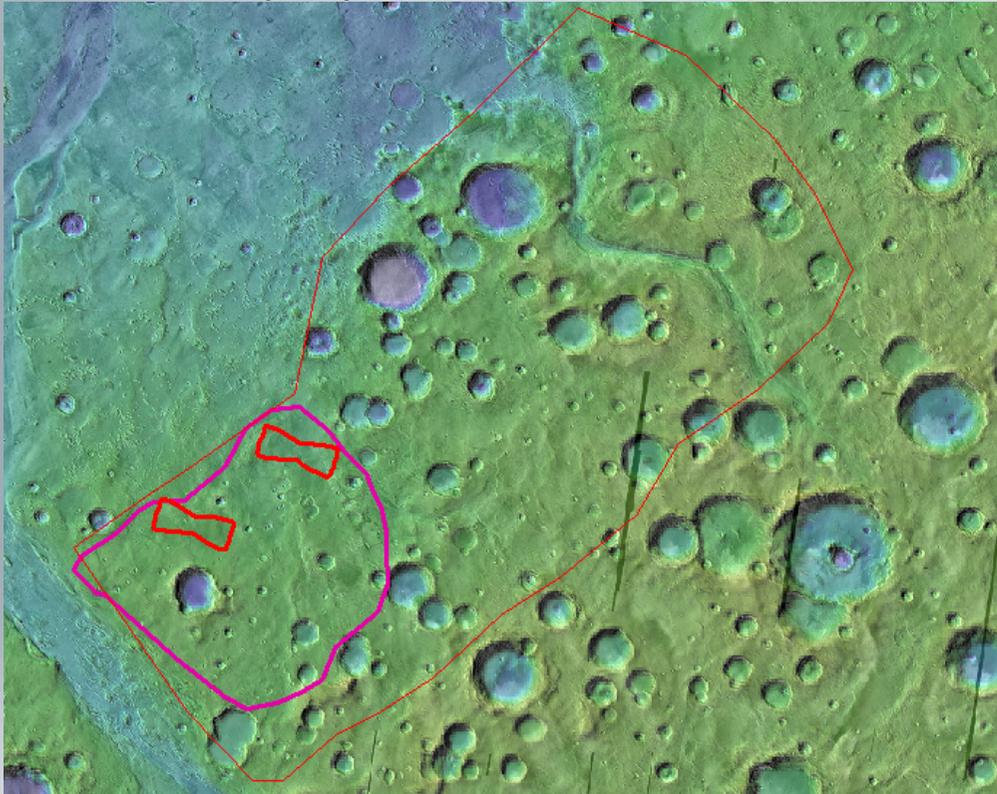


Global geological map

Preliminary geological map



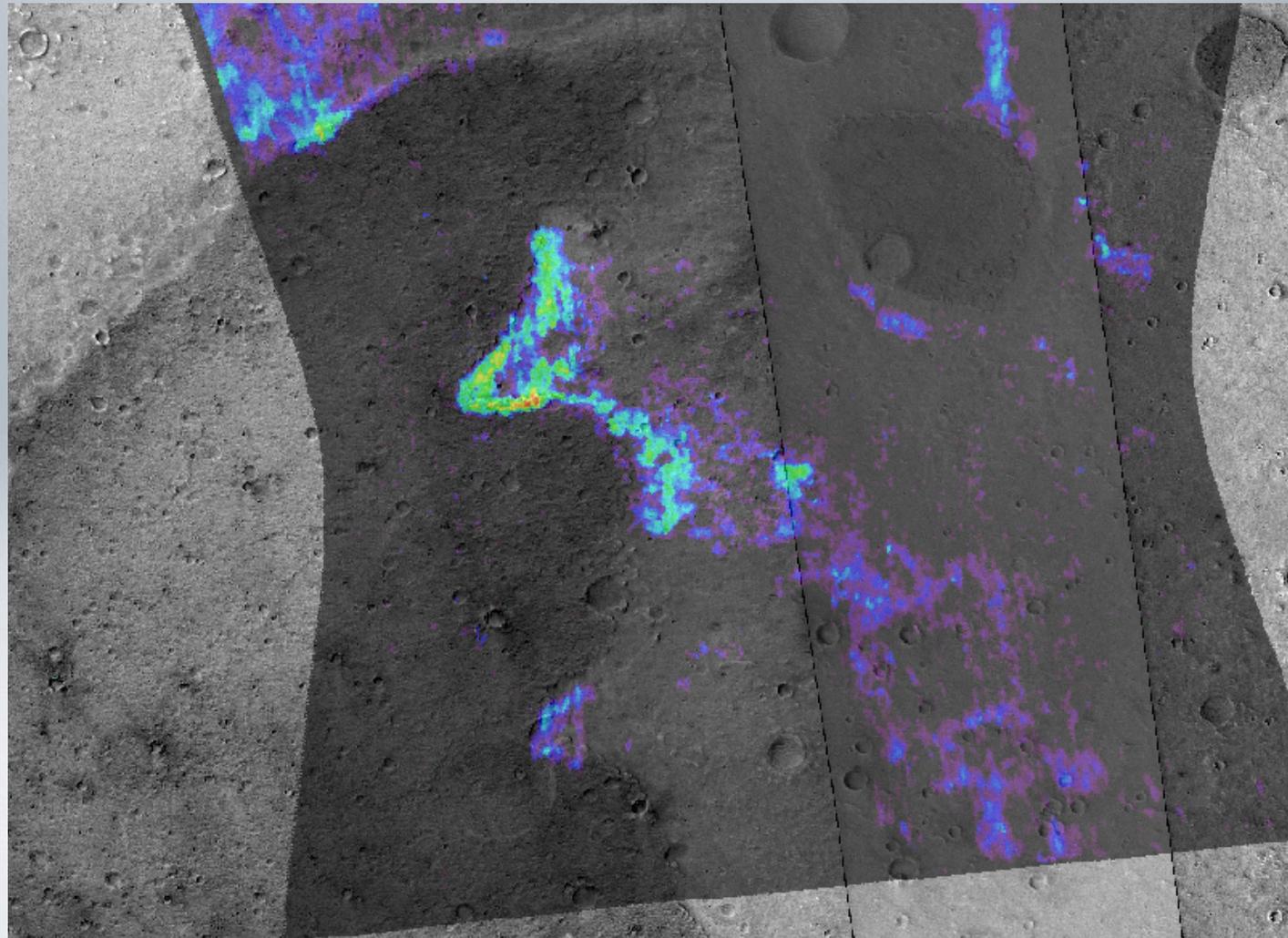
The phyllosilicate rich unit



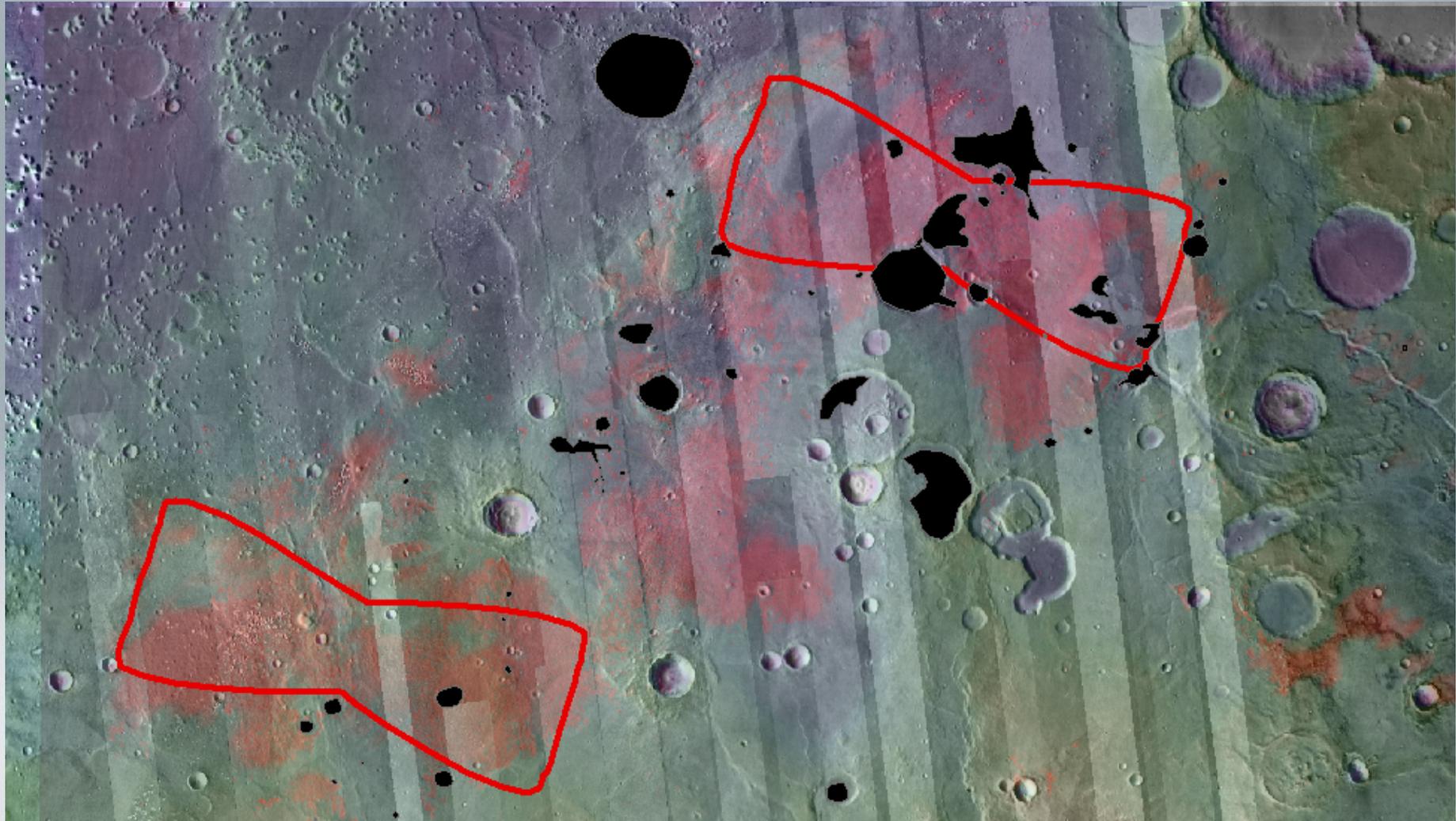
History of the Area from crater count

- Margin is 4Gy (+- 200 My) old
- Intense crater obliteration from 4 Gy to 3.6 Gy
- Moderate but continuous erosion since 3.6 Gy

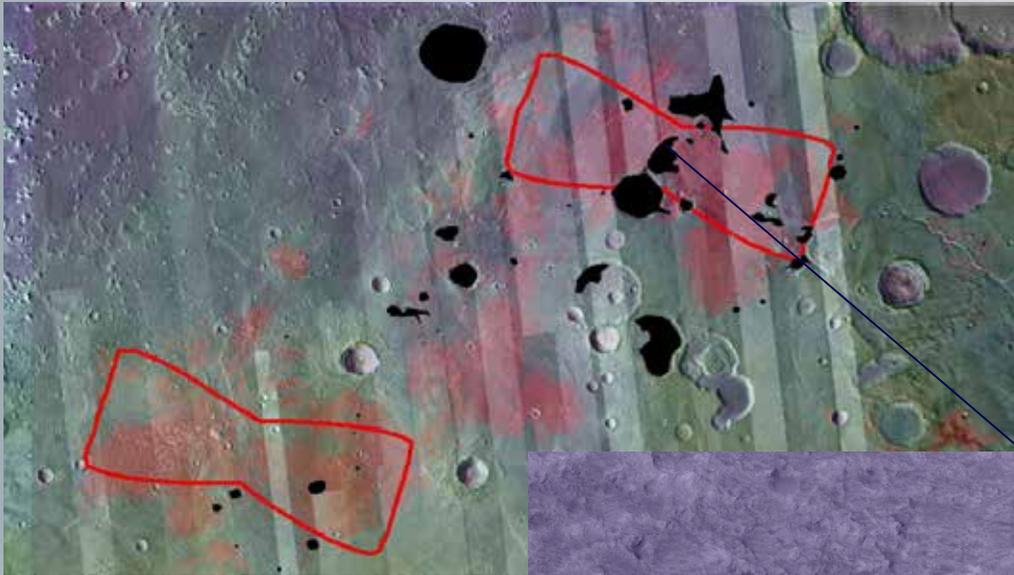
The capping unit



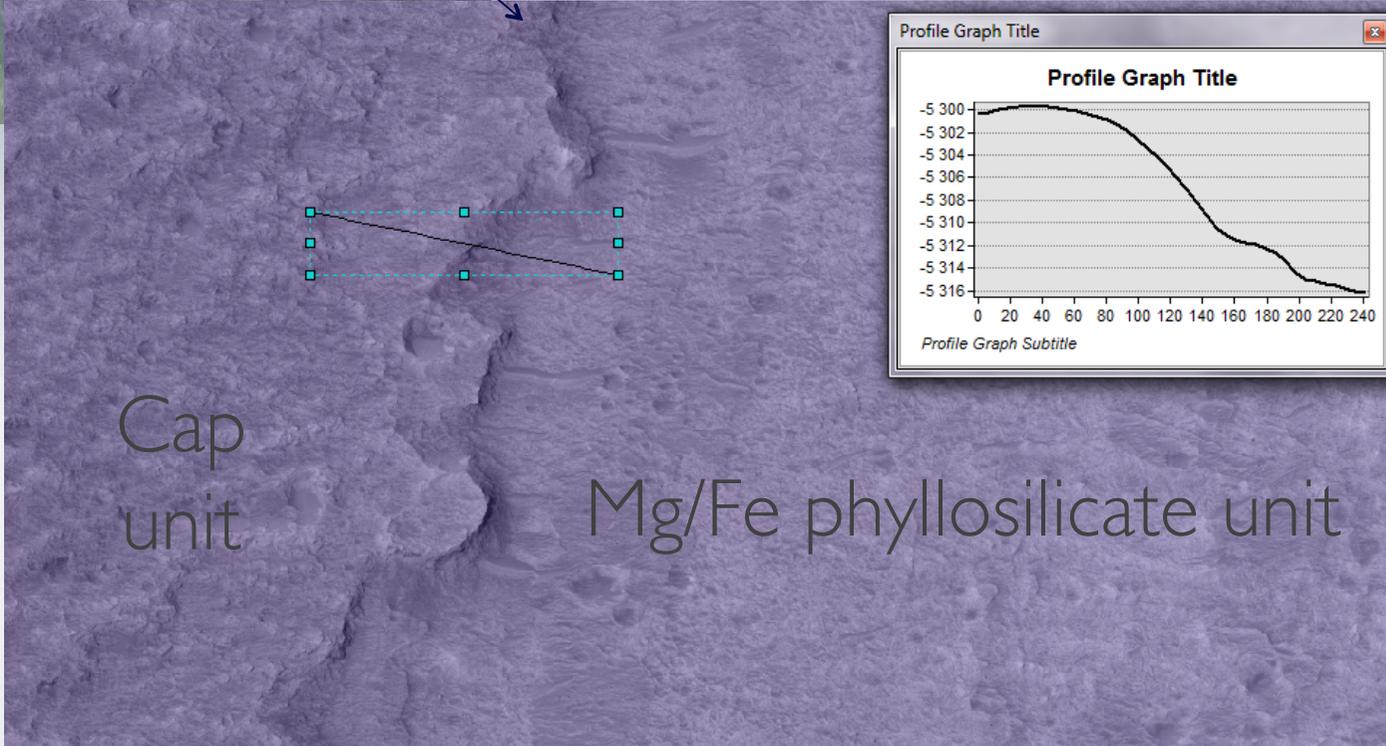
Extention of the cap unit



Thickness and life time of the cap unit



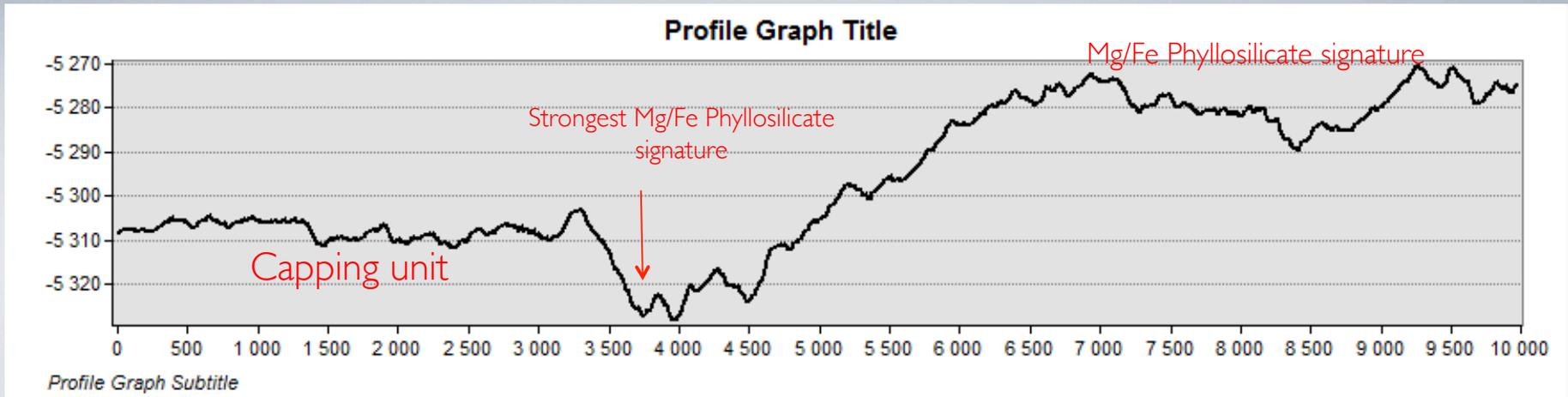
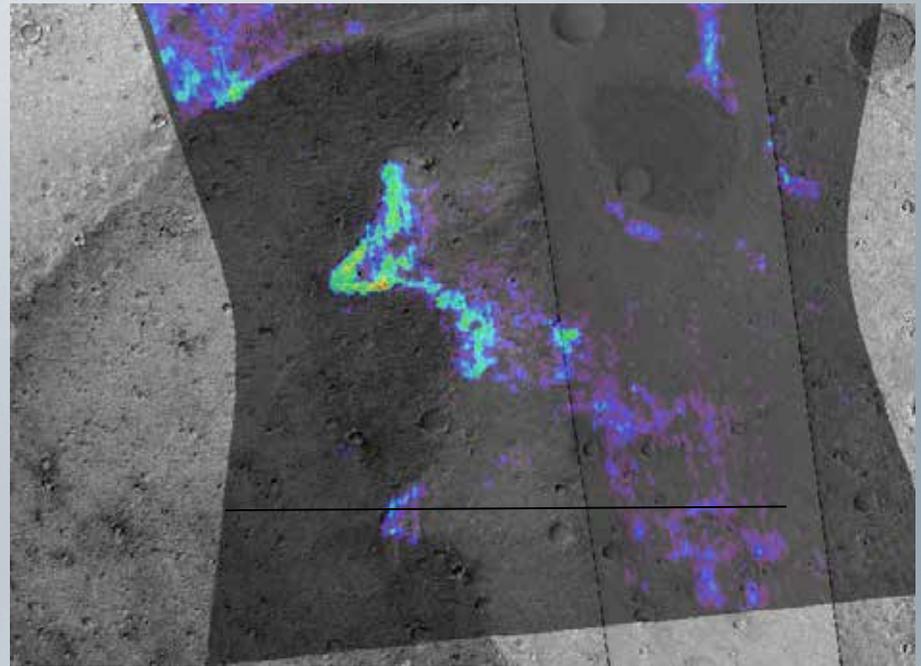
About 20m

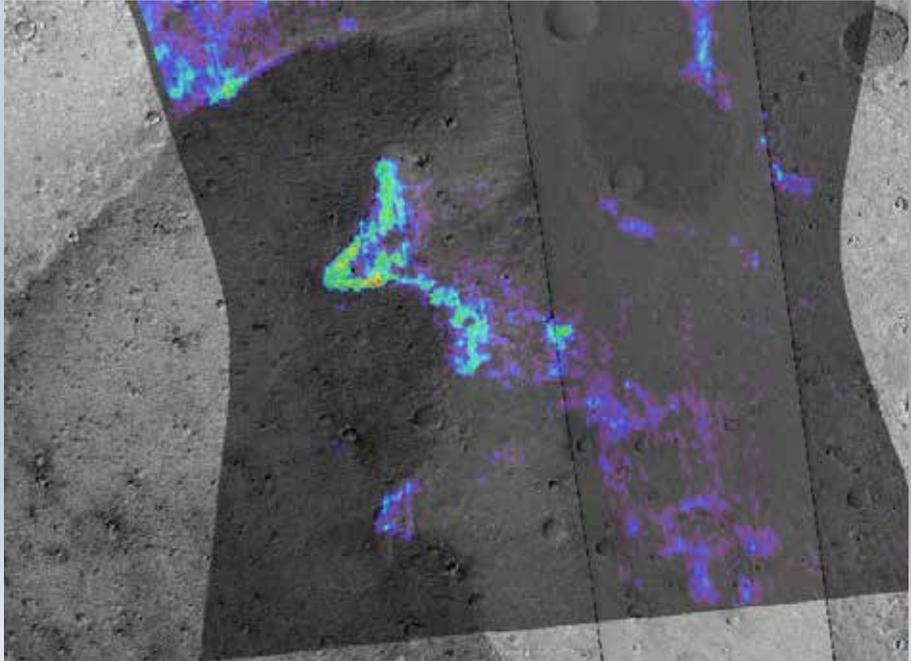
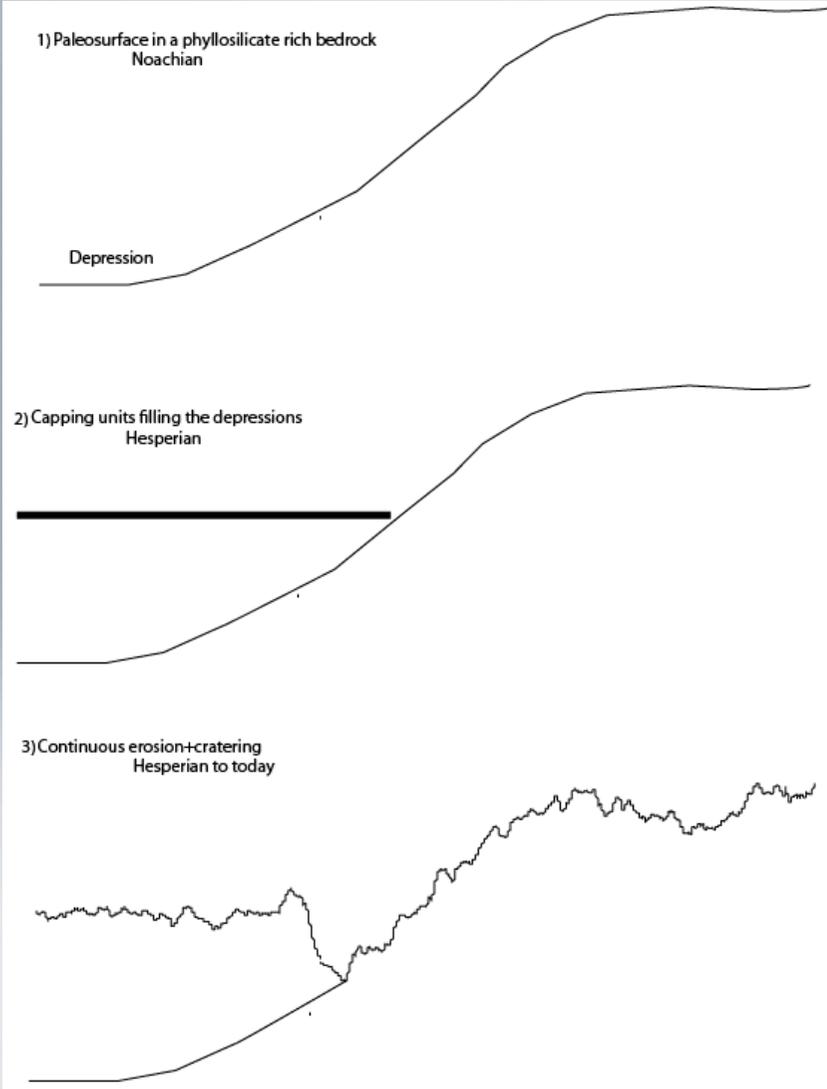


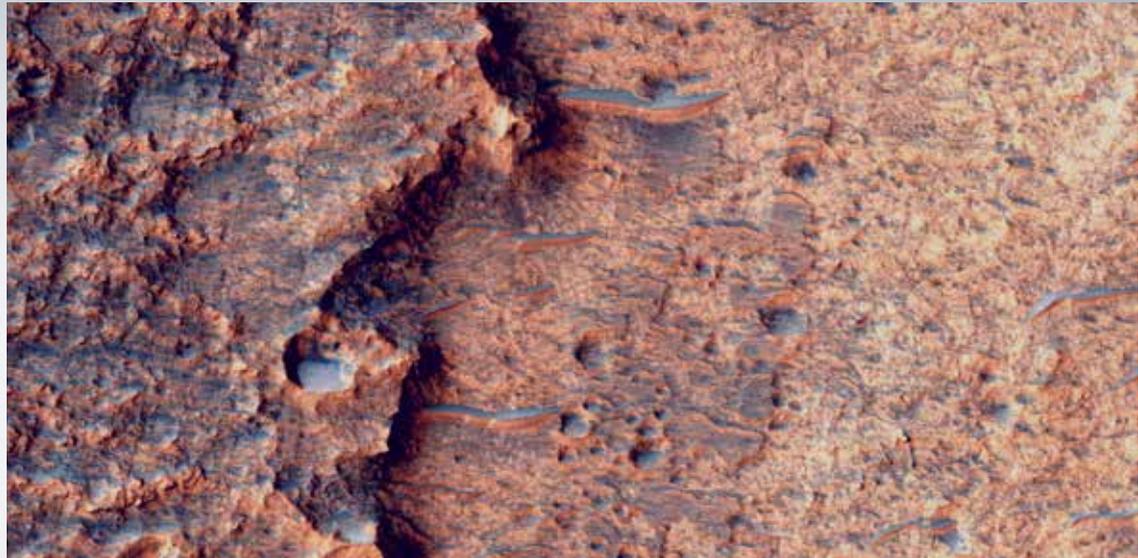
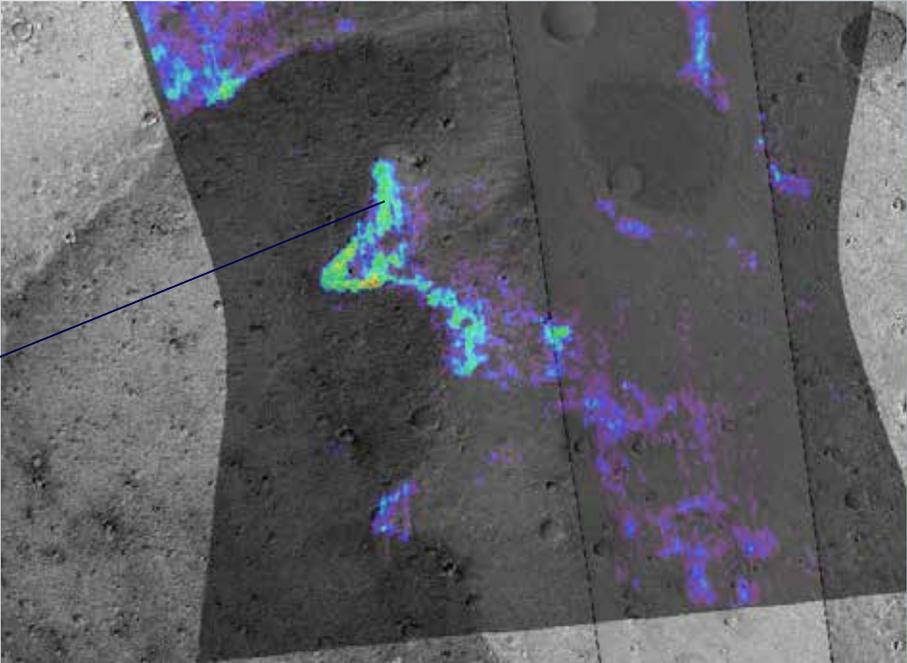
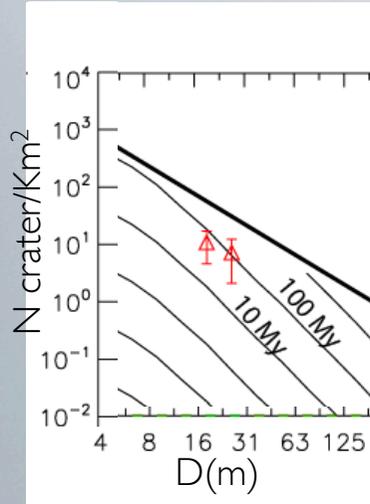
Erosion rate of 0.01 m/My during 3 Gy is enough!

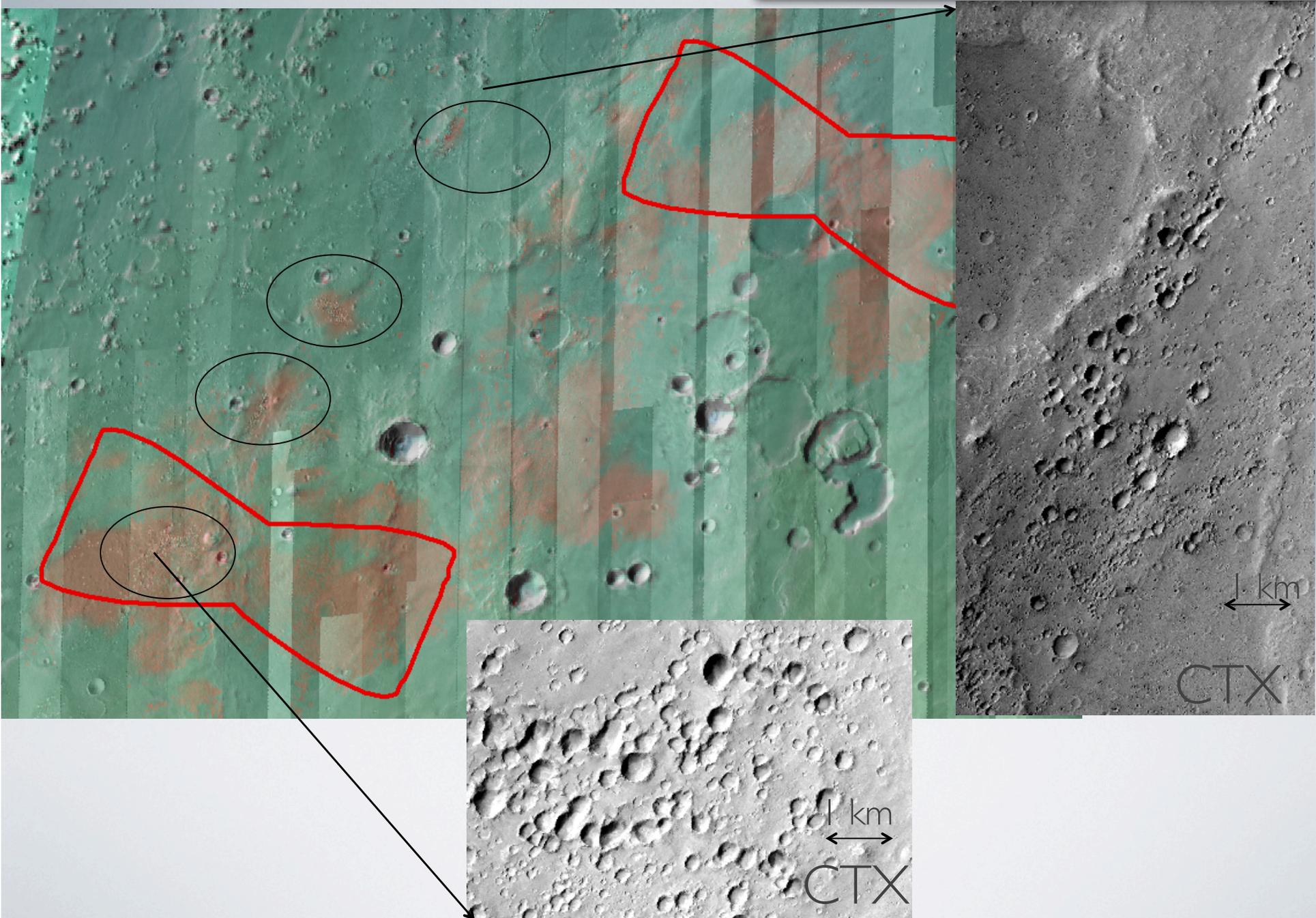
Cap unit

Mg/Fe phyllosilicate unit



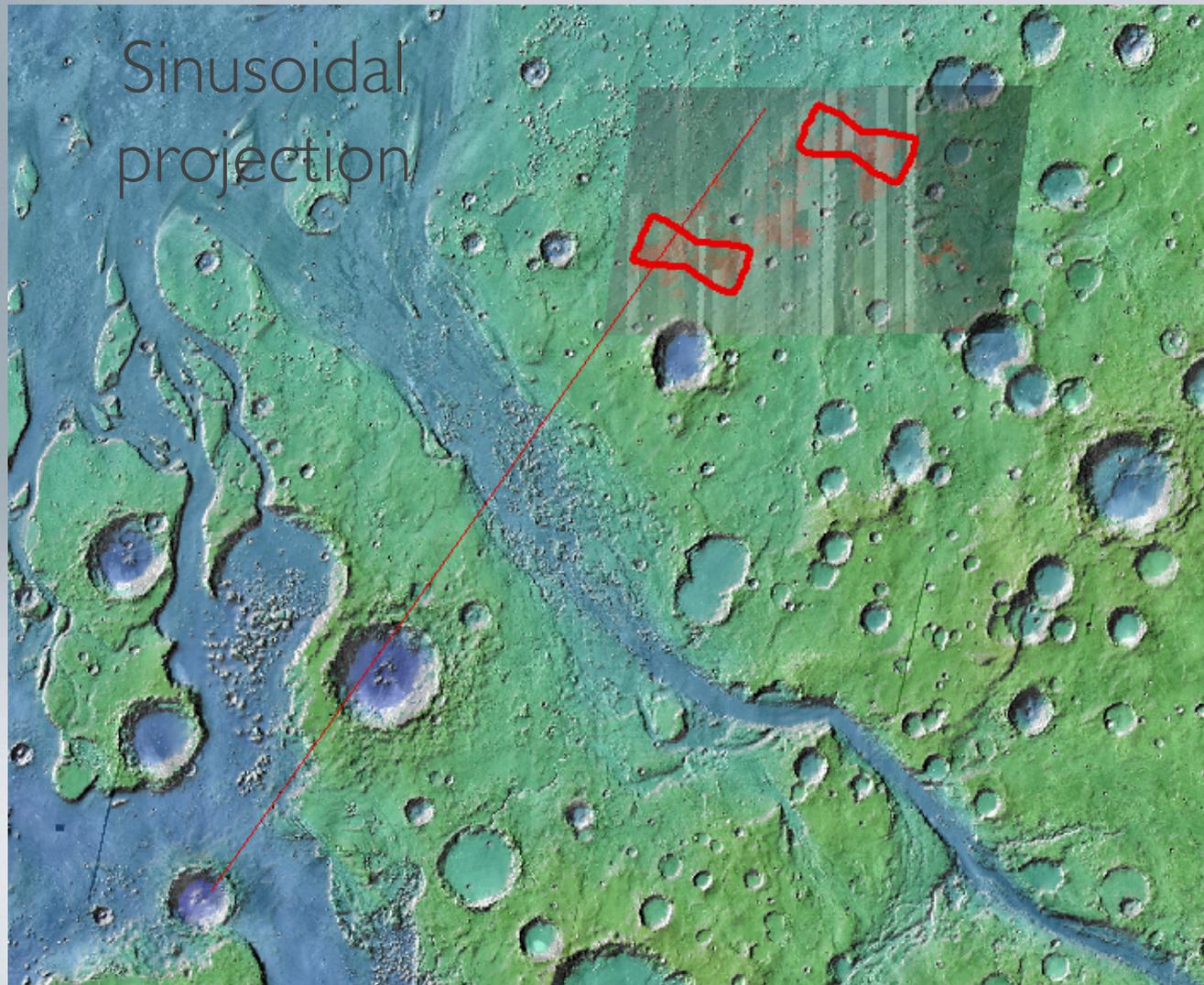






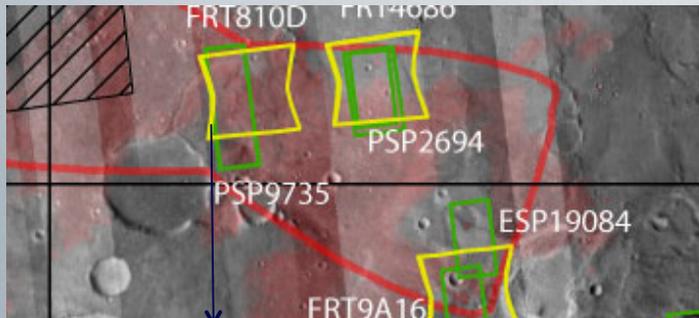
Aligned clusters



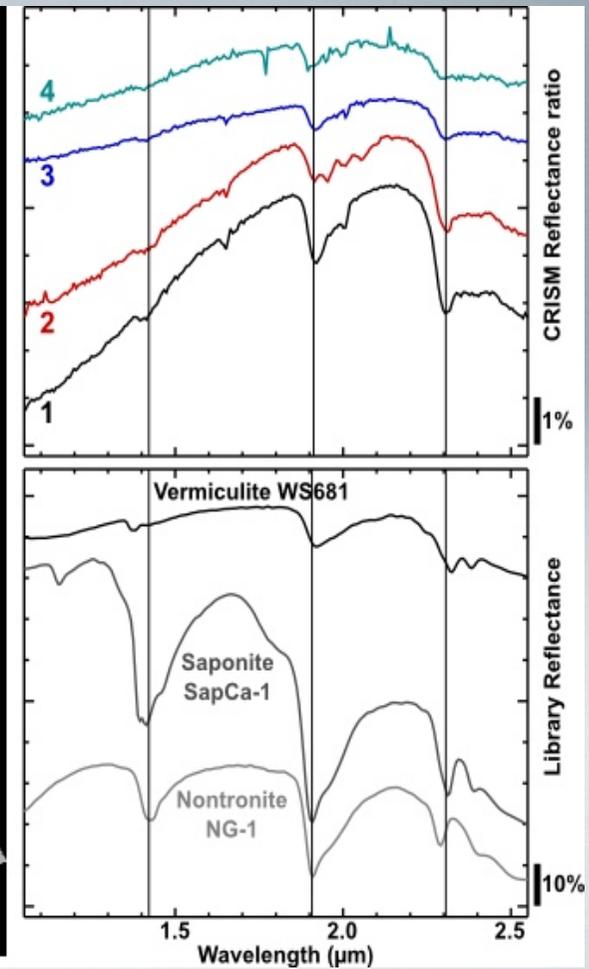
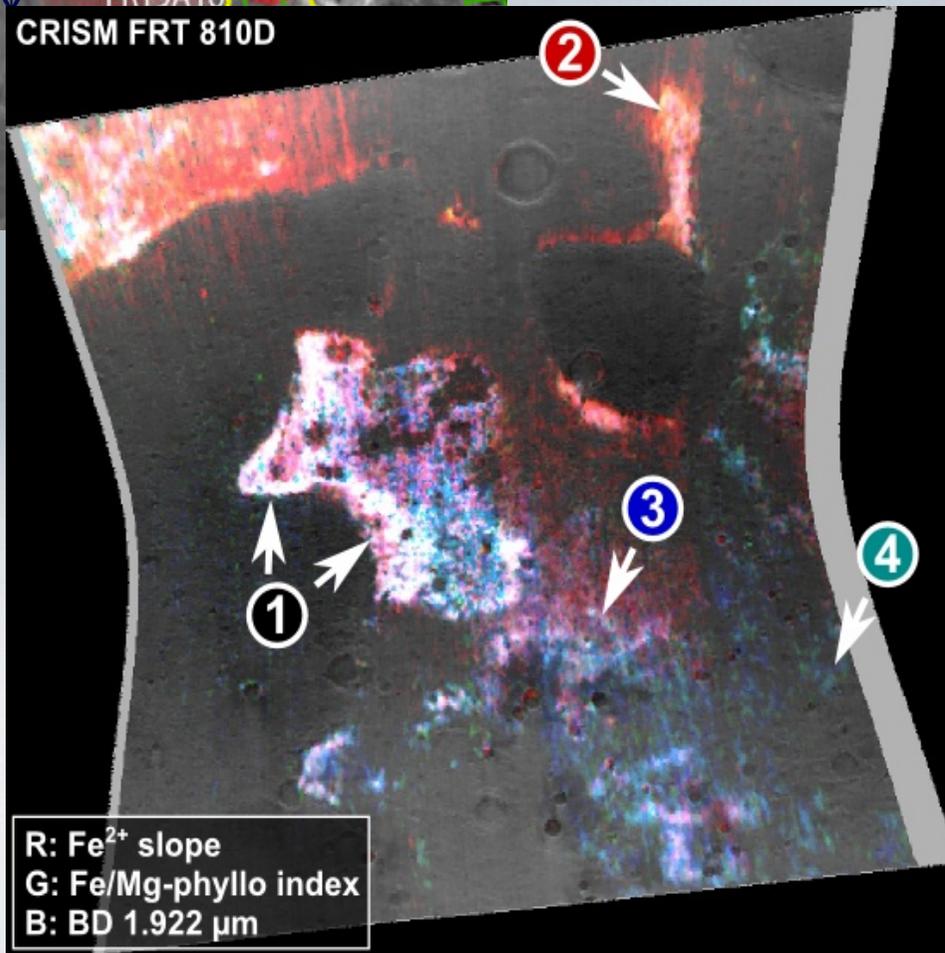


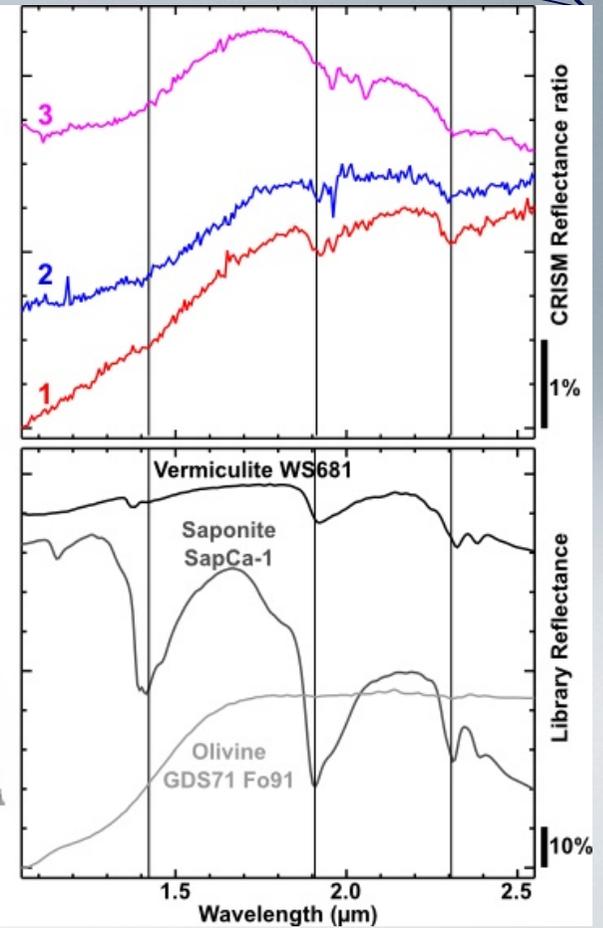
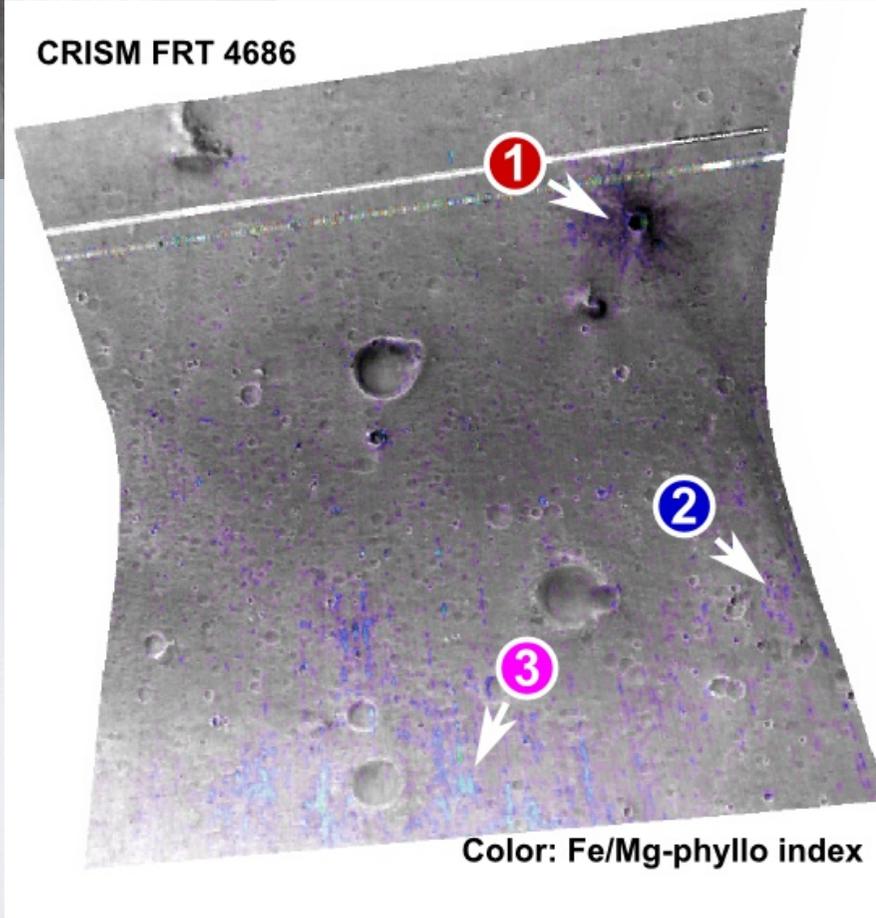
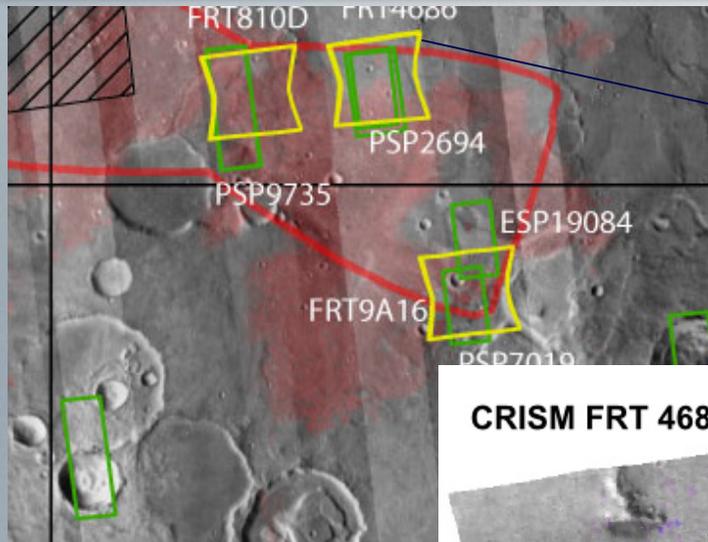
Find the primary
=find the
exposition age!

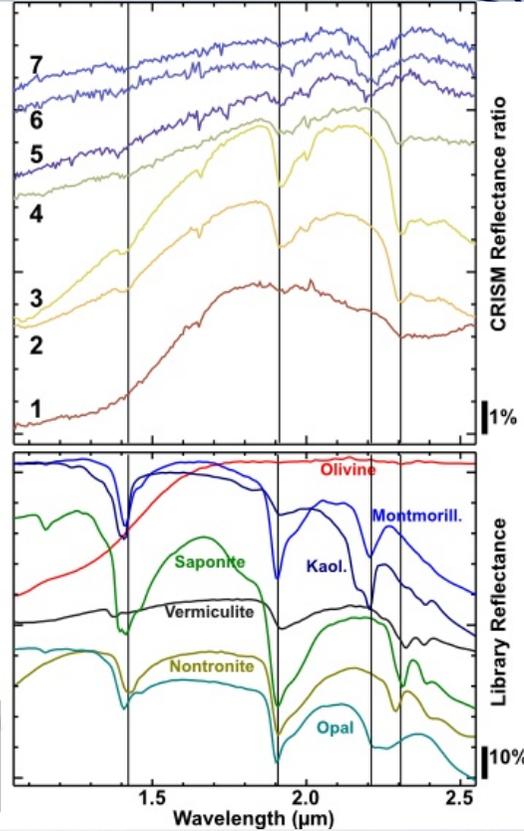
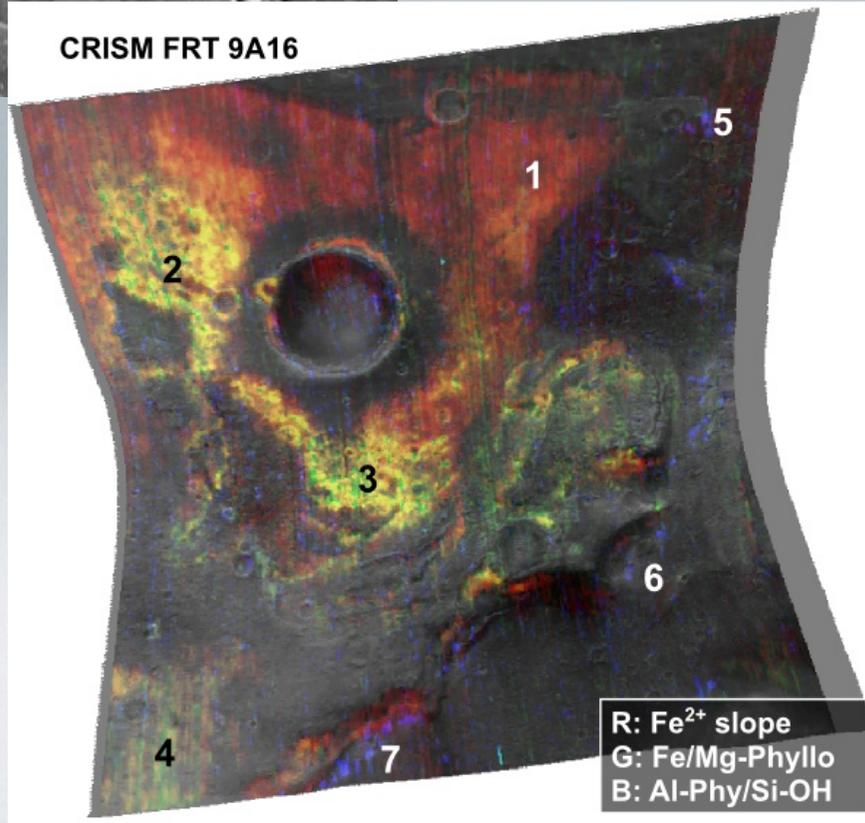
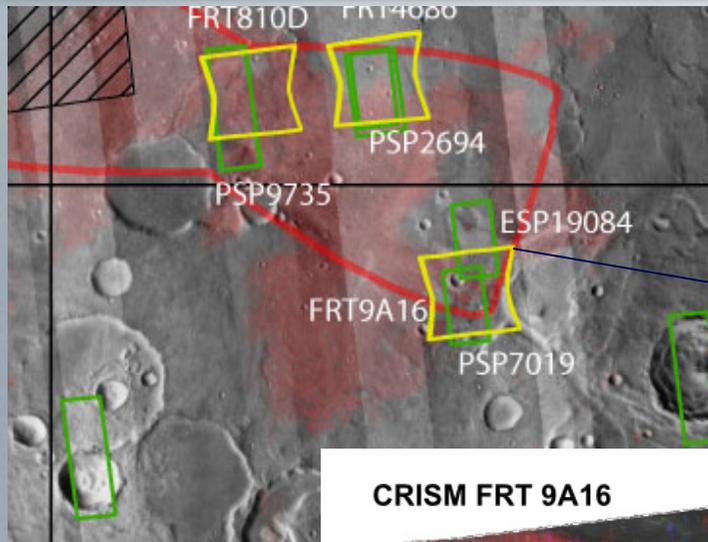
Mojave Crater
5My (Werner et
al., 2014)



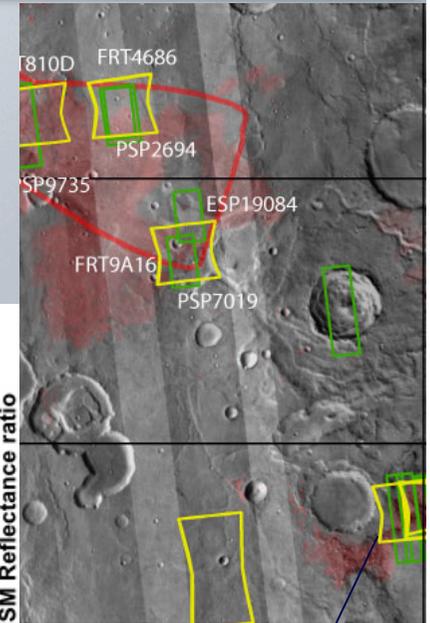
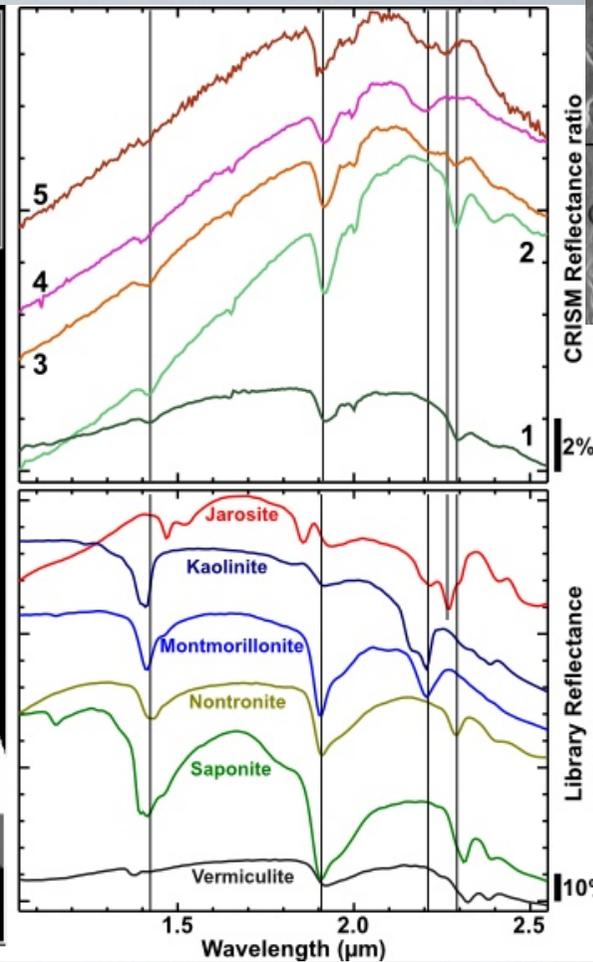
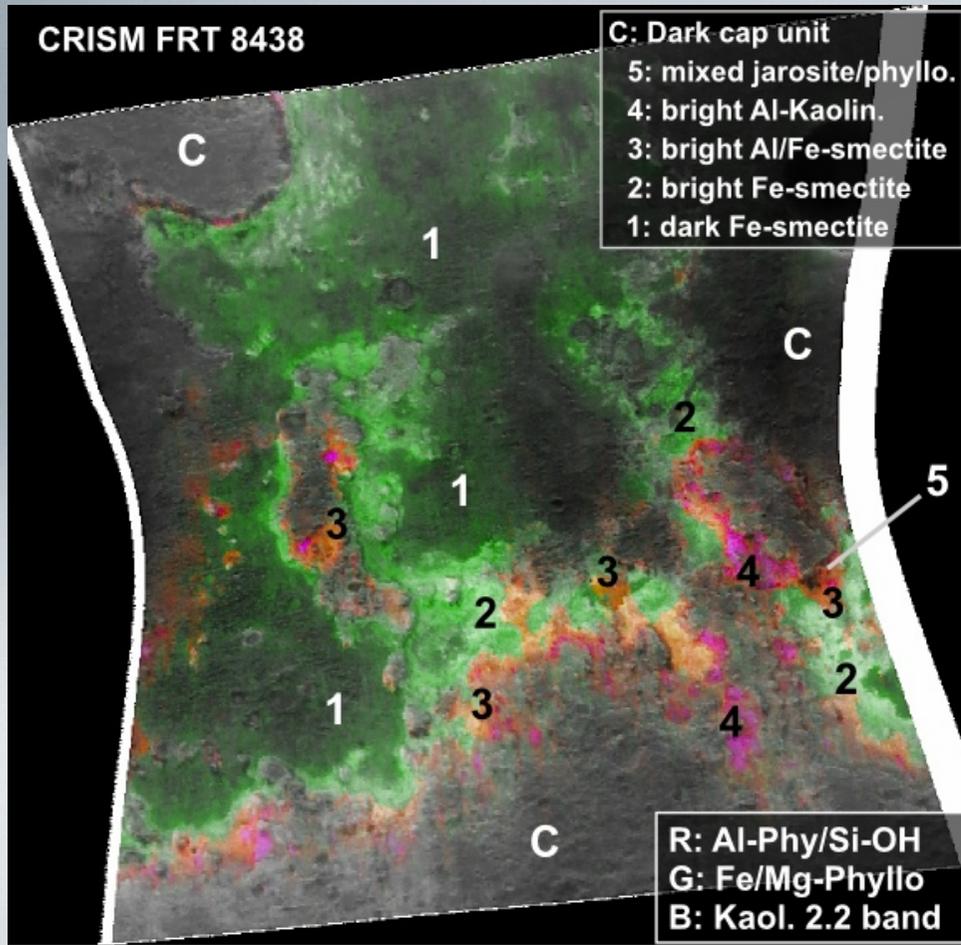
The closer we are from the capping unit, the stronger the signature are



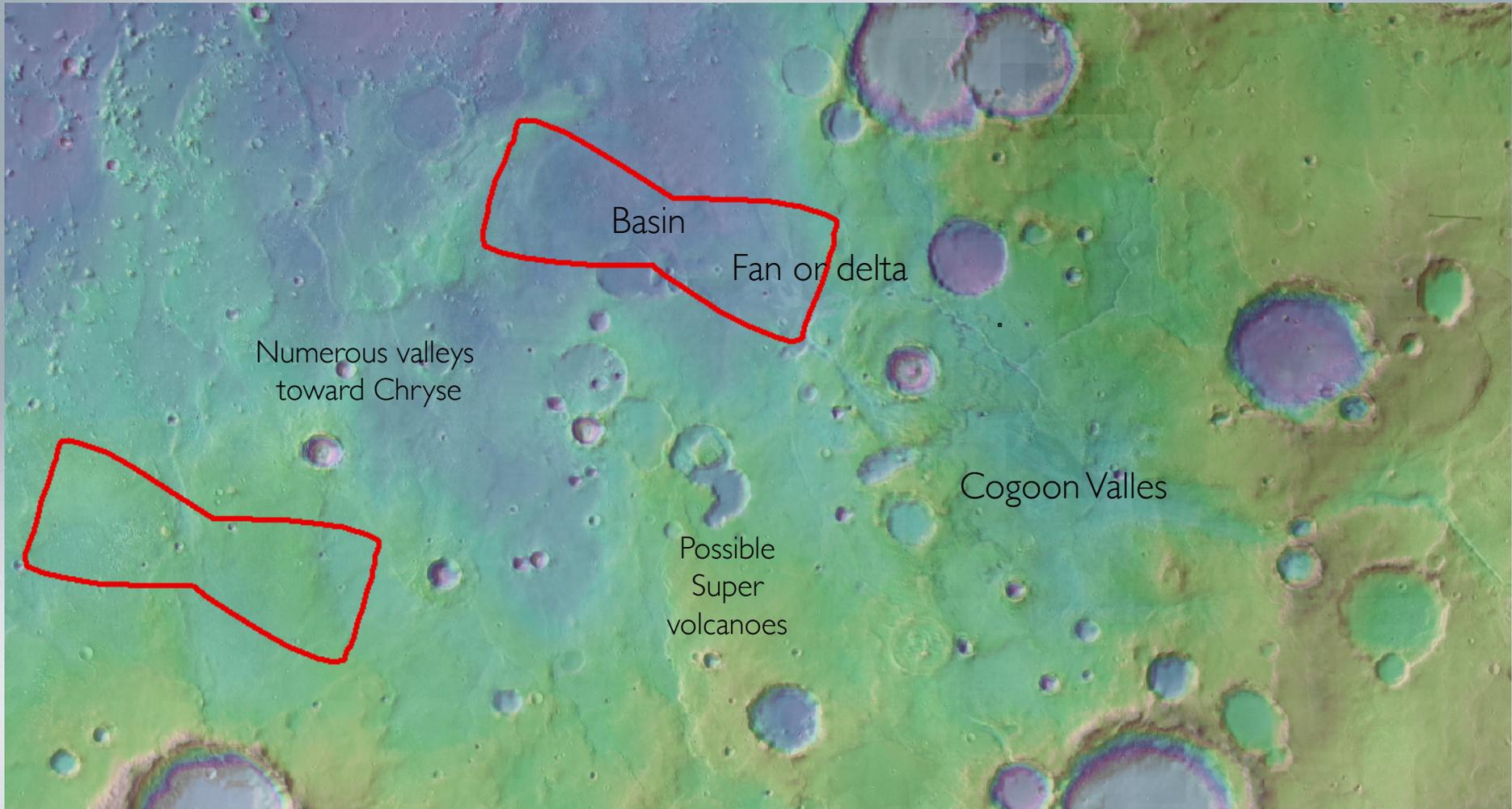




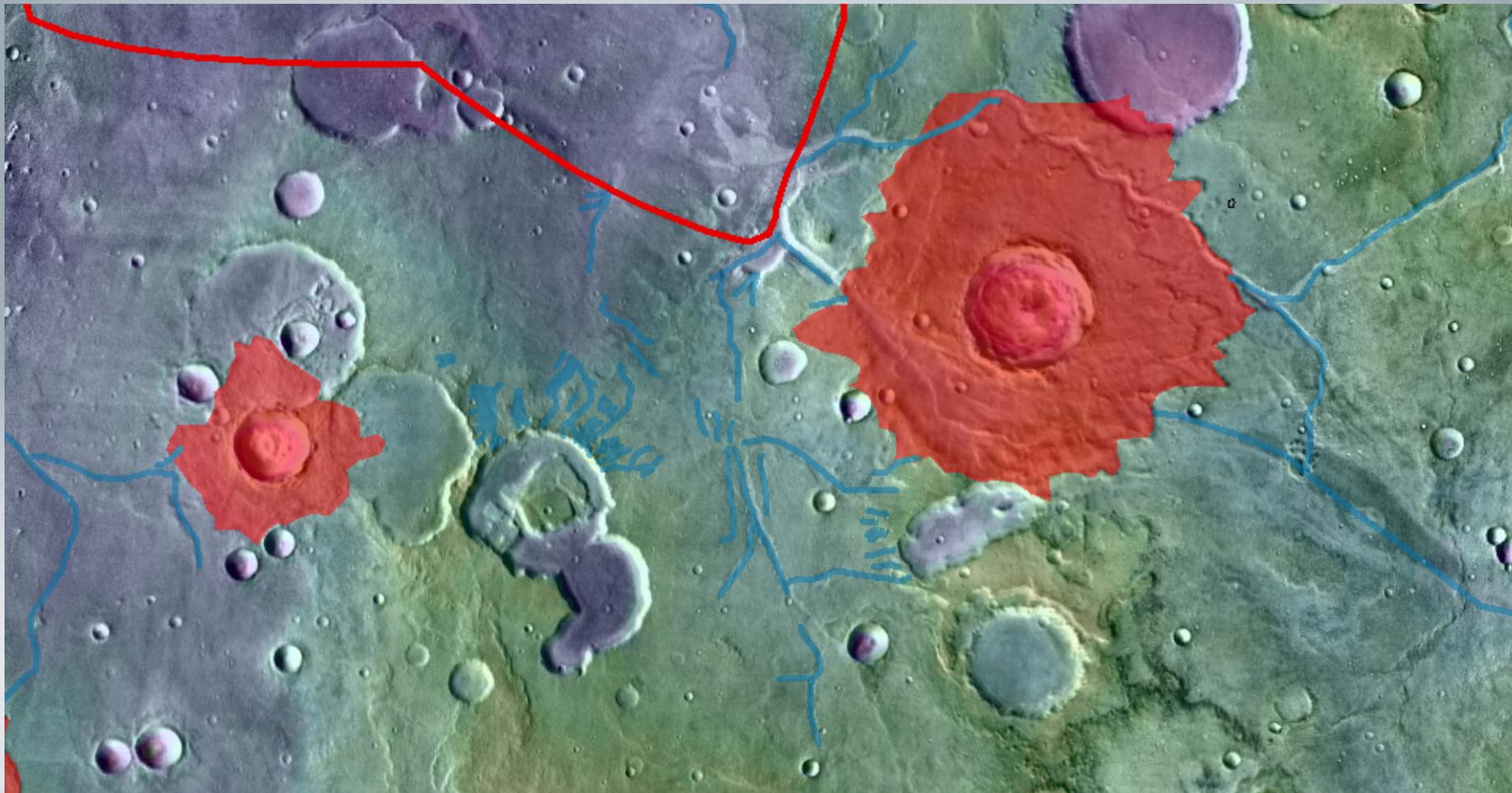
Marwth vallis like sequence



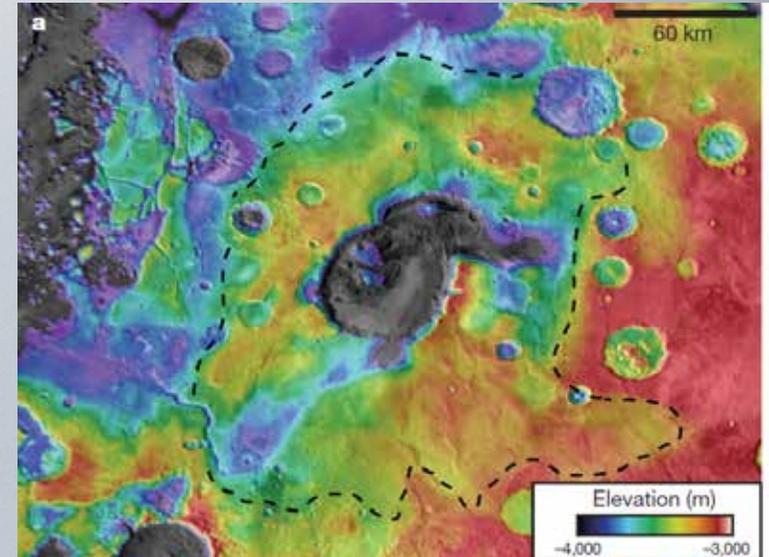
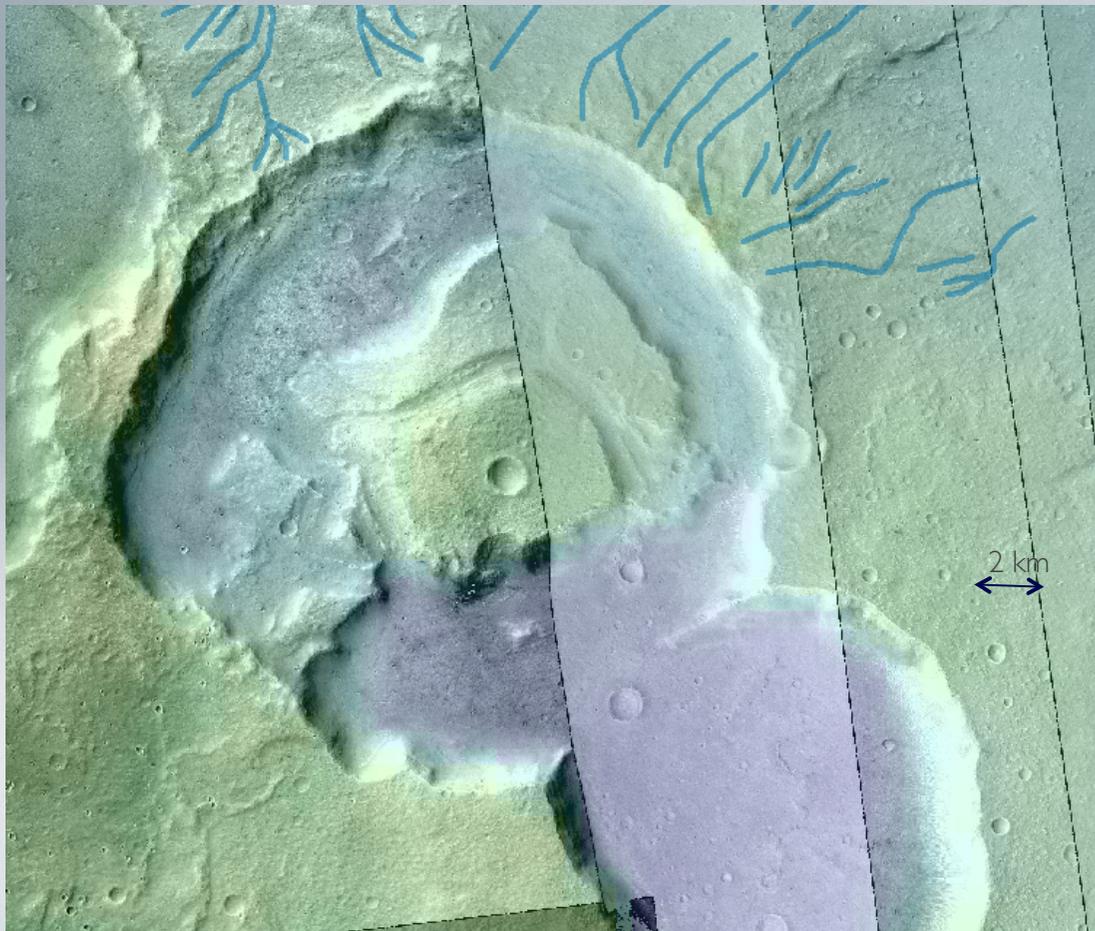
Overview of other key elements



Volcanic edifices ?

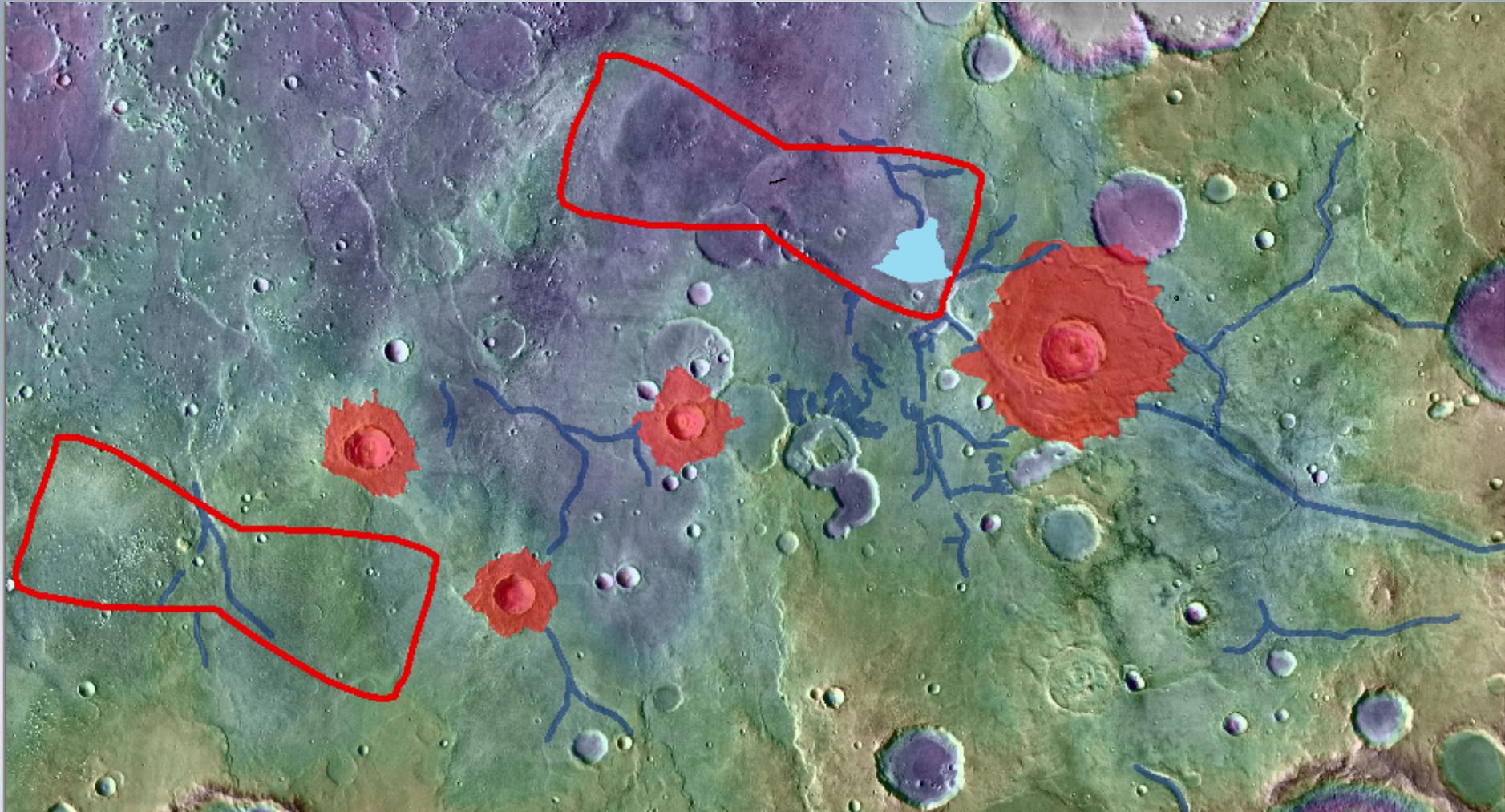


Volcanic edifices ?



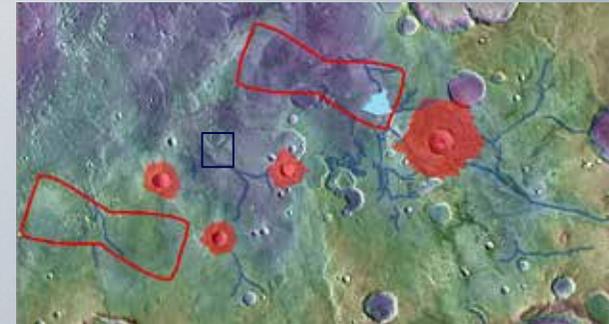
Exemple of supervolcano detected further north in Arabia Terra (Michalski and Bleacher, 2013)

Fluvial features

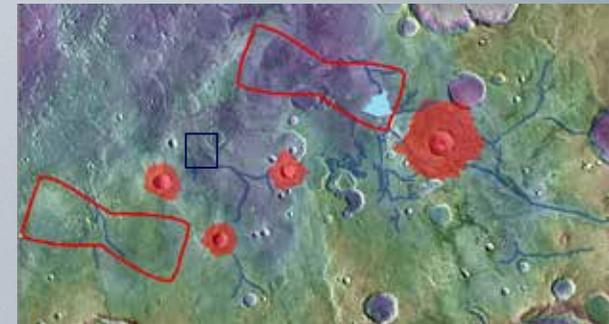
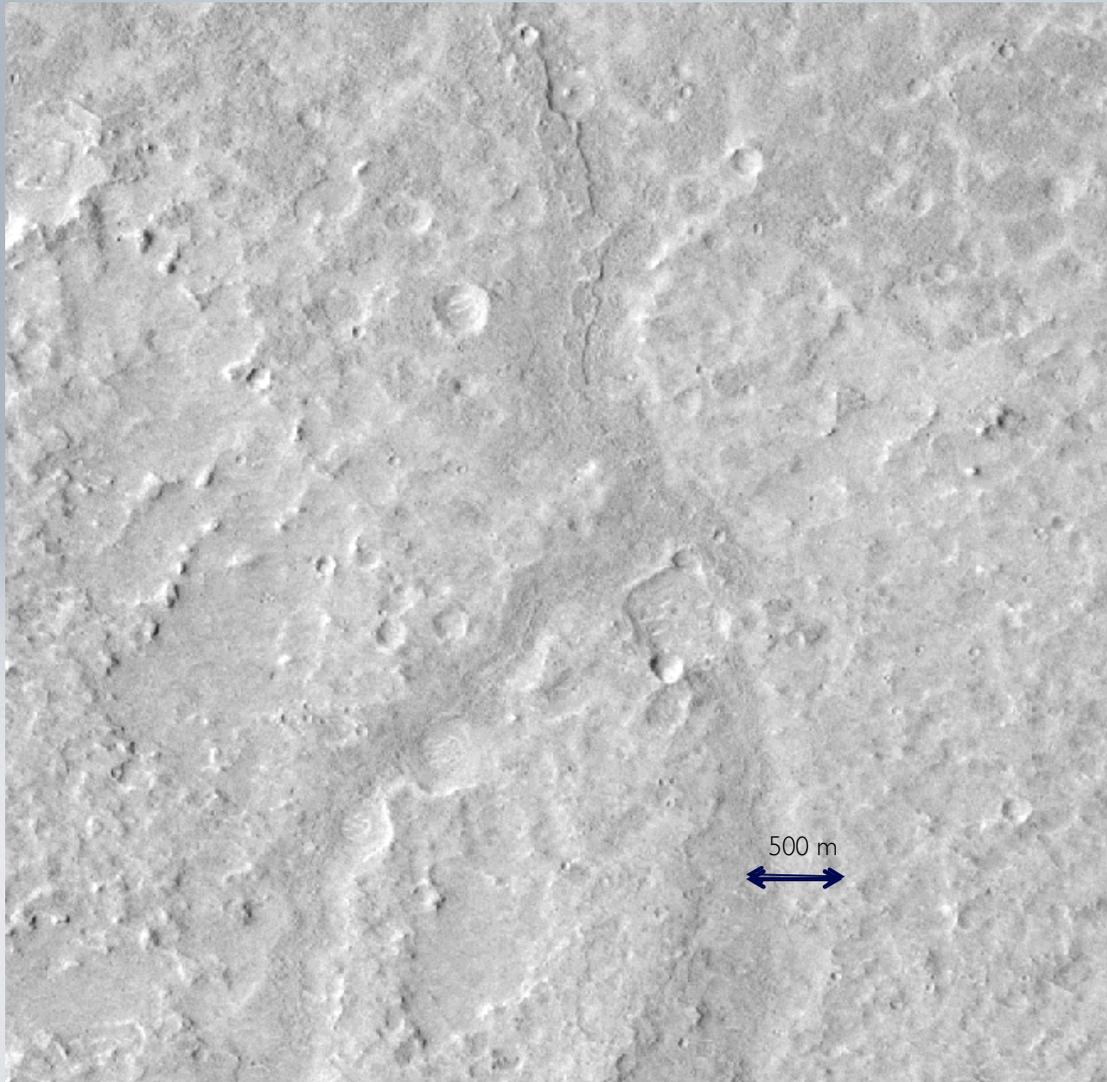


Fluvial features

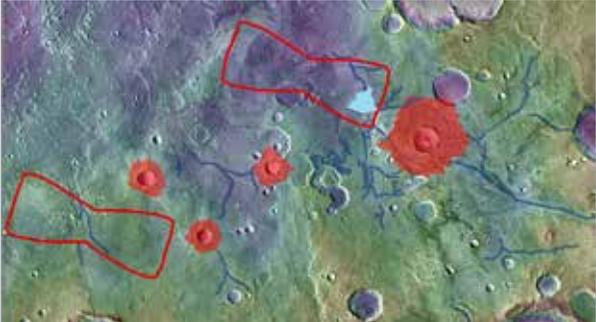
- Inverted channels



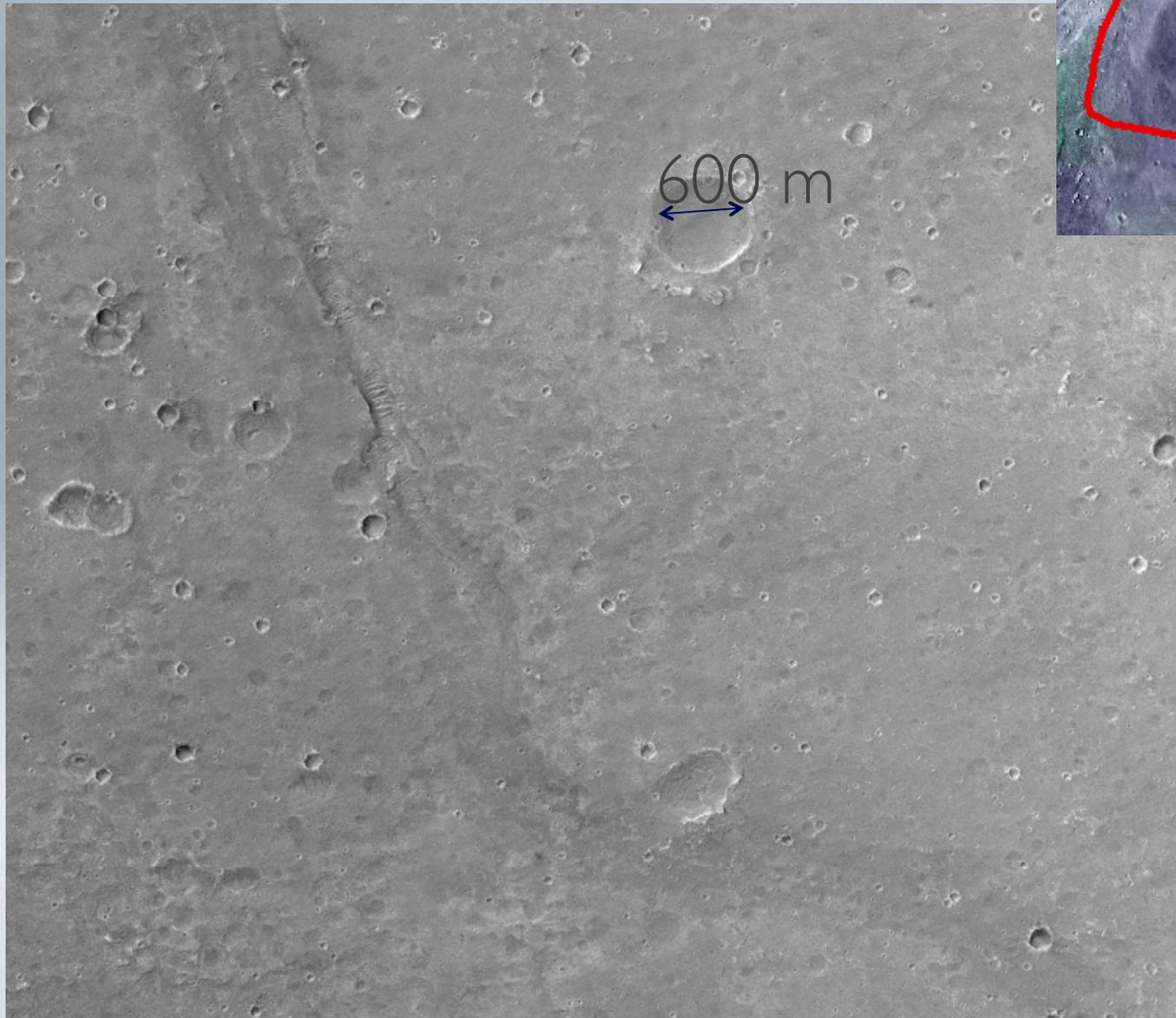
Fluvial features : inverted channels



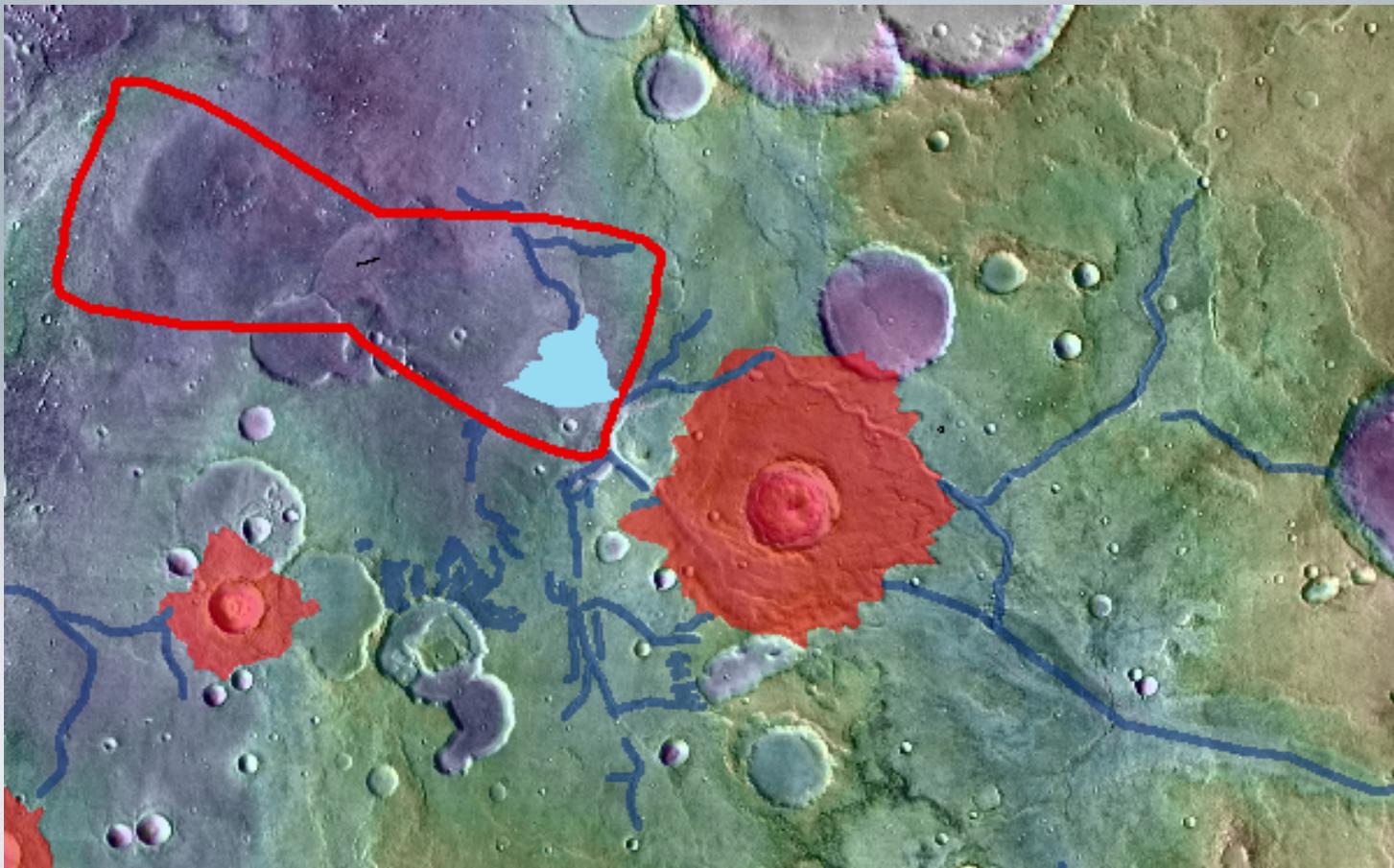
Fluvial features : EI2



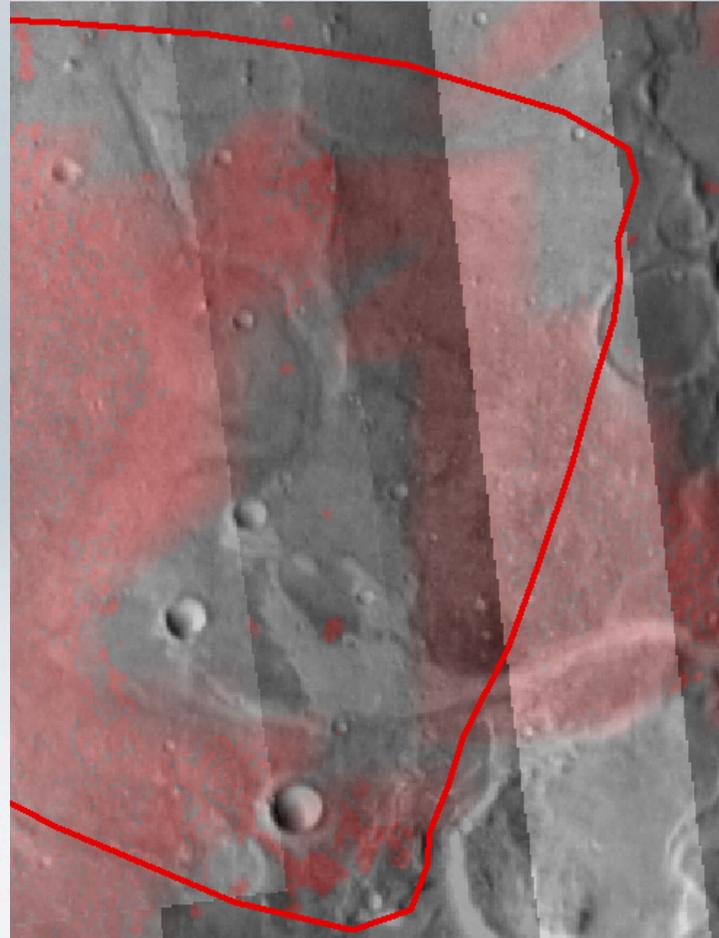
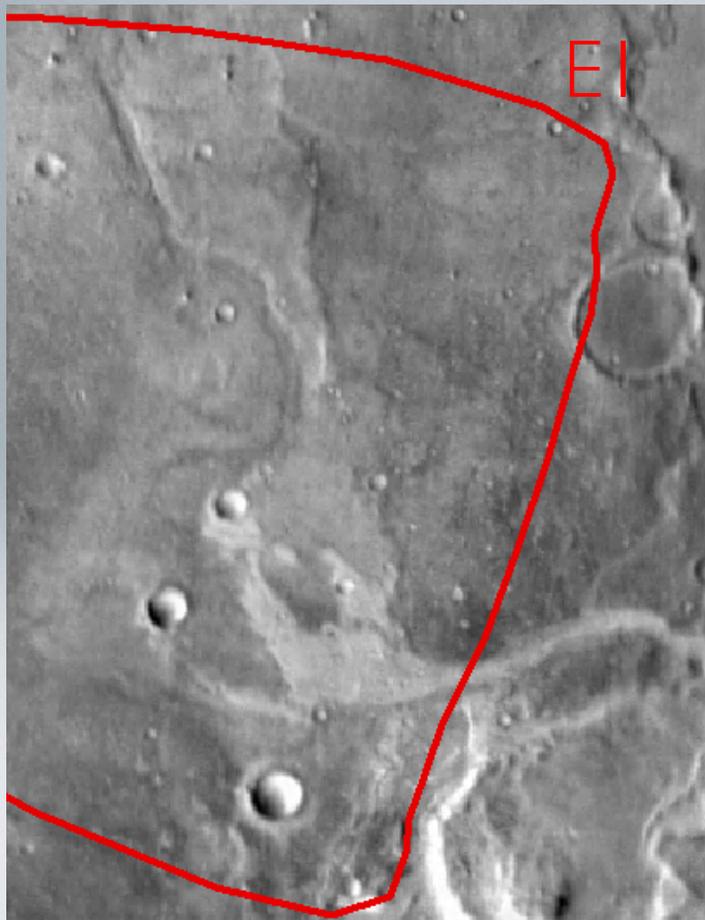
Fluvial features : E1



Fans shaped deposit : outlet of Cogoon Vallis

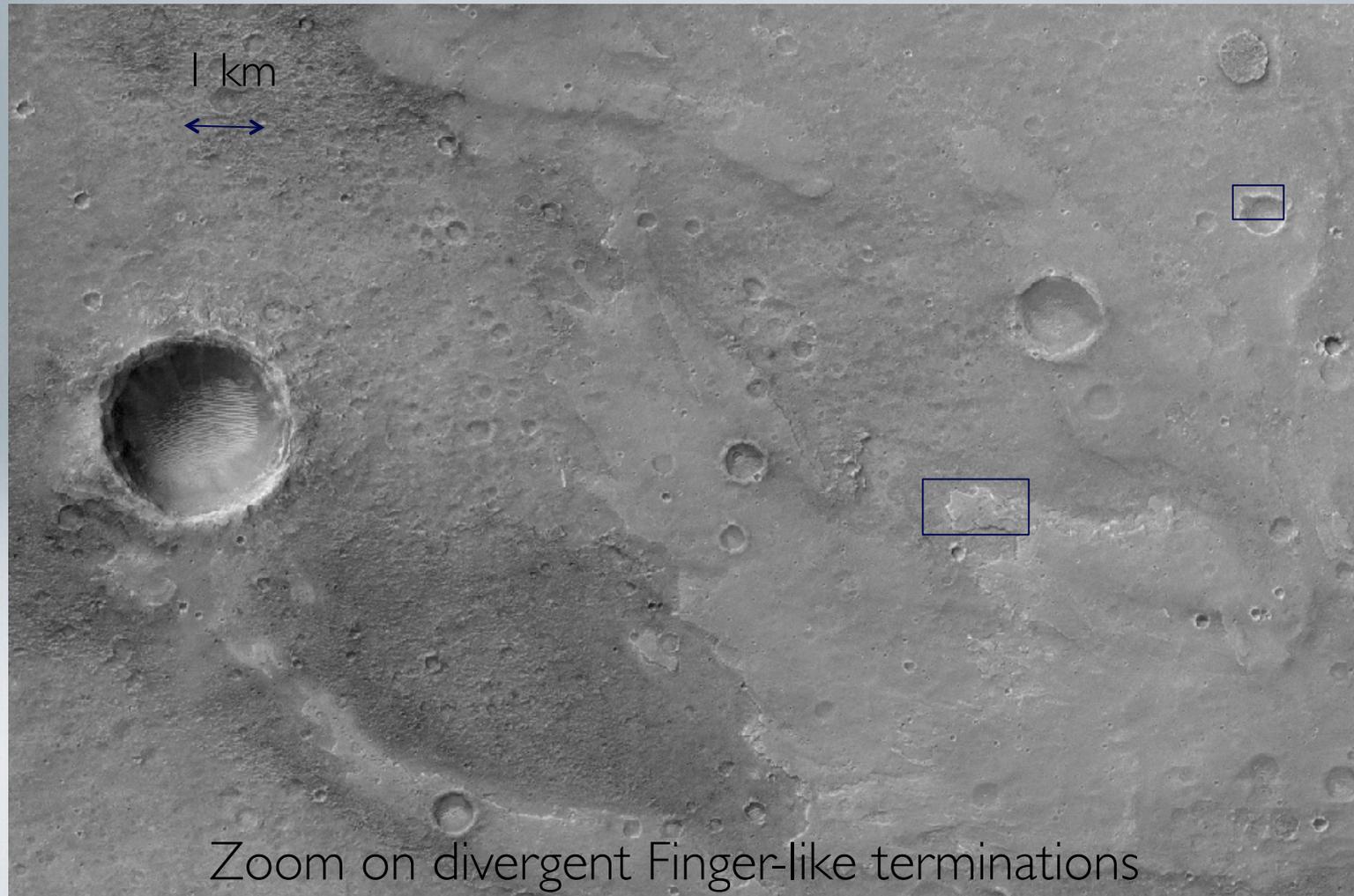


Fans shaped deposit : outlet of Cogoon Vallis



Divergent Finger-like terminations

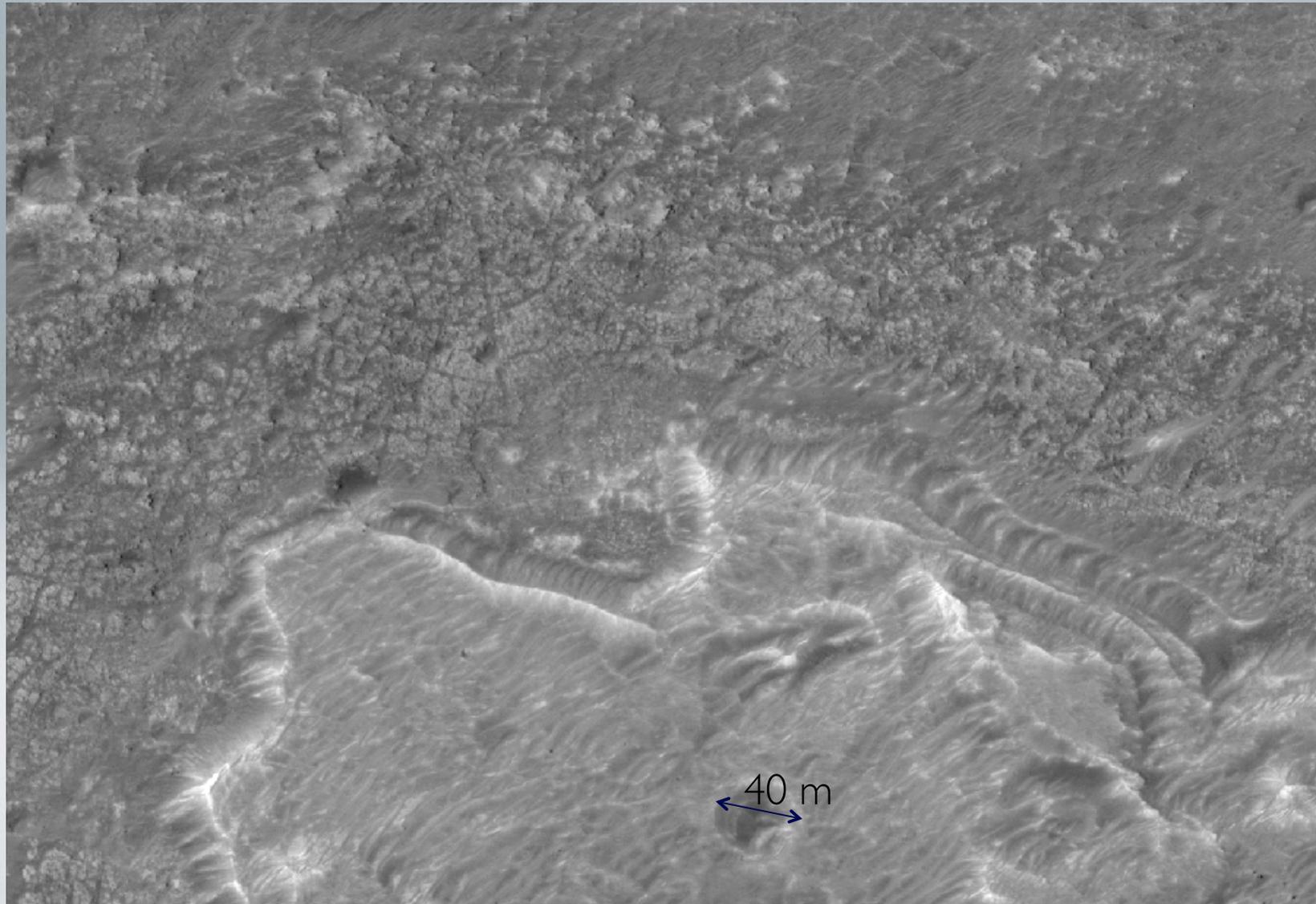
Fans shaped deposit : outlet of Cogoon Vallis



Zoom on divergent Finger-like terminations

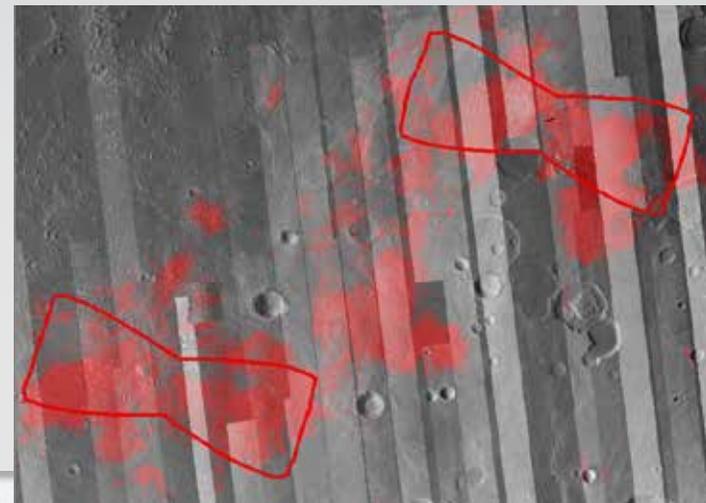
Flat surface and No obvious channels : subaqueous delta fans ?

Fans shaped deposit : outlet of Cogoon Vallis

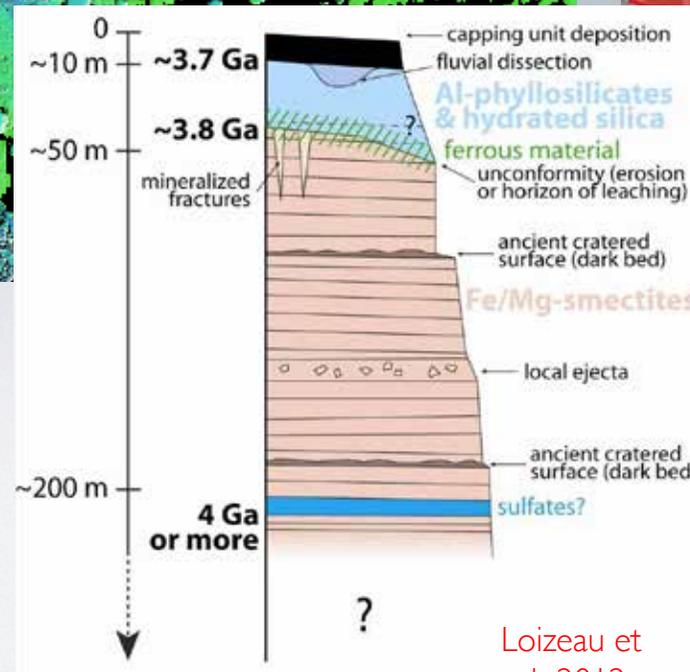
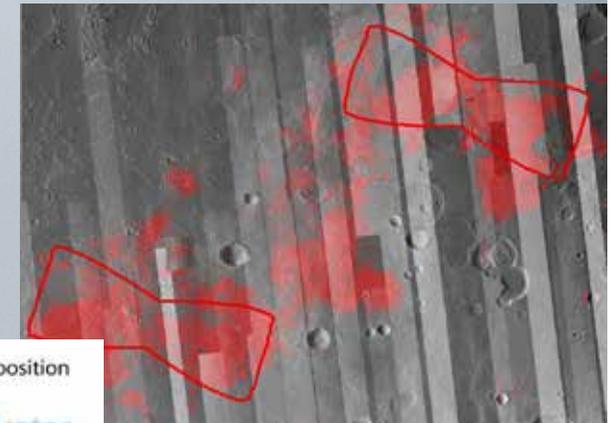
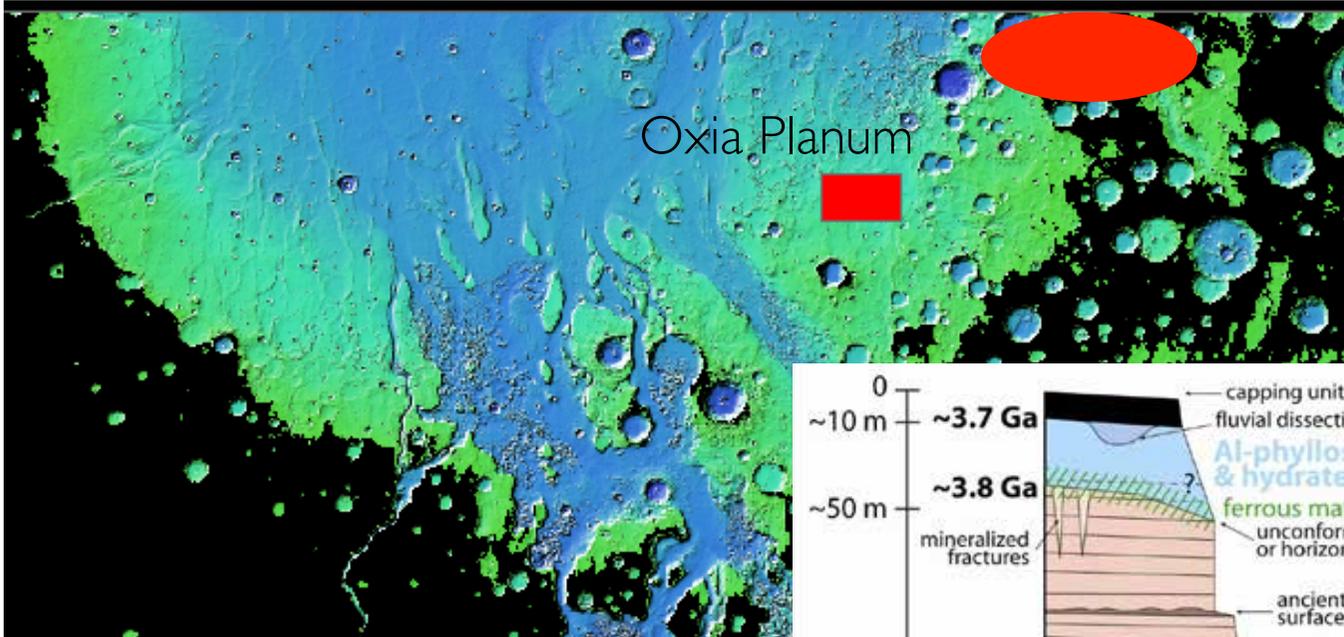


- Ellipses inside a large scale clay bearing unit : primary science everywhere in the ellipse
- **Noachian terrain intensely eroded until today with surfaces as young as 100 My inside the ellipse**
- **Capping unit that may have preserved putative organic matter**
- Both ellipses have **water** related morphologies such as valleys and fan or **delta** postdating the clay bearing unit.

Conclusion : Intense aqueous alteration during the Noachian epoch and preserved since then : fulfillment of ExoMars objectives!!



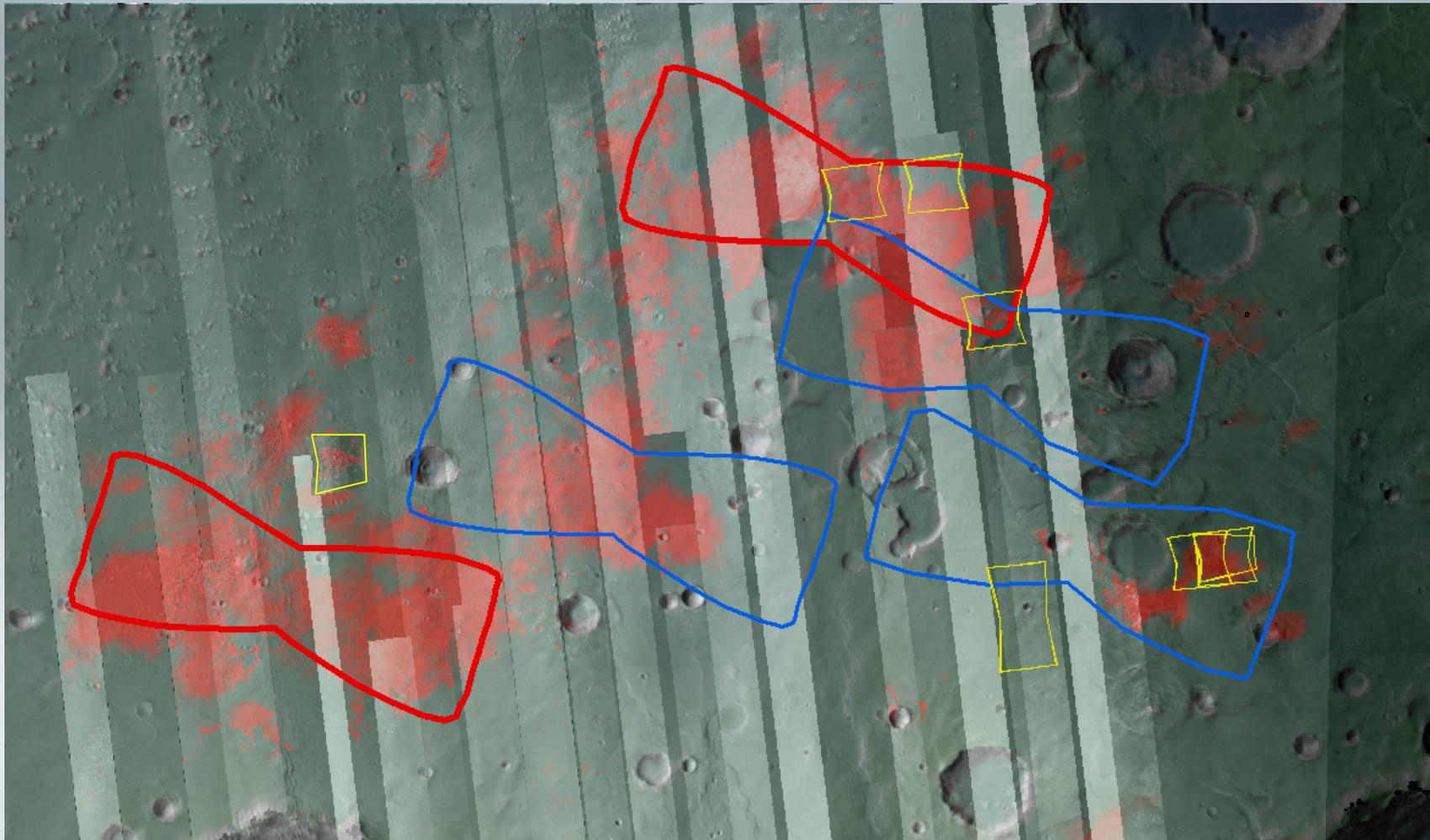
Chyse Planitia and Mawrth Vallis



Loizeau et al., 2012

- Landing ellipses characterizations

We started with 5 ellipses to end up with 2



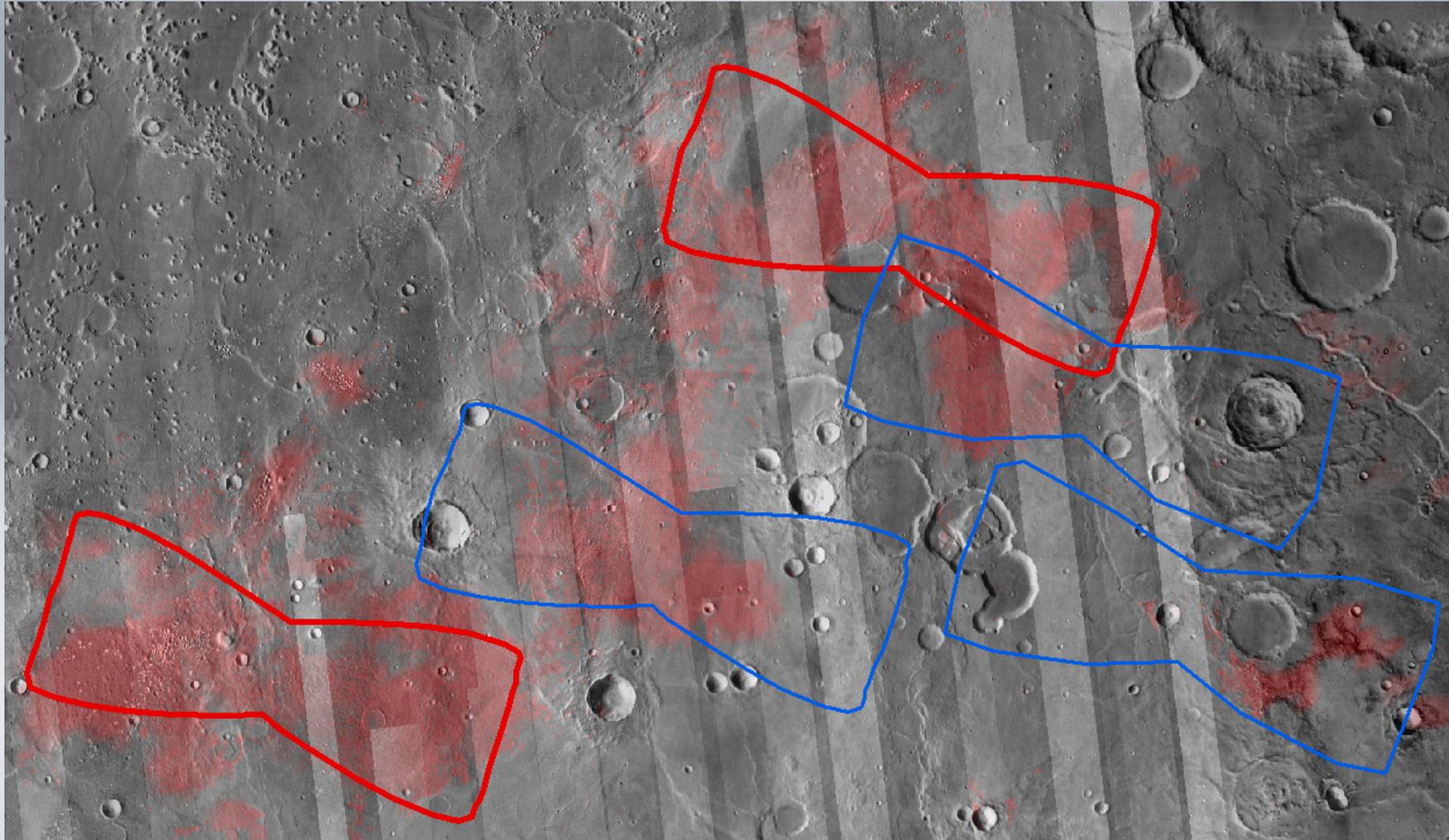
The reasons of our top 2:
1) safety reasons



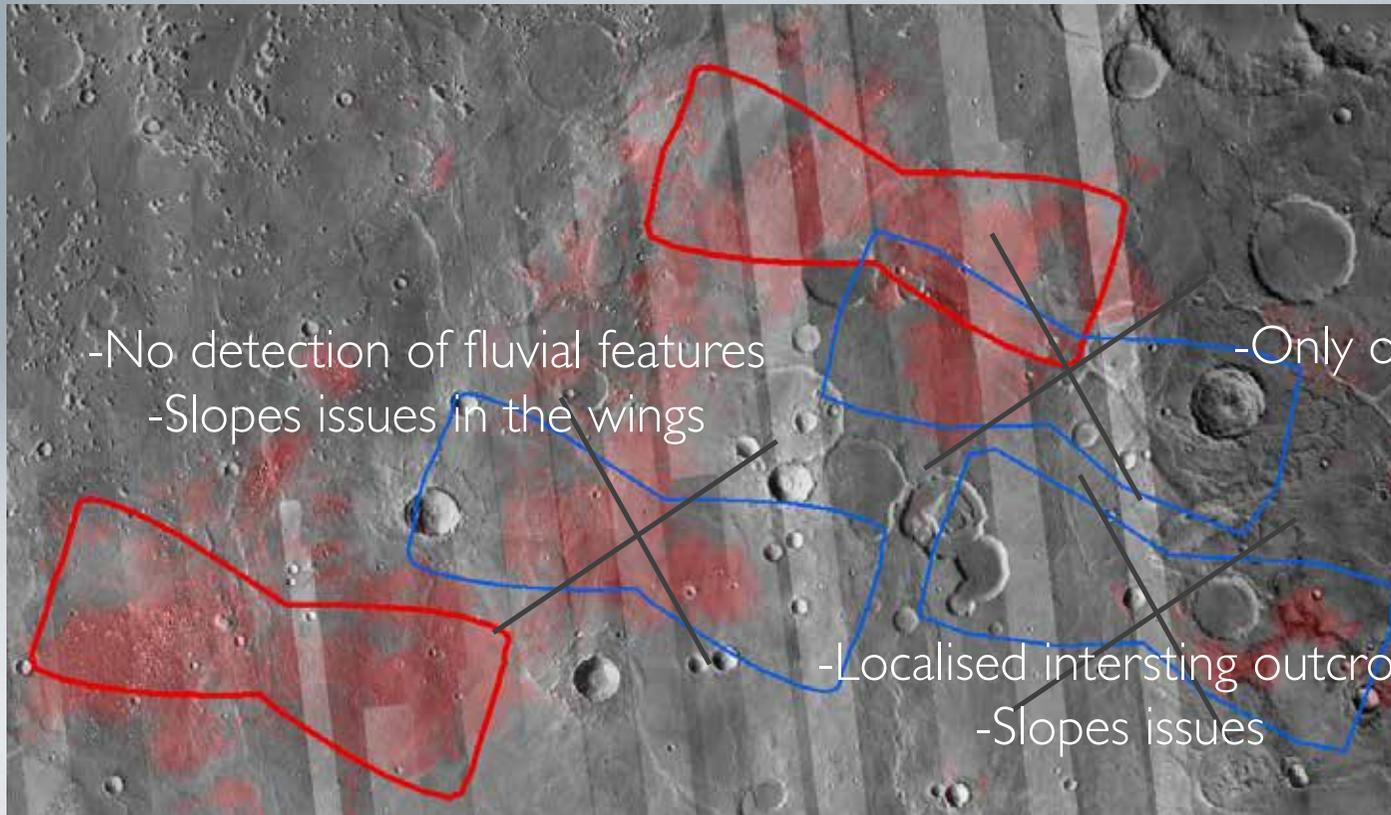
MOLA Slope



The reasons of our top 2:
2) Maximise the chance to land on hydrated minerals



The reasons of our top 2:
summerize



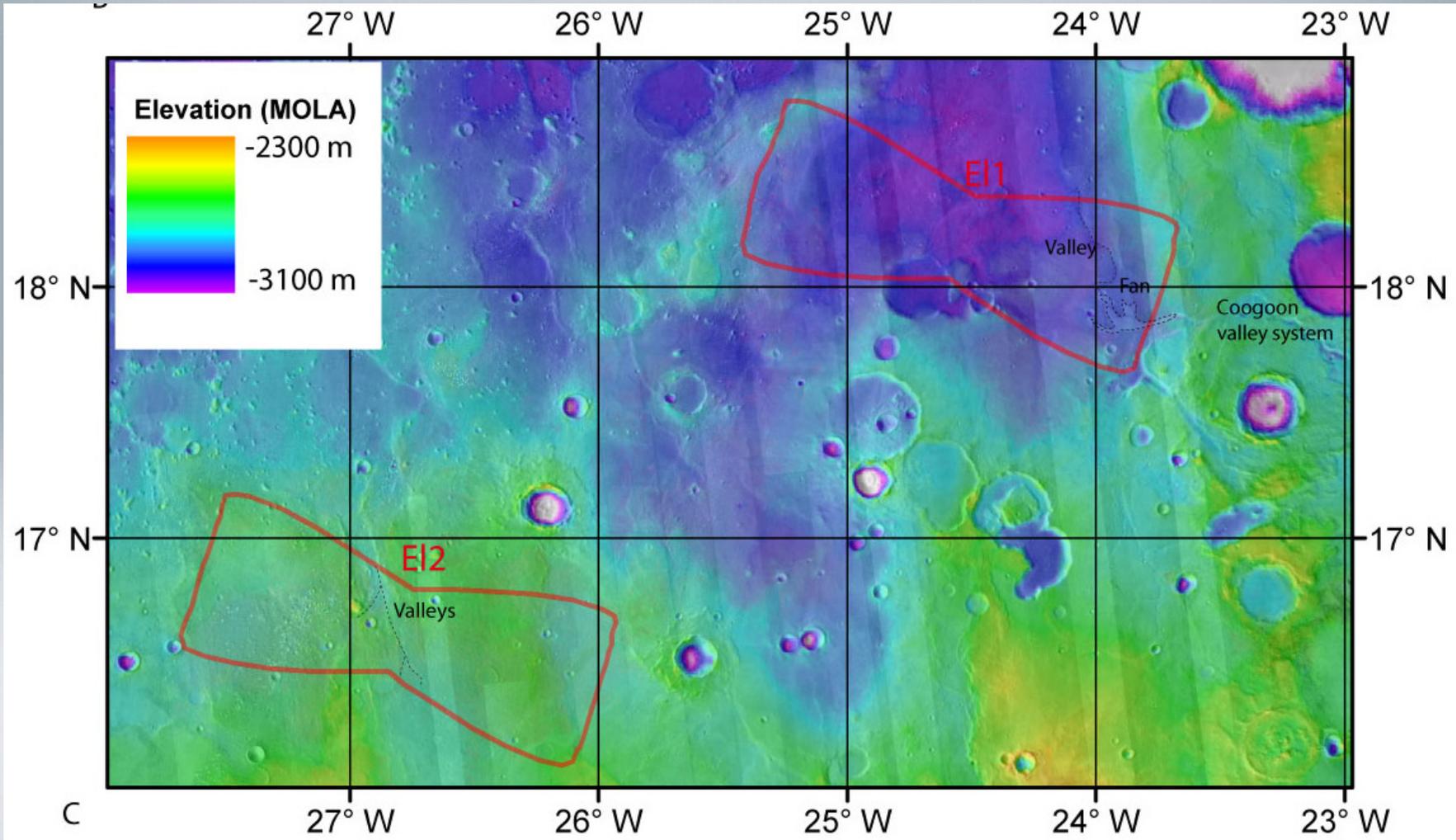
-No detection of fluvial features
-Slopes issues in the wings

-Only one wing with Hy.Min.
-Slopes issues

-Localised interesting outcrop
-Slopes issues

No RSL
Nothing in McEwen et al., 2014
Nothing reported during the field trips!

Elevation (center, max, min)	EL1: (-3100 m, -2830 m, -3150 m)
	EL2: (-2700 m, -2486 m, -2810 m)

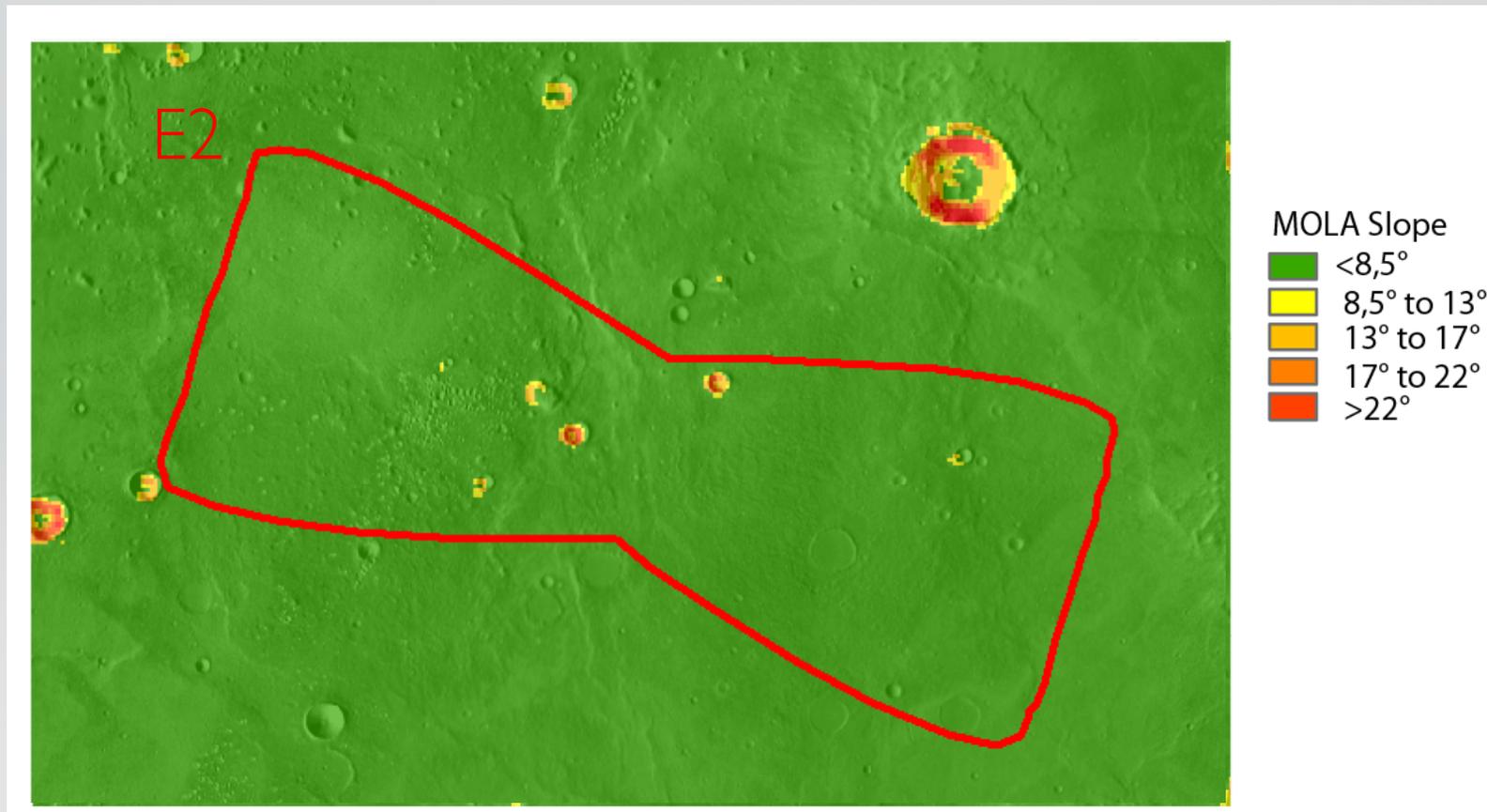


SLOPE MOLA [463 m/pix] EI



Slope of a plane to the z-values of a 3 x 3 cell neighborhood around center cell [463 m/pix]

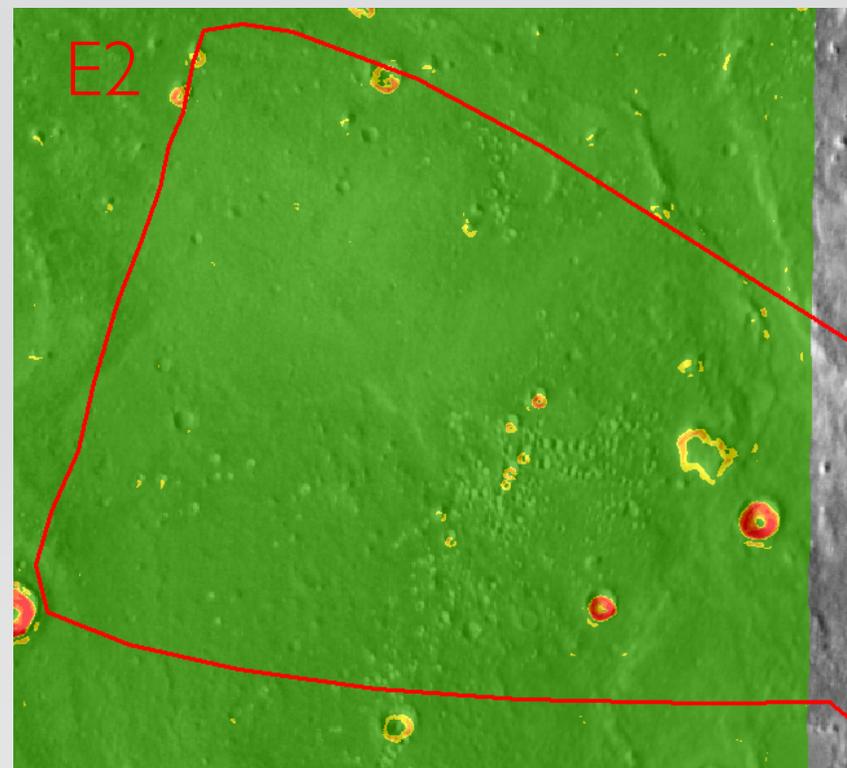
SLOPE MOLA [463 m/pix] E12



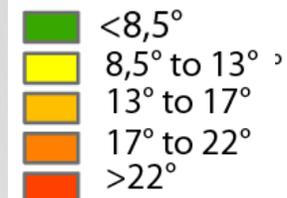
Slope of a plane to the z-values of a 3 x 3 cell neighborhood around center cell [463 m/pix]

SLOPE HRSC [75 m/pix]: uncompleted coverage

EI2

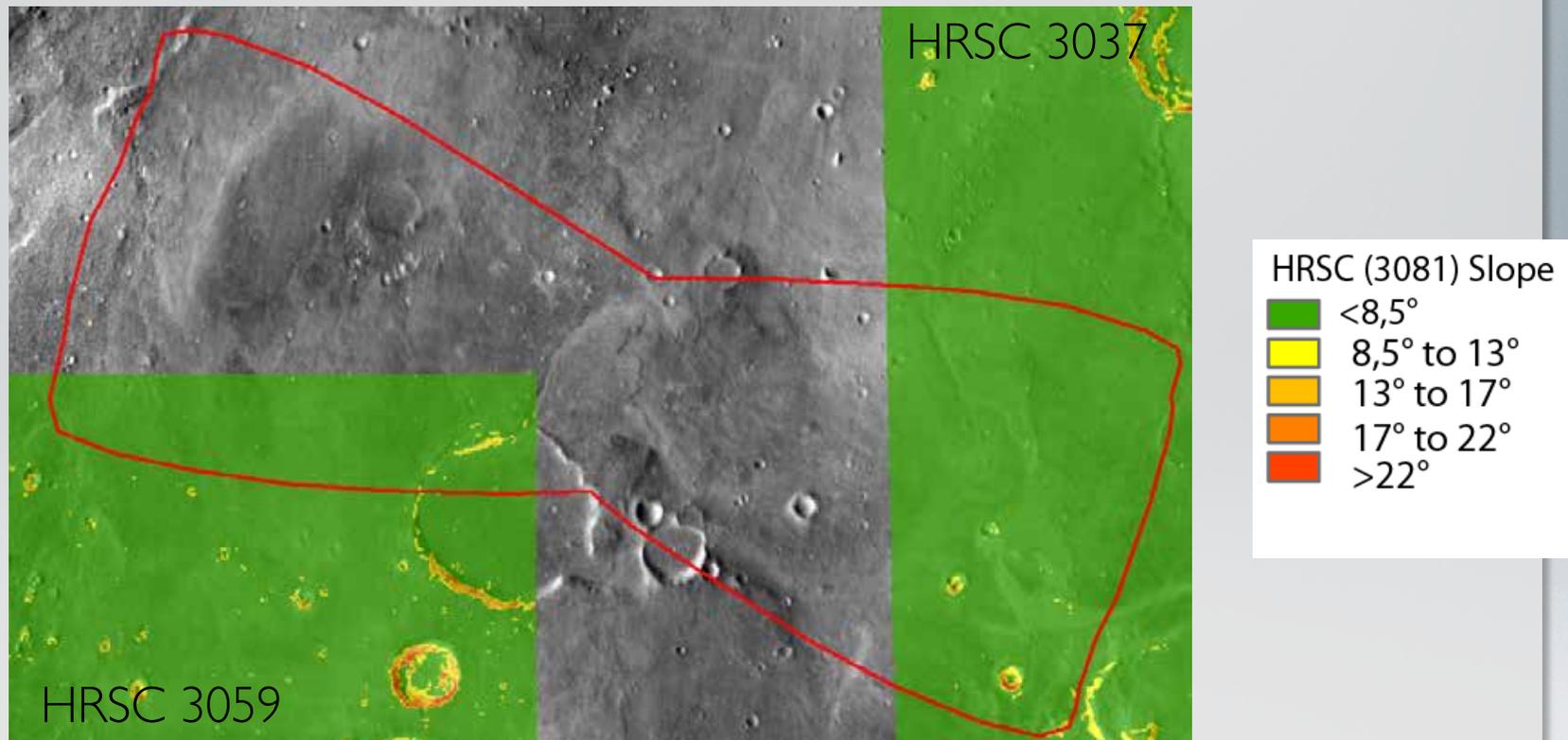


HRSC (3081) Slope



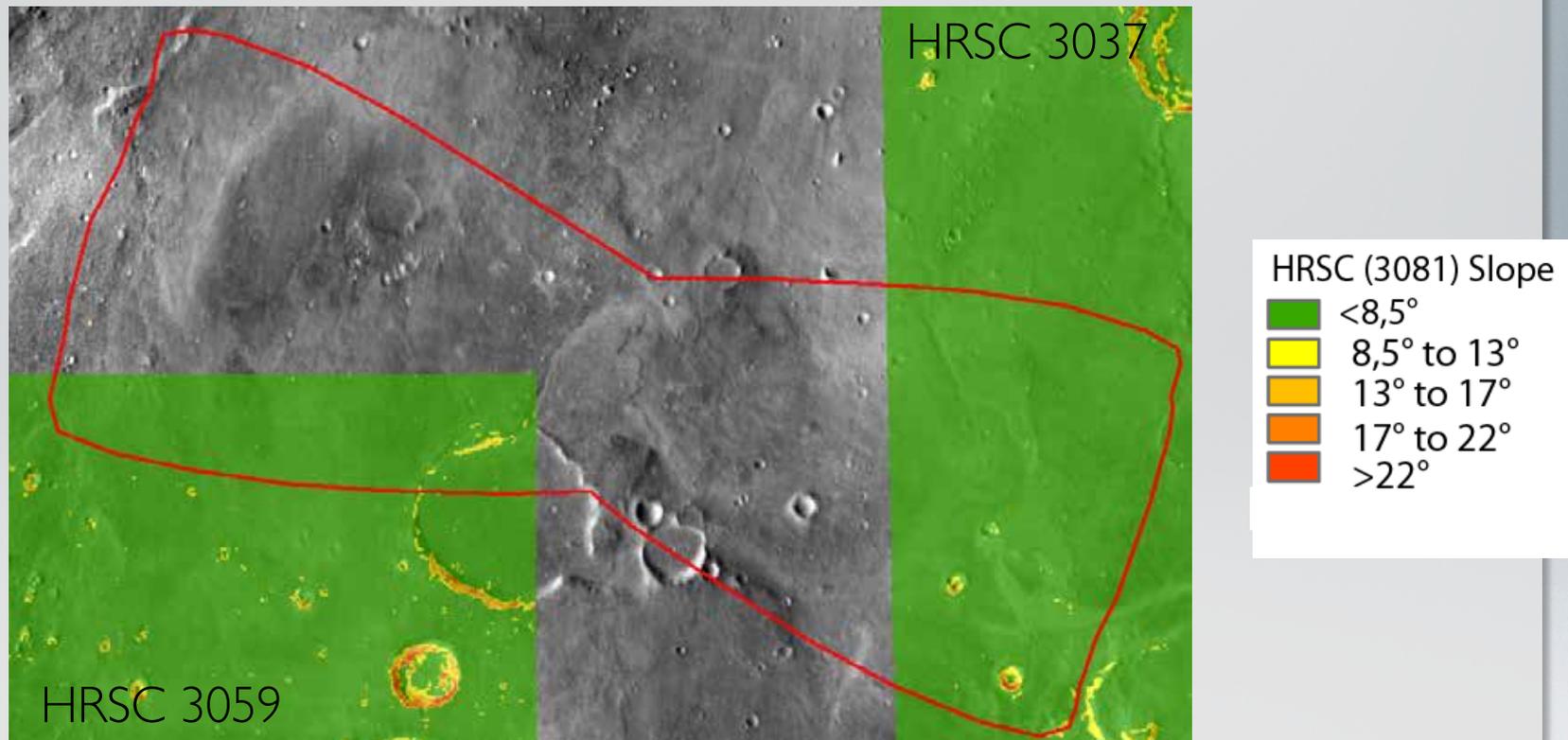
Slope of a plane to the z-values of a 3 x 3 cell neighborhood around center cell [75 m/pix]

[75 m/pix]: uncompleted coverage Ell



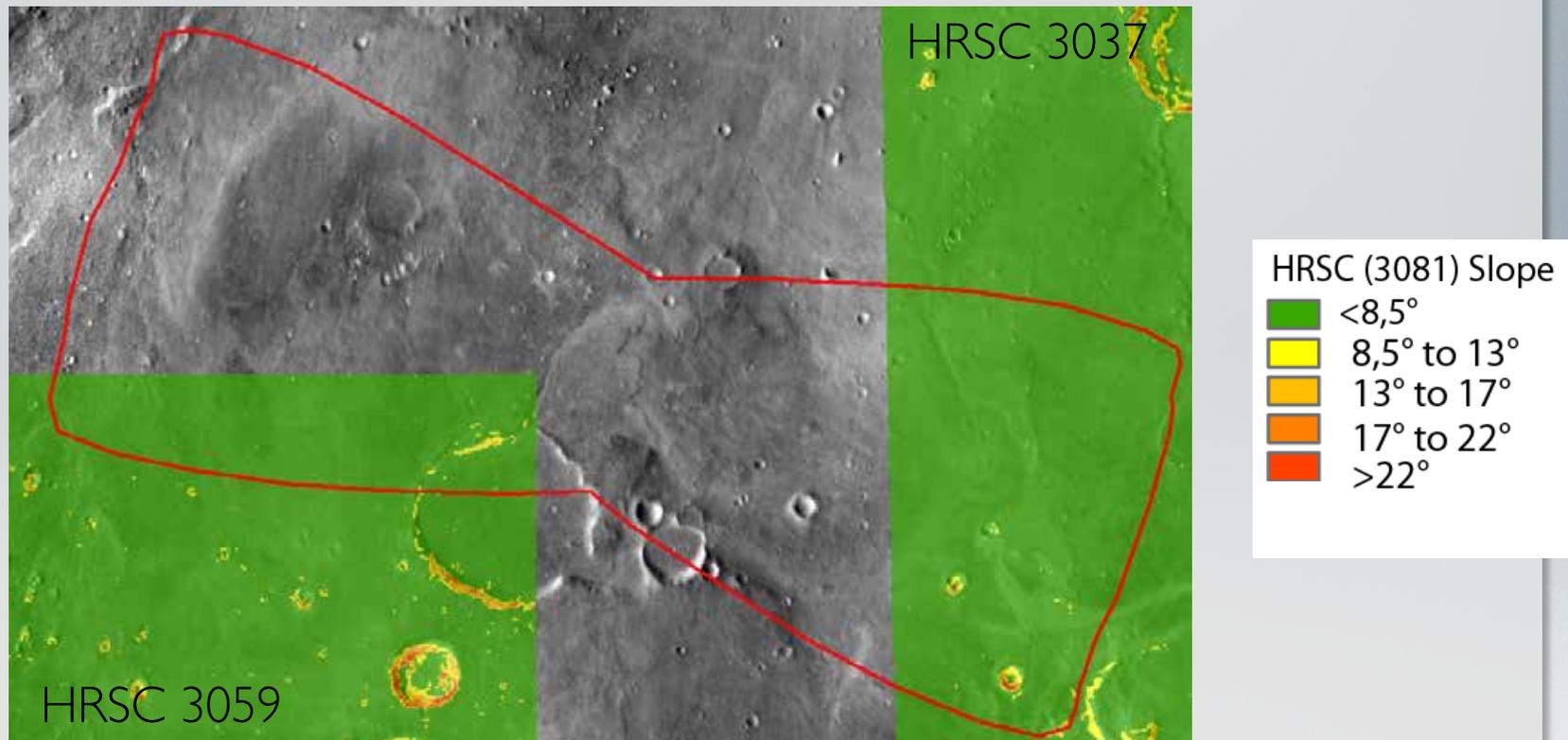
Slope of a plane to the z-values of a 3 × 3 cell neighborhood around center cell [75 m/pix]

[75 m/pix]: uncompleted coverage Ell



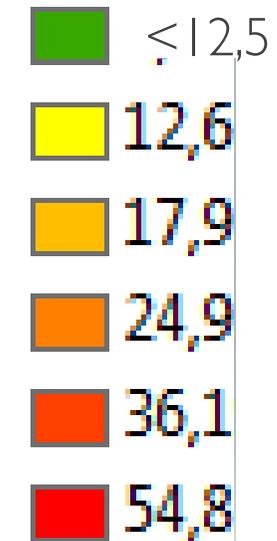
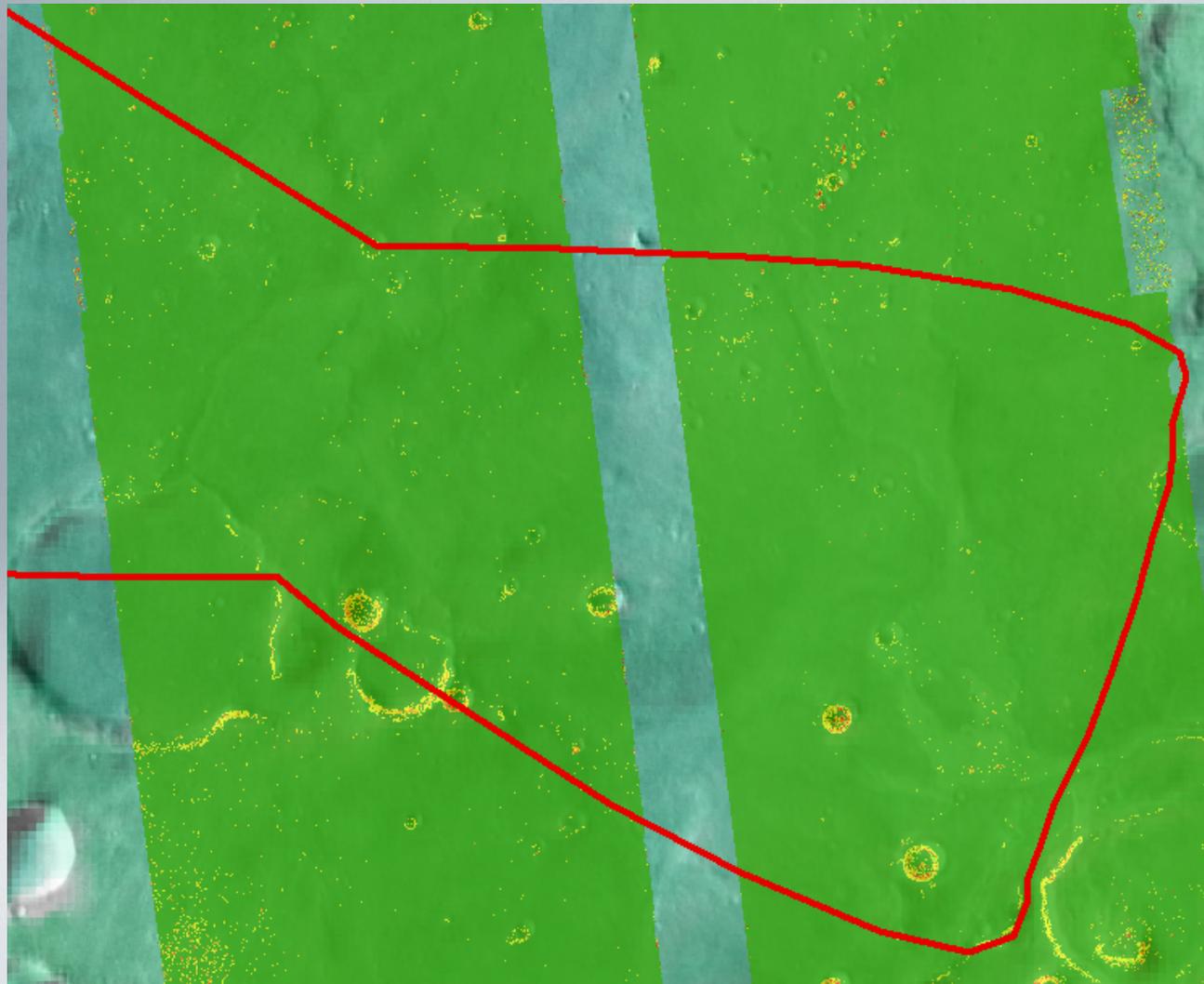
Slope of a plane to the z-values of a 3×3 cell neighborhood around center cell [75 m/pix]

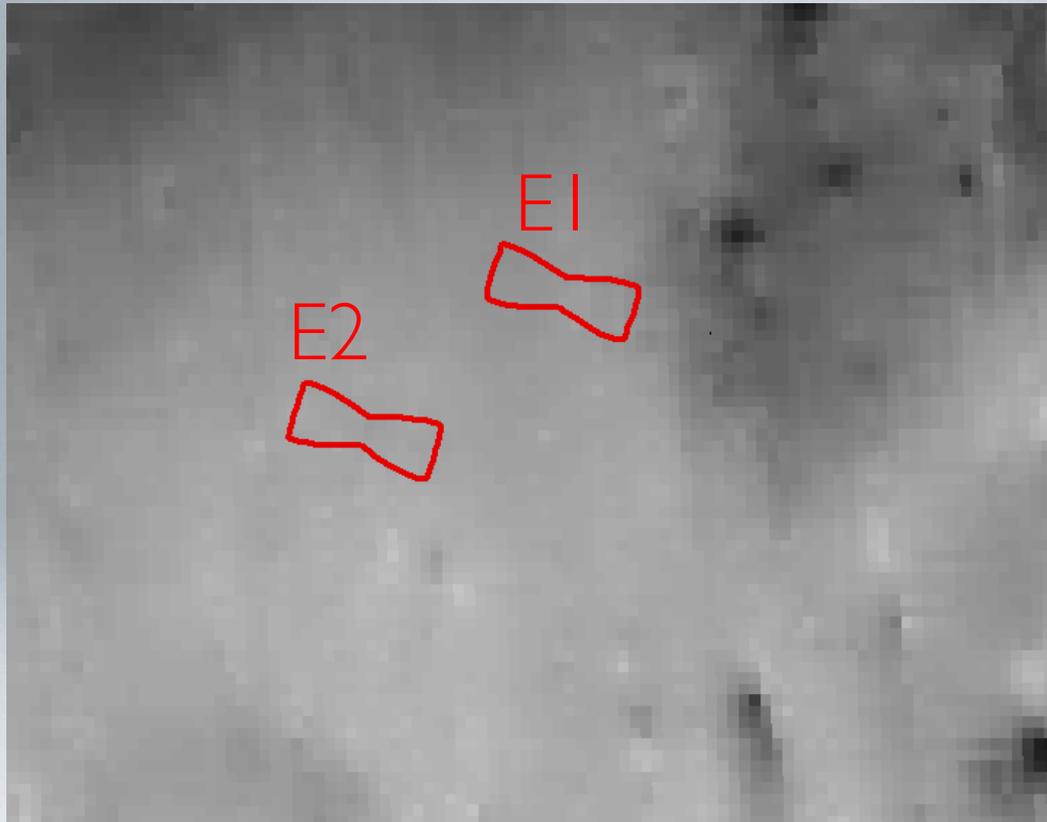
[75 m/pix]: uncompleted coverage Ell



Slope of a plane to the z-values of a 3 × 3 cell neighborhood around center cell [75 m/pix]

CTX scale [6 m/pix]: uncompleted coverage Ell



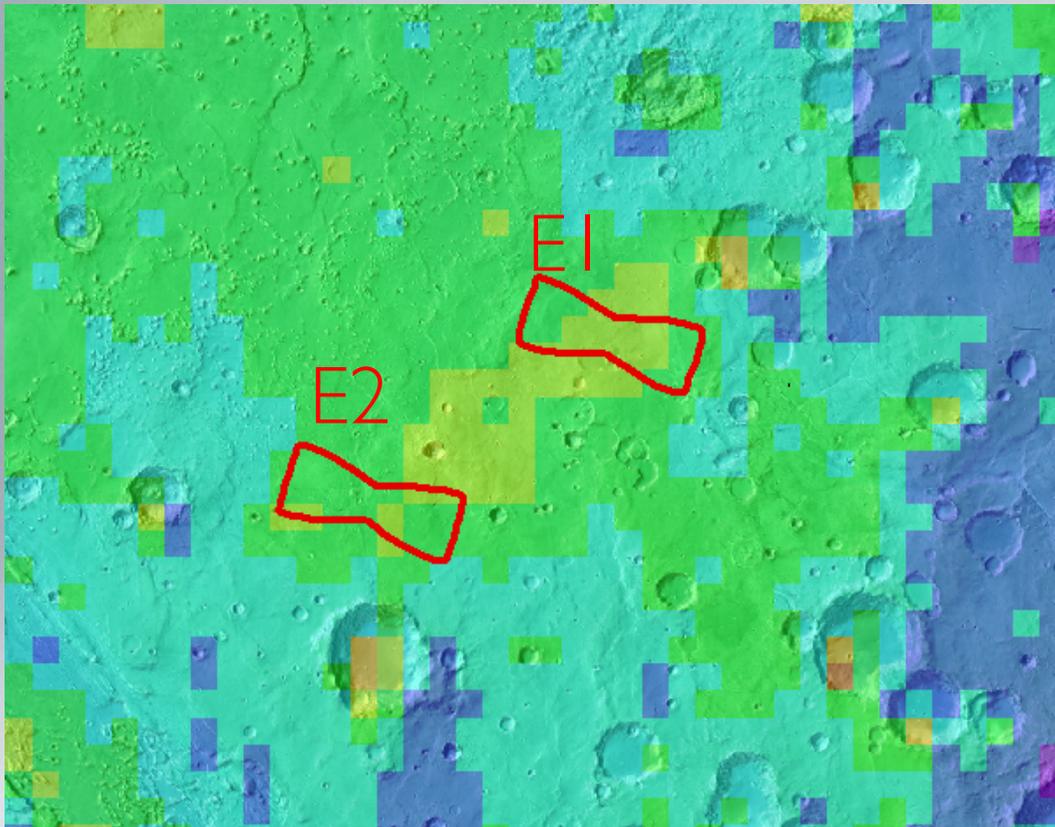


Albedo (from TES
global map)

E1 : 0.18 to 0.22

E2: 0.23 to 0.24

OK!



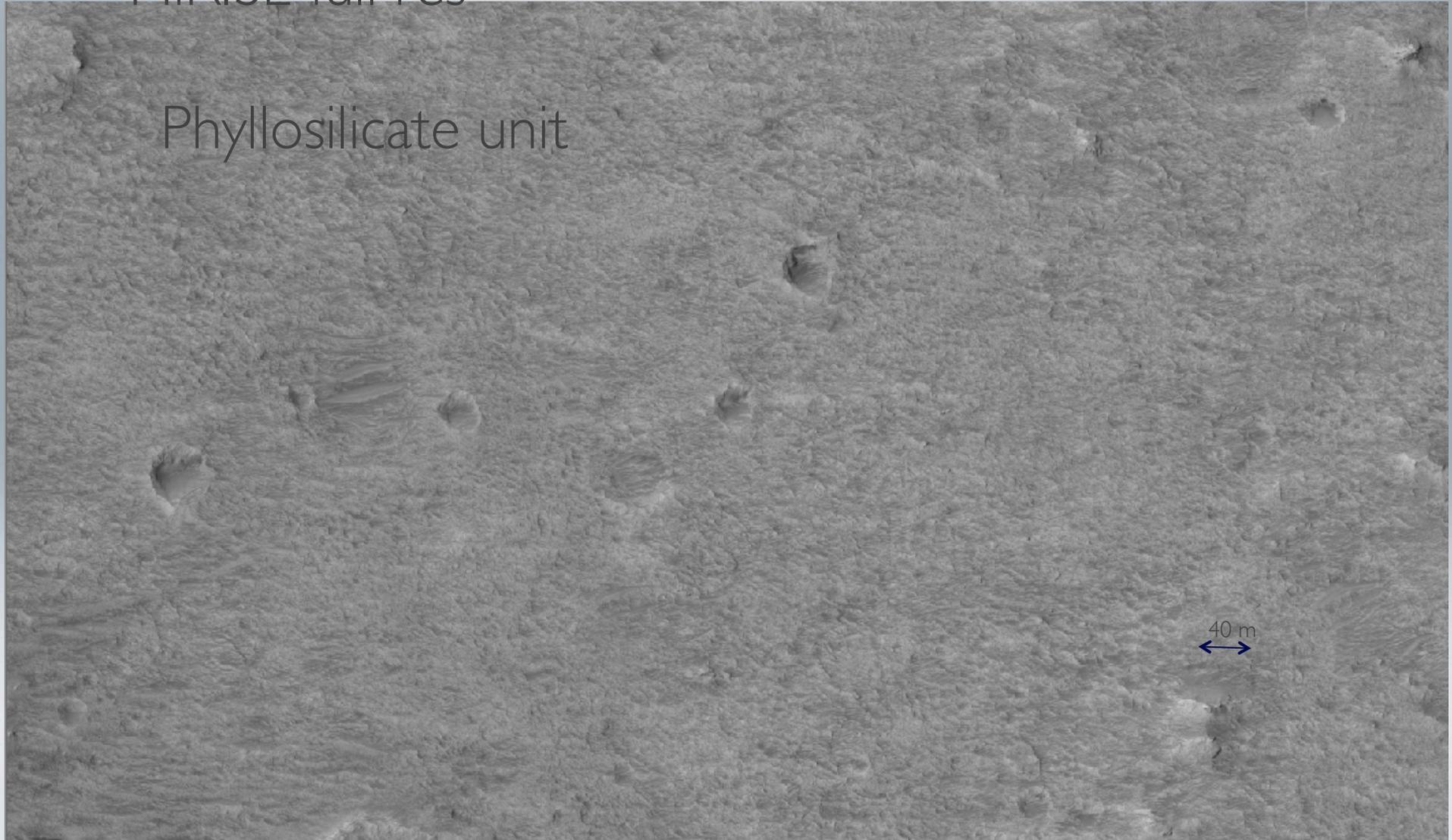
OK!

Thermal Inertia (TES)

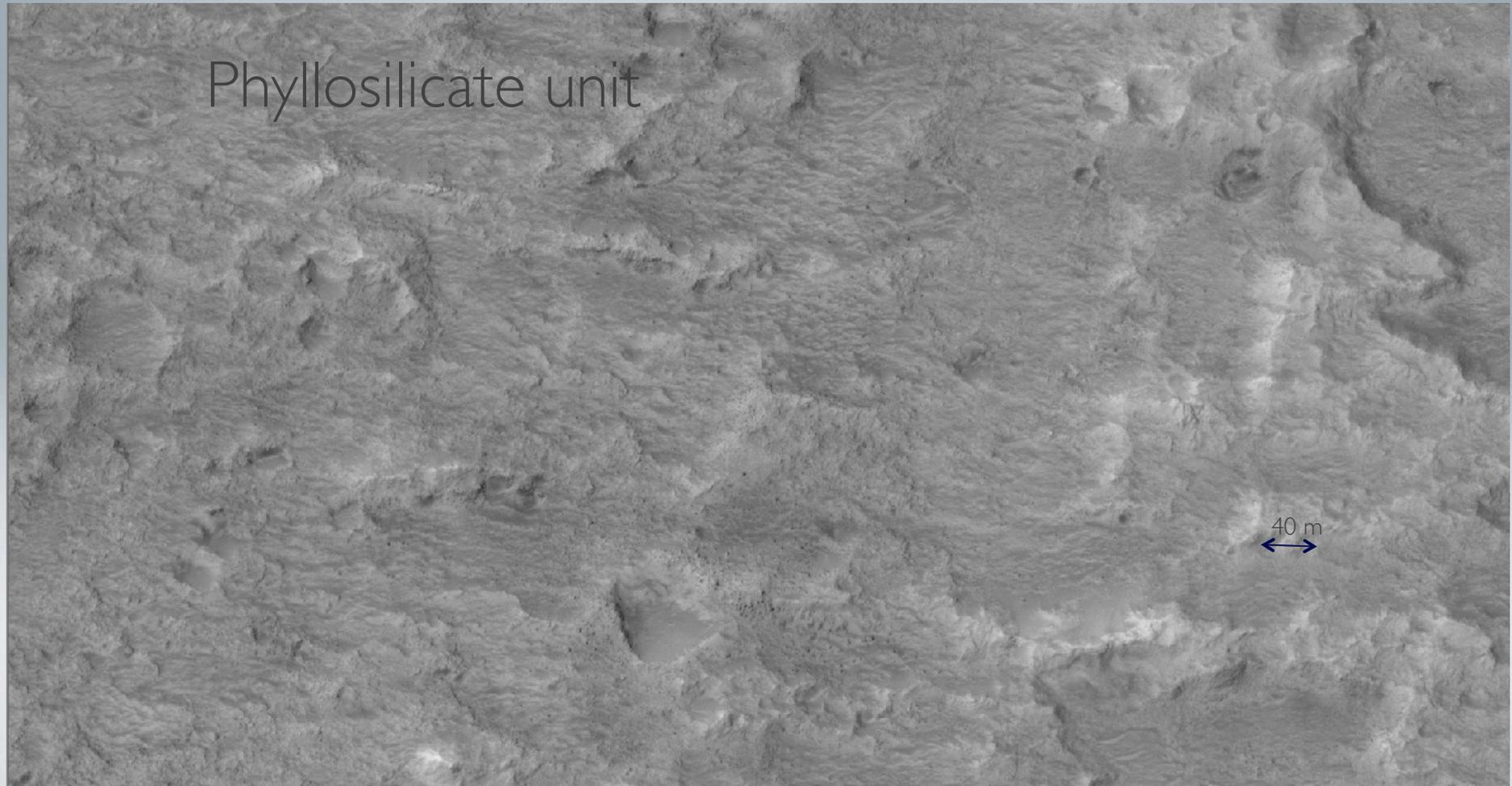
E1 : 257 to 483 $\text{J}\cdot\text{m}^{-2}\cdot\text{s}^{-0.5}\cdot\text{K}^{-1}$ E2: 274 to 446 $\text{J}\cdot\text{m}^{-2}\cdot\text{s}^{-0.5}\cdot\text{K}^{-1}$

HiRISE full res

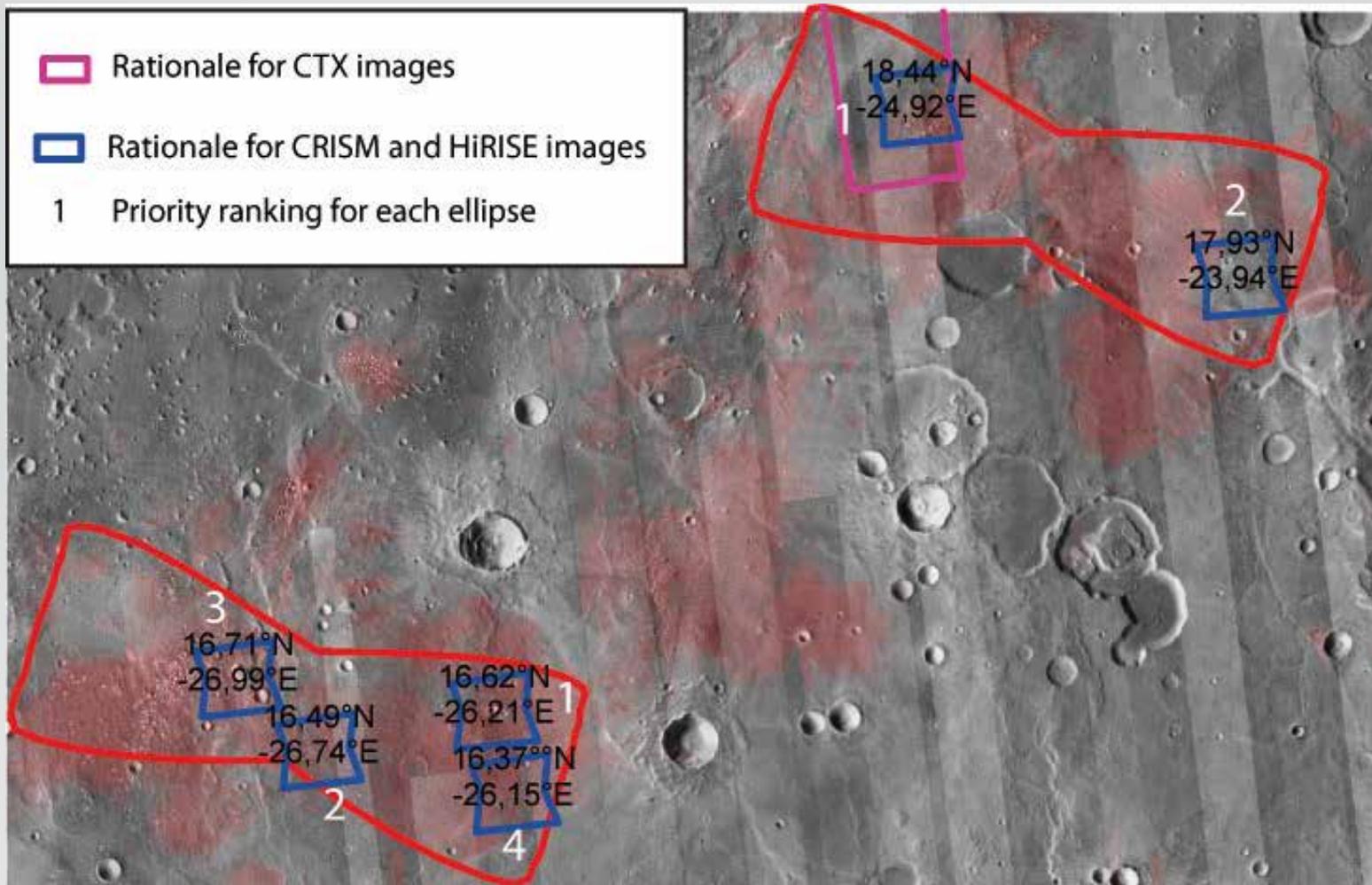
Phyllosilicate unit



HiRISE full res



Rationale for images



EL1: -24,55°E ; 18,2°N

EL2: -26,81°E; 16,63°N

Criterion	Specification	Data Used	This Landing Site
Latitude	5 S to 25 N	MOLA	ok
Elevation	Below -2 km	MOLA	100 % of ellipses is below
Slopes (Mola scale)	$\leq 8.6^\circ$	MOLA	99% of E1 and 98 % of E2
Slopes (HRSC scale)	$\leq 8.6^\circ$	HRSC	Partly checked -98 % is below
Slopes (CTX scale)	$\leq 12.5^\circ$	CTX	Partly checked -95 % is below
Slopes (7 m)	$\leq 12.5^\circ$	No Data	No Data
Slopes (2 m)	$\leq 15.0^\circ$	No Data	No Data
Rock abundance	$\leq 7\%$	IRTM	No Data
Rock abundance	$\leq 7\%$	HiRISE	No Data
Thermal Inertia	$\geq 150 \text{ J m}^{-2} \text{ s}^{-0.5} \text{ K}^{-}$	TES	100 % of ellipse is above
Albedo	$0.1 \leq \text{albedo} \leq 0.26$	TES	100 % of ellipse is in spec
Radar Reflectivity	-15 dB \leq Ka band backscatter cross section at nadir \leq 27.5 dB	No Data	No Data
Horizontal Wind (1 m–10 km agl)	$\leq 0.25 \text{ m/s}$	GCM	See F. Forget
Horizontal Wind (1 m above ground)	$\leq 0.30 \text{ m/s}$	GCM	See F. Forget

• **THANK YOU.**