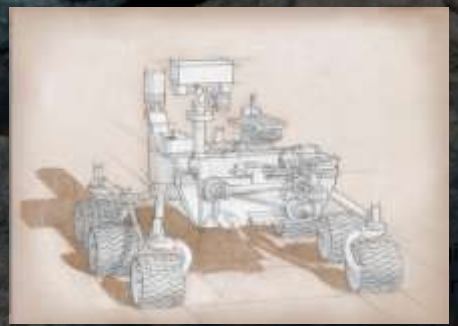
Oyama crater sediments: a concentrate of Mawrth with a touch of lava flows

D. Loizeau, F. Poulet, N. Mangold, J. Carter

Mars 2020 Landing Site Workshop



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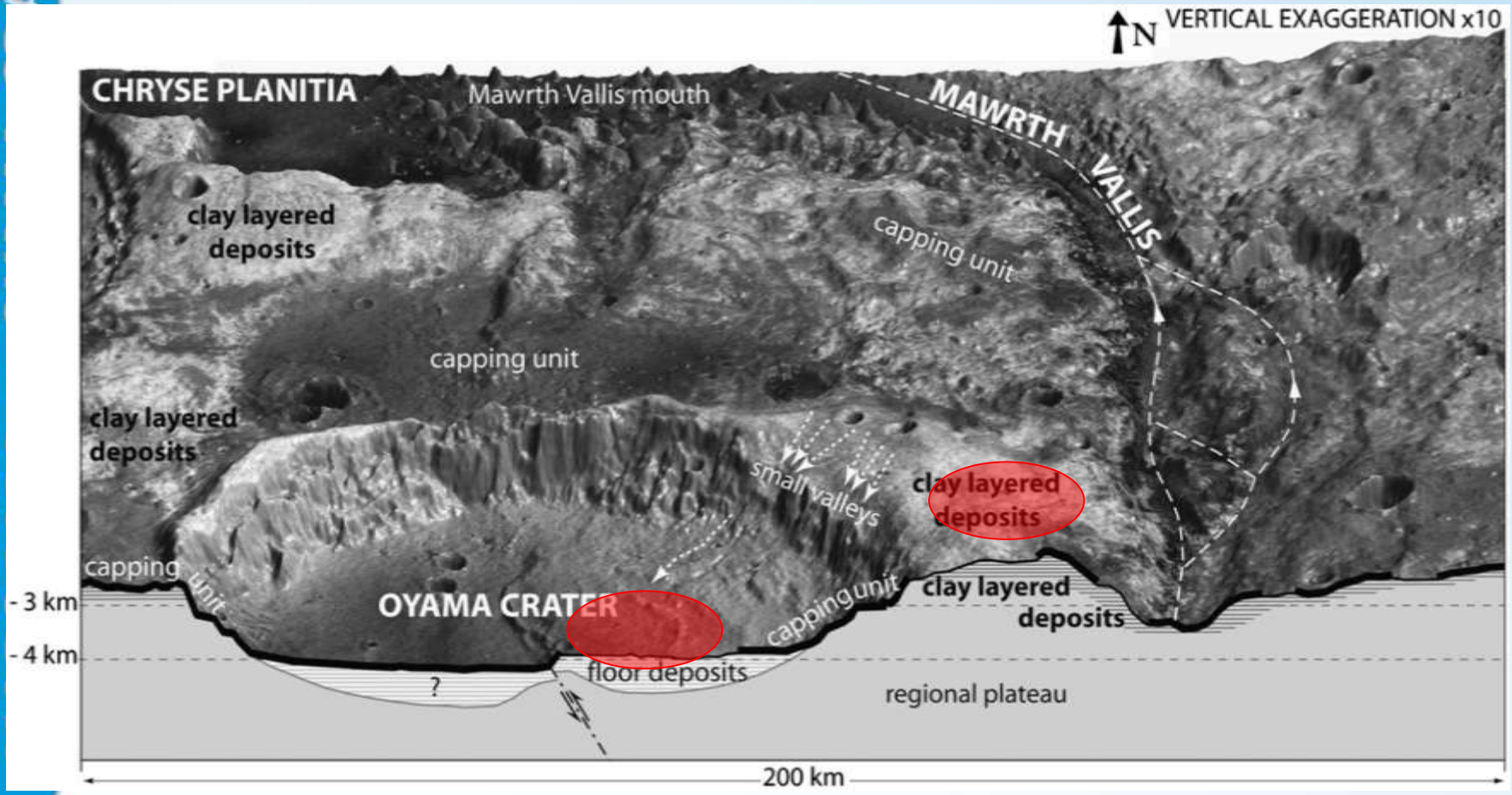
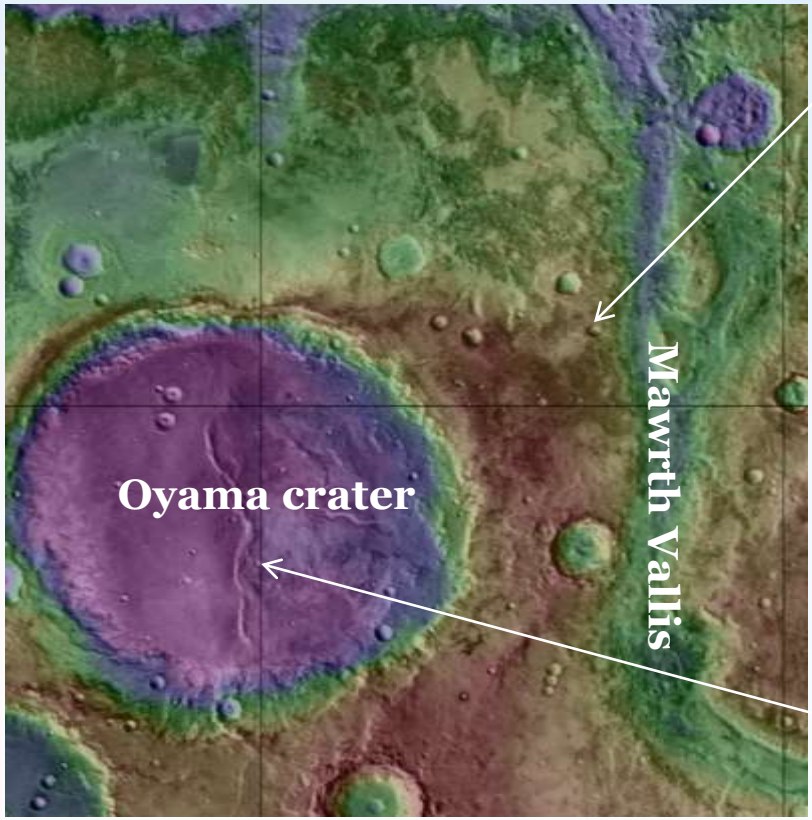
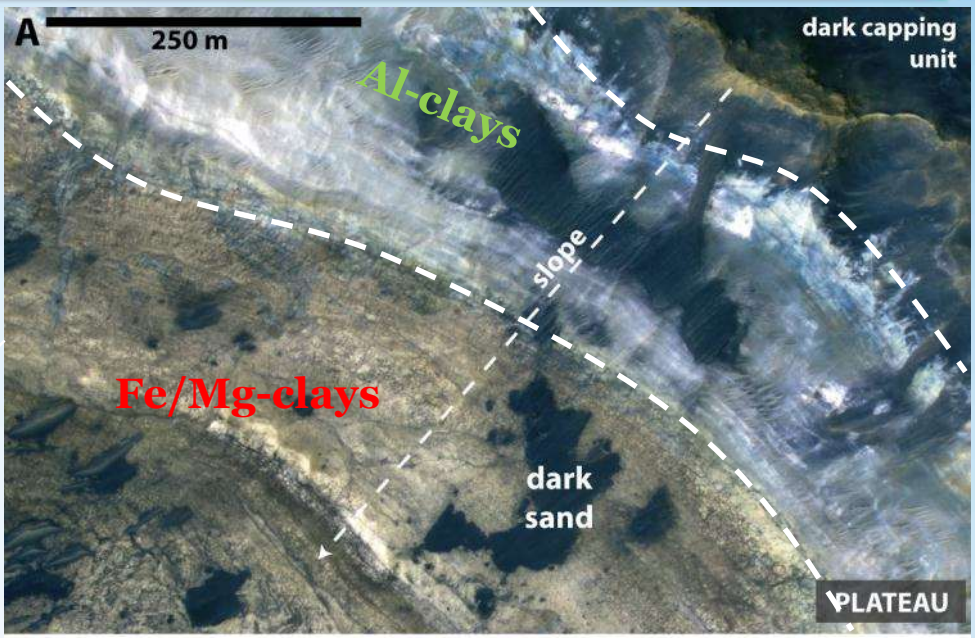
REGIONAL CONTEXT

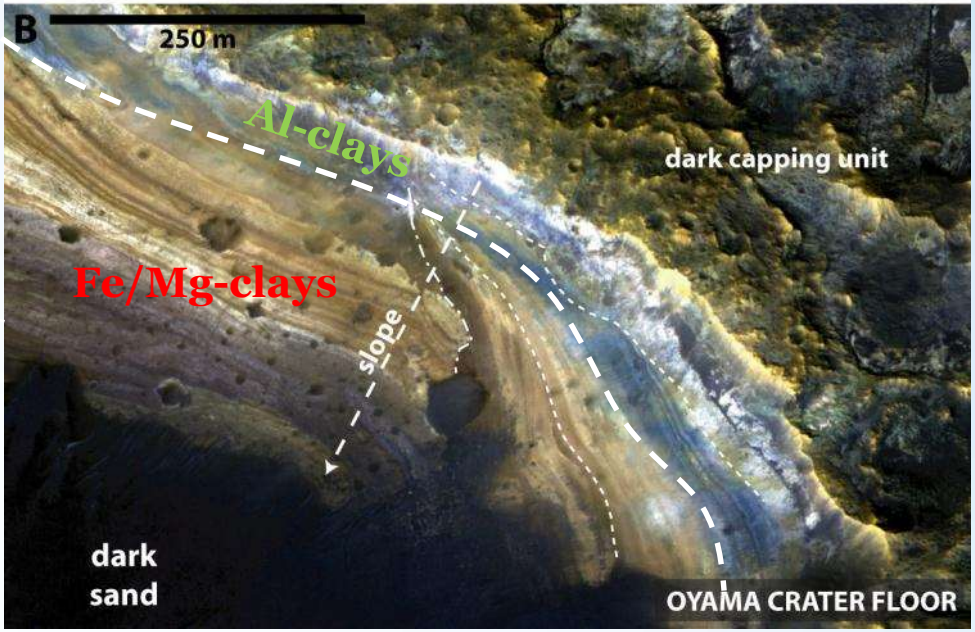
- remobilized clays from the plateaus
- Oyama divided by a north-south ridge



STRATIGRAPHY

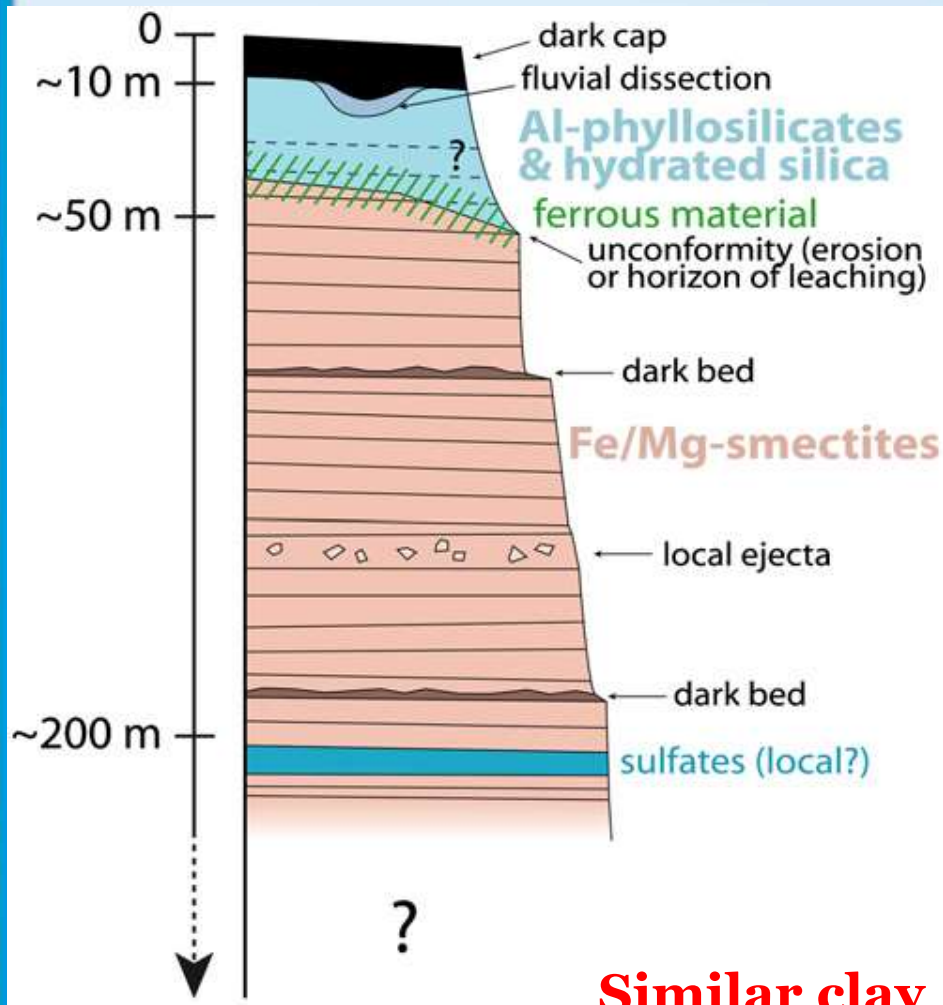


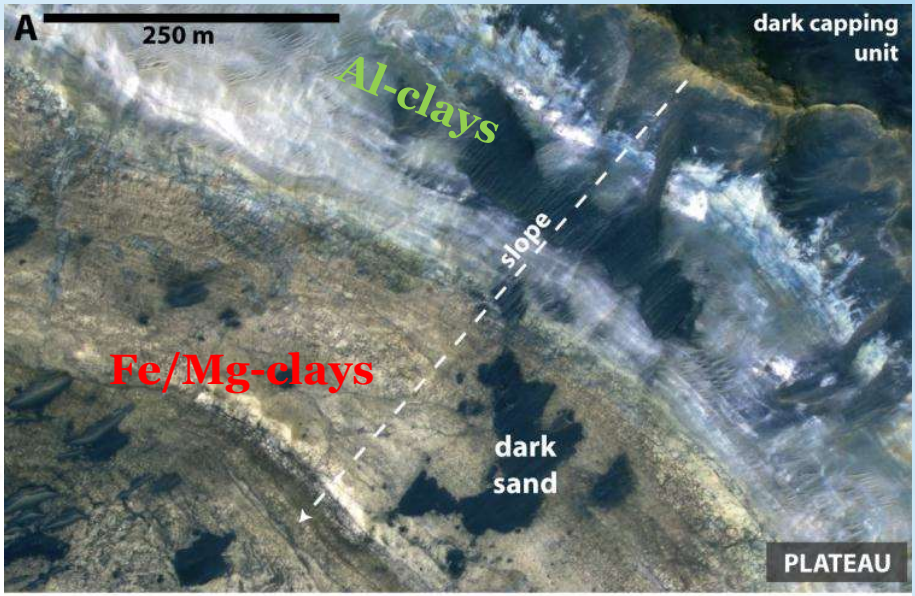


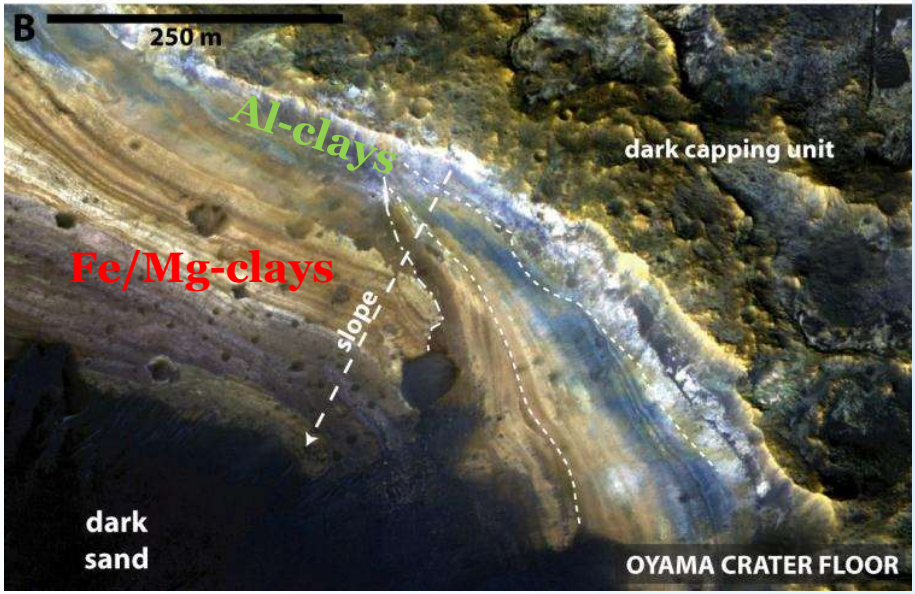


Loizeau et al., 2012

STRATIGRAPHY

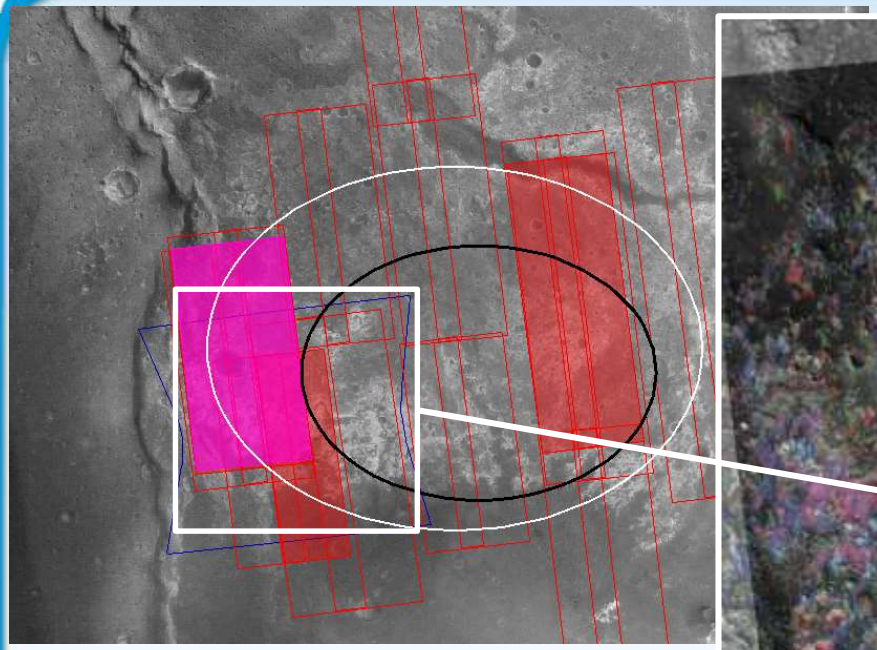


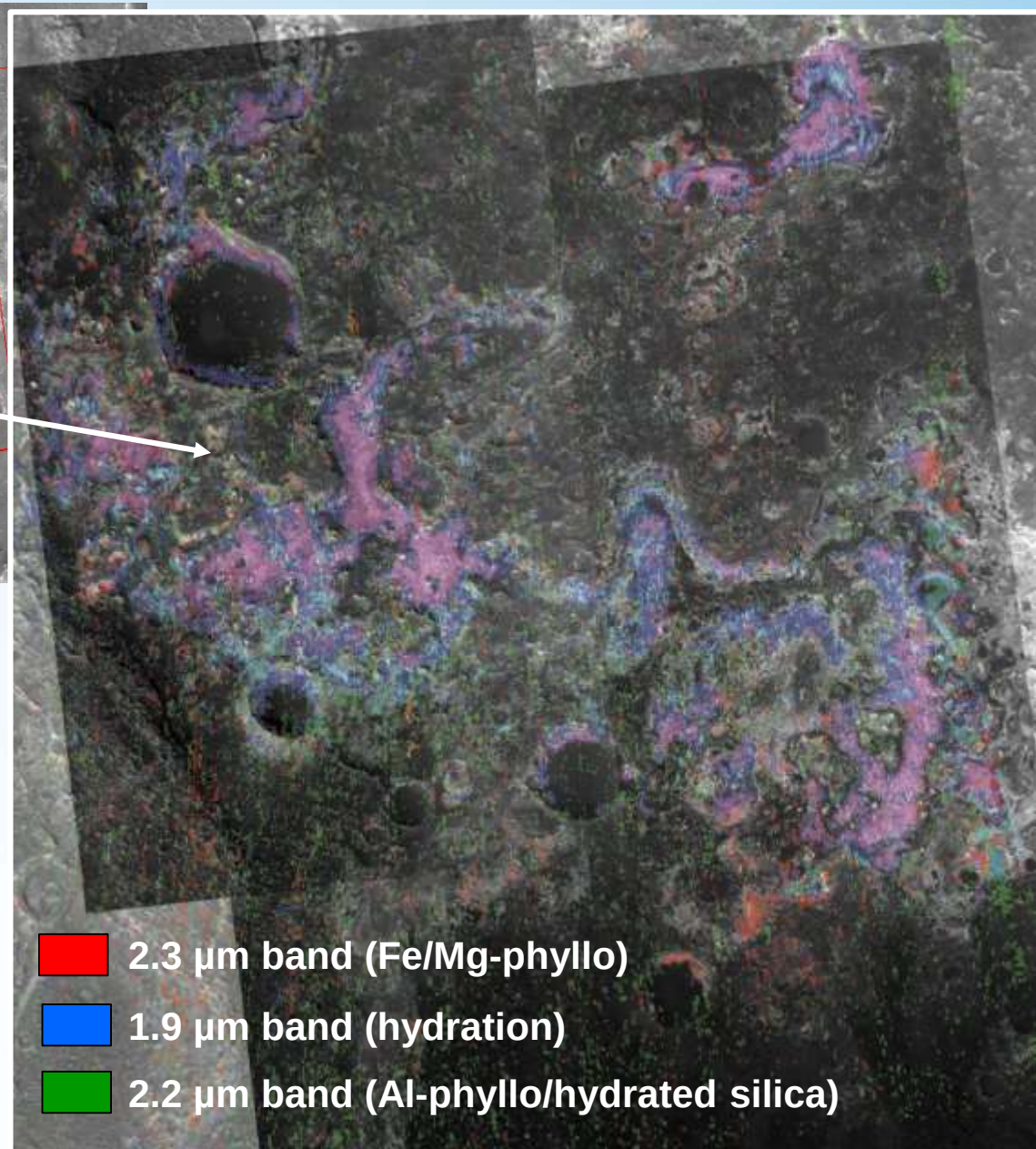




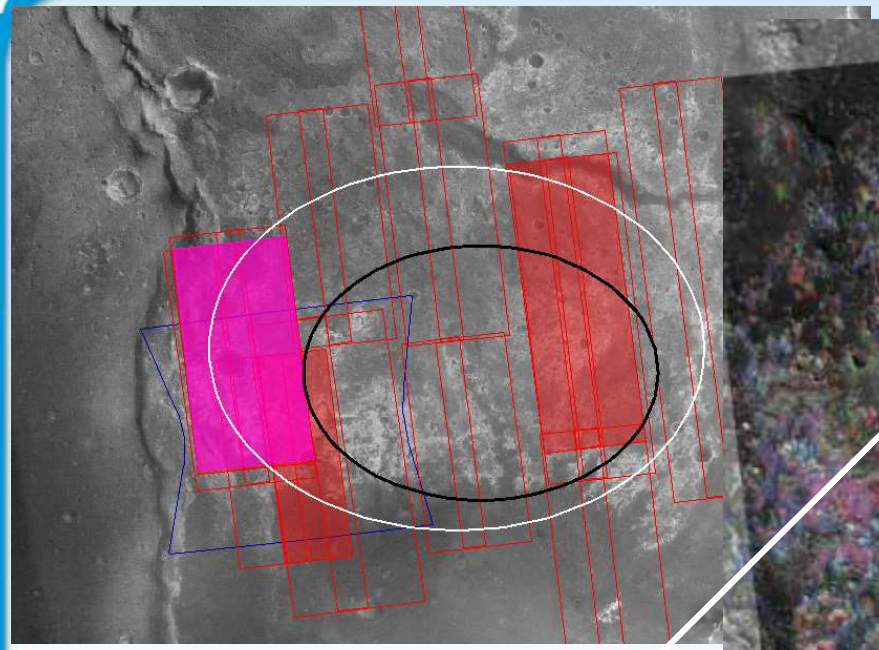
Similar clay sequence but more prononced layering

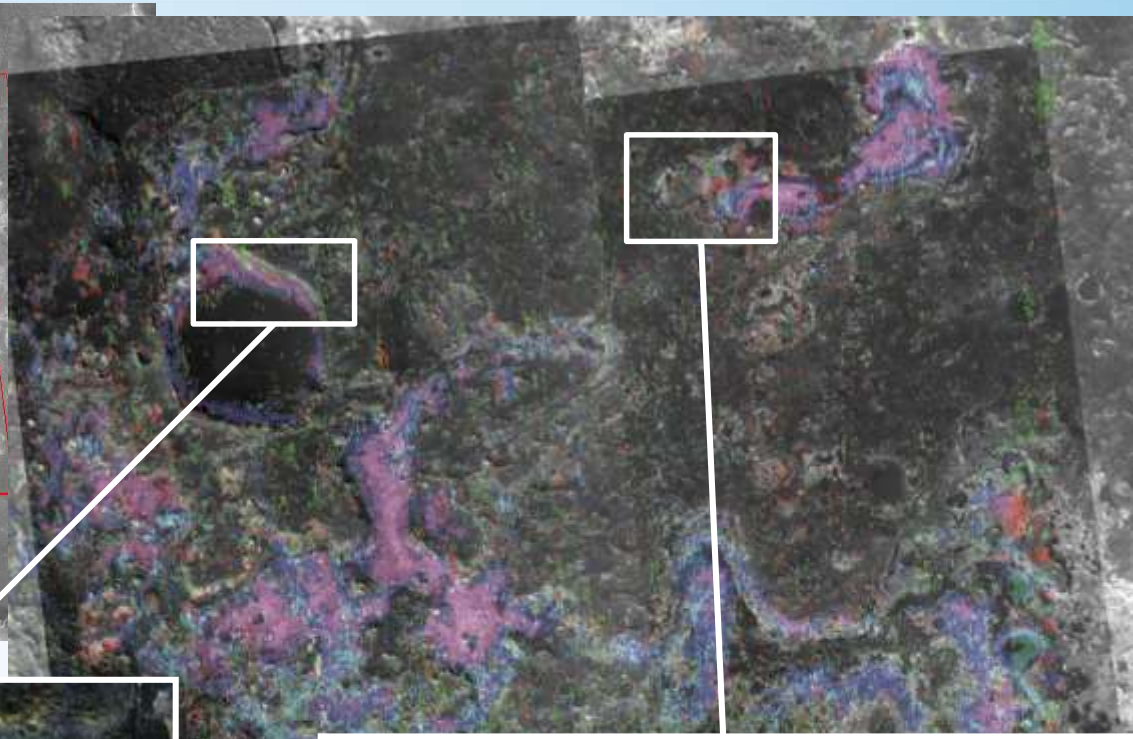
MARS 2020 at OYAMA CRATER

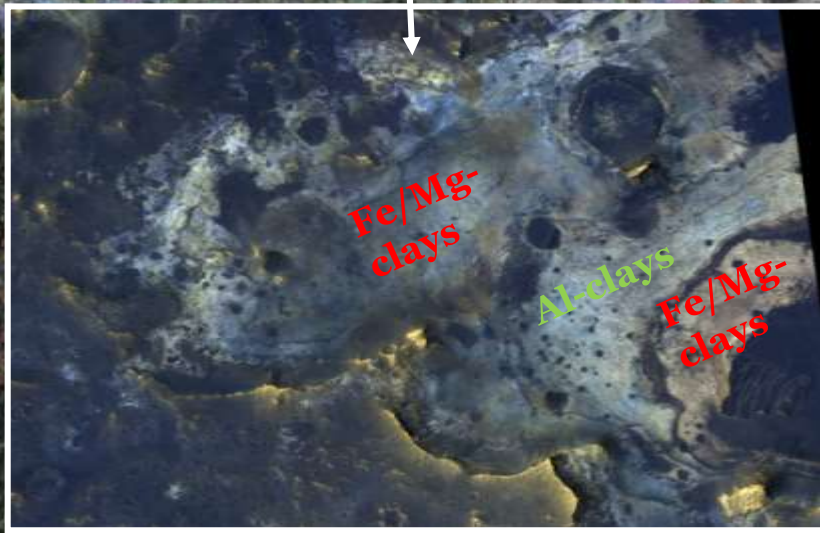




MARS 2020 at OYAMA CRATER

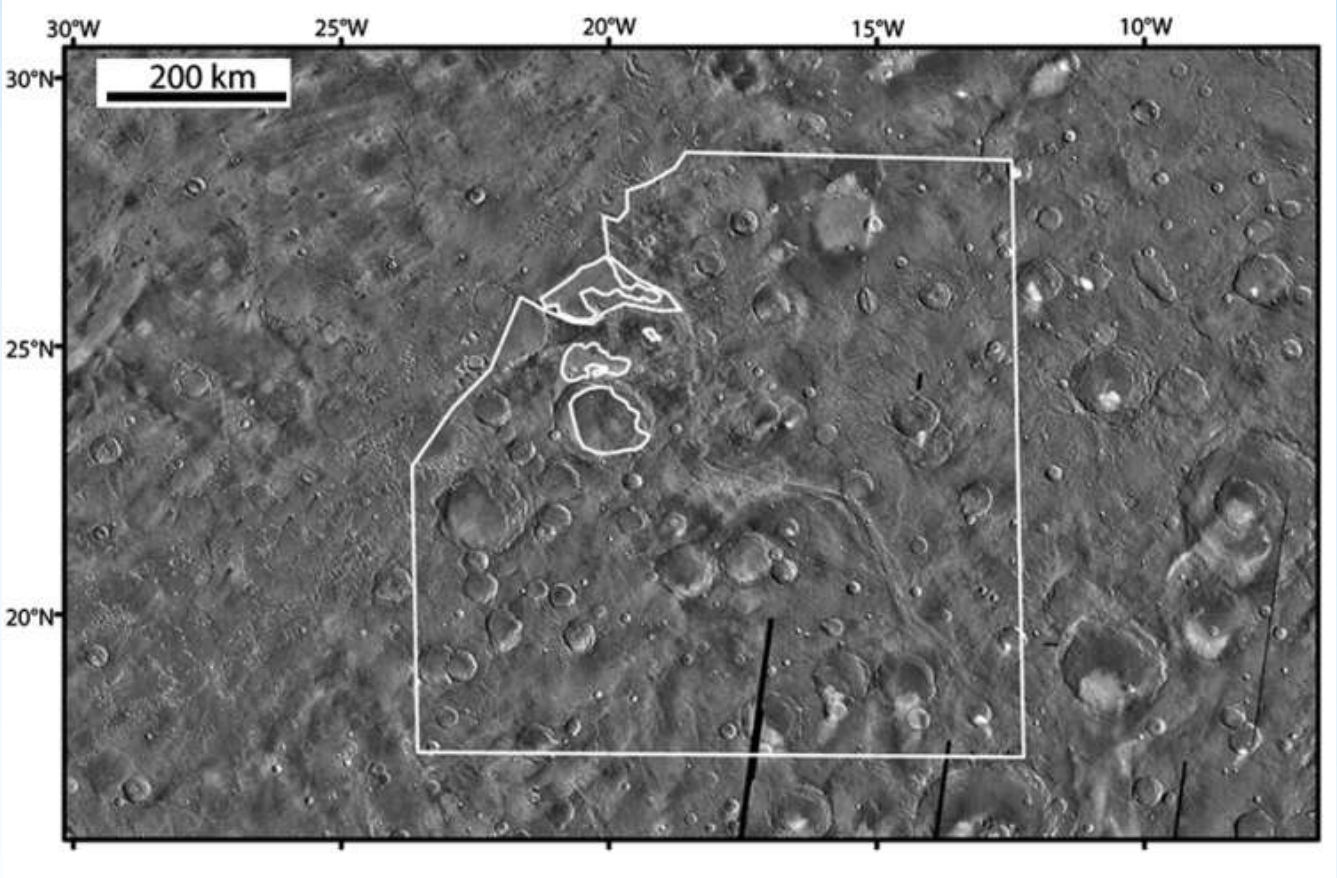




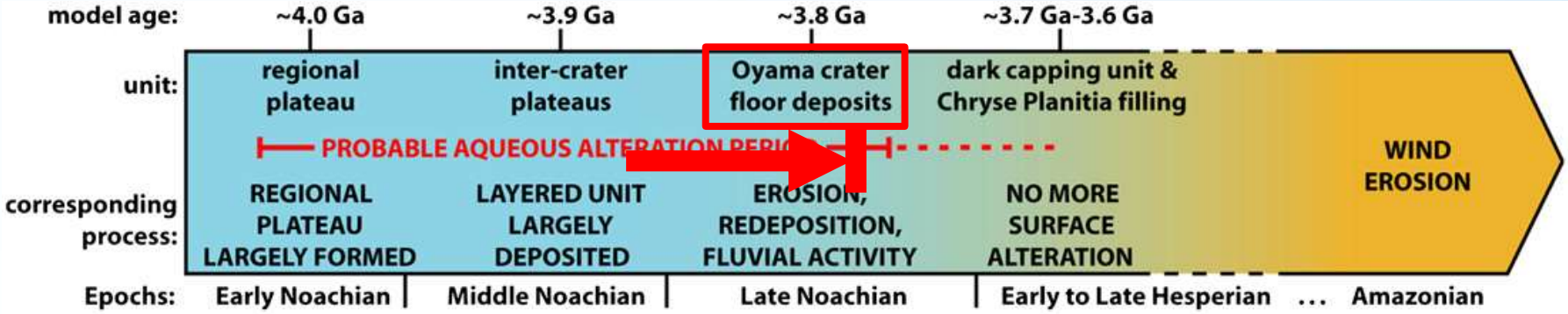


AGE CONSTRAINTS

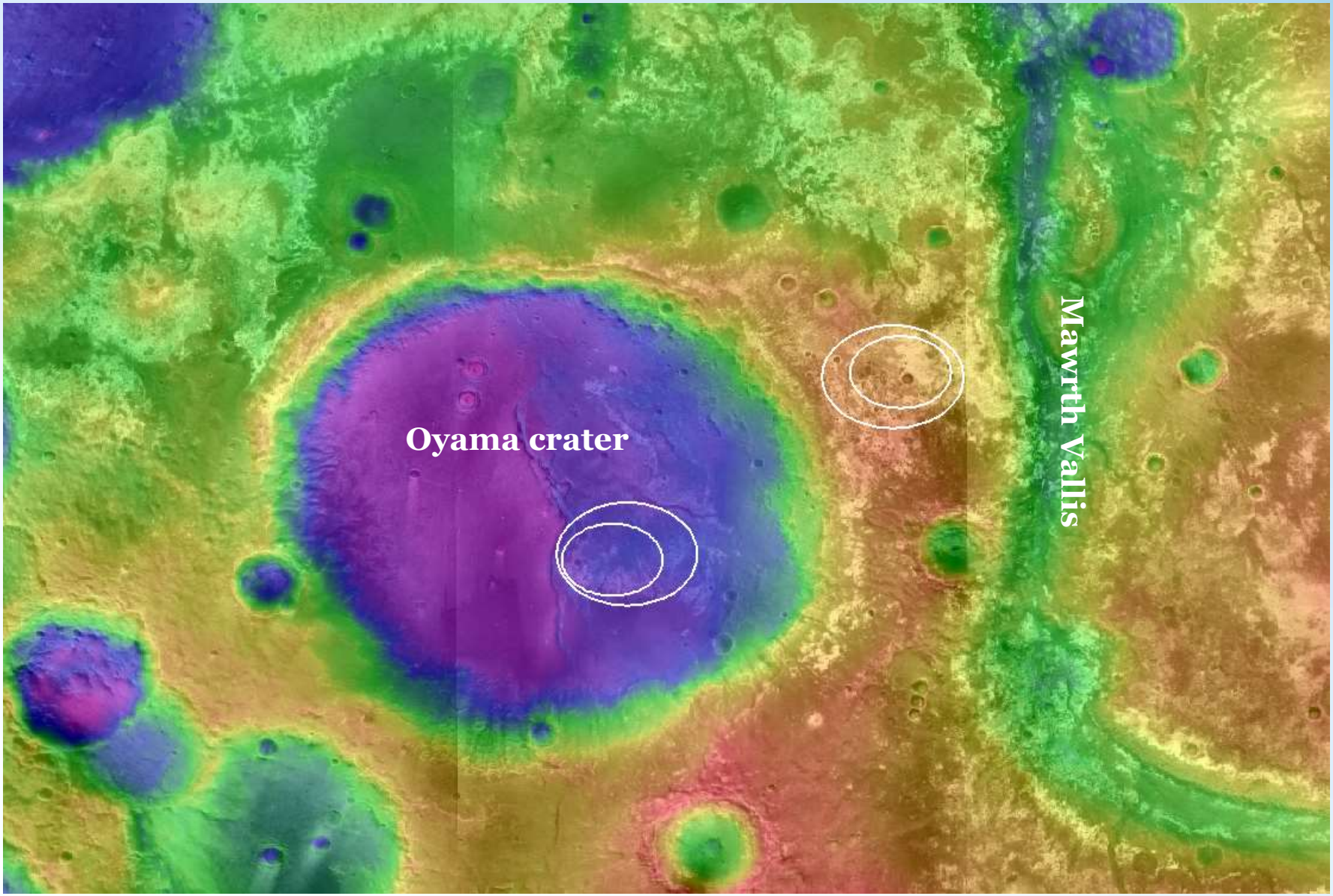
MARS 2020 at OYAMA CRATER



Mostly late Noachian activity



OYAMA ELLIPSE



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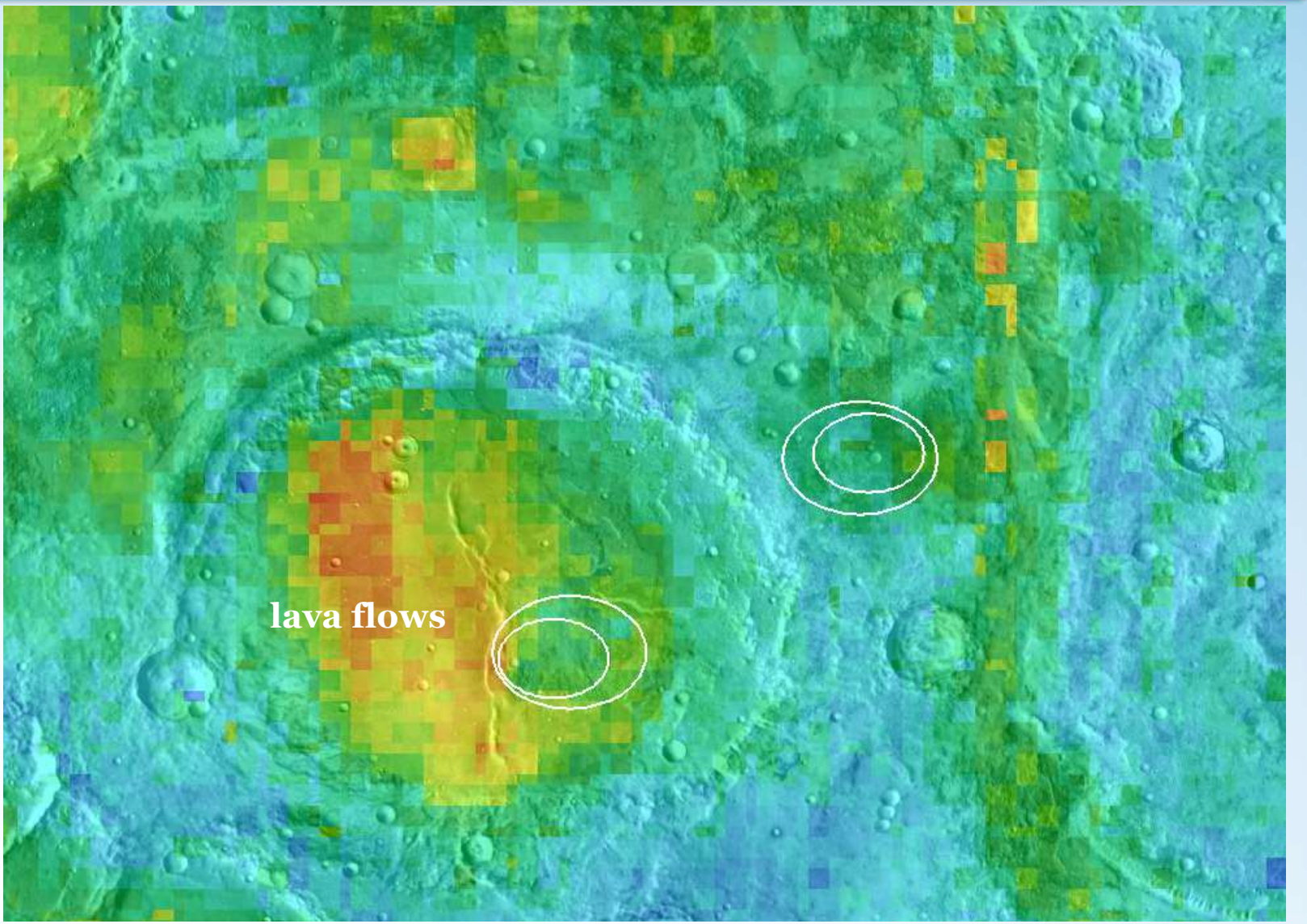
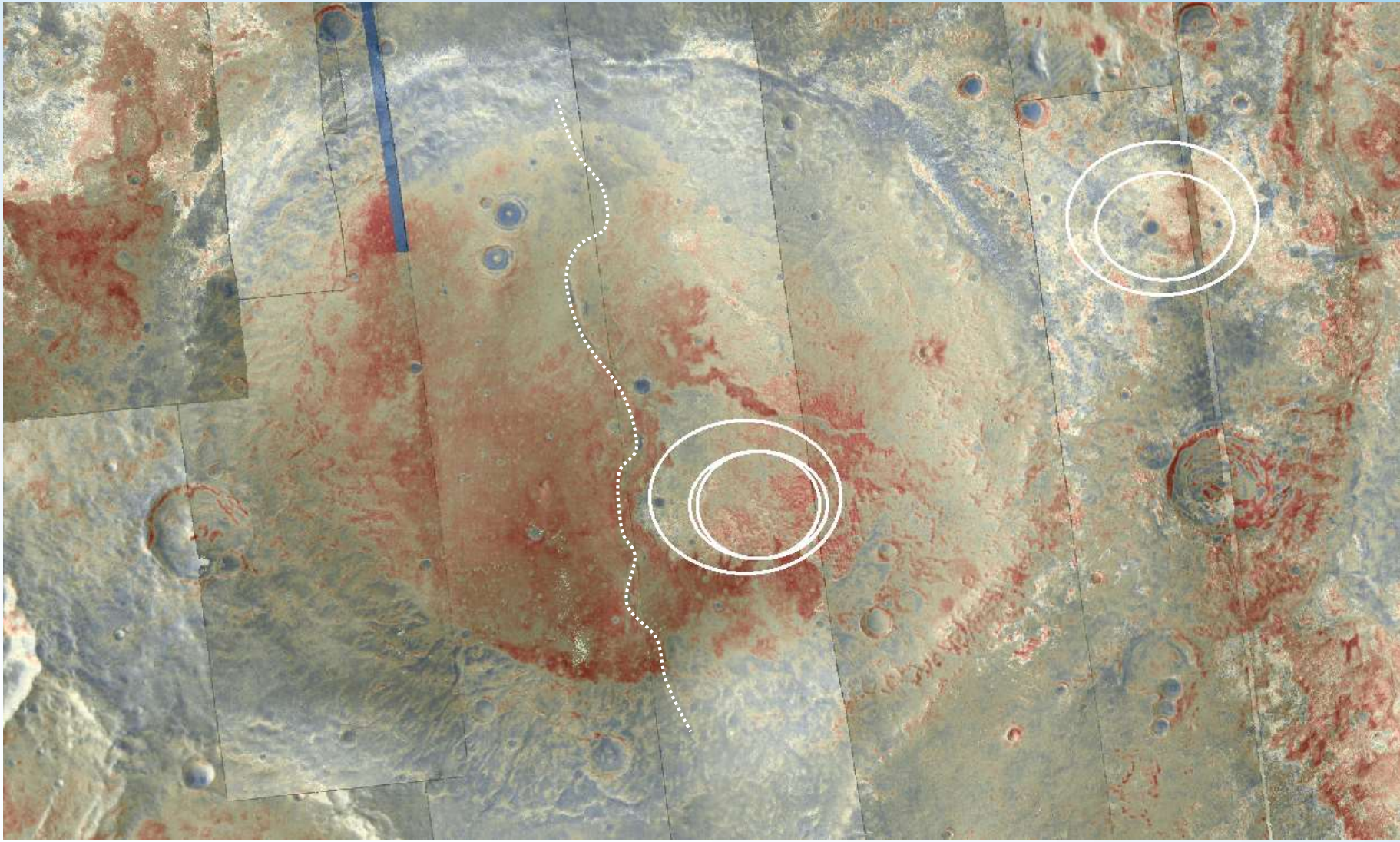


TES nighttime thermal inertia (Putzig et al. 2007)

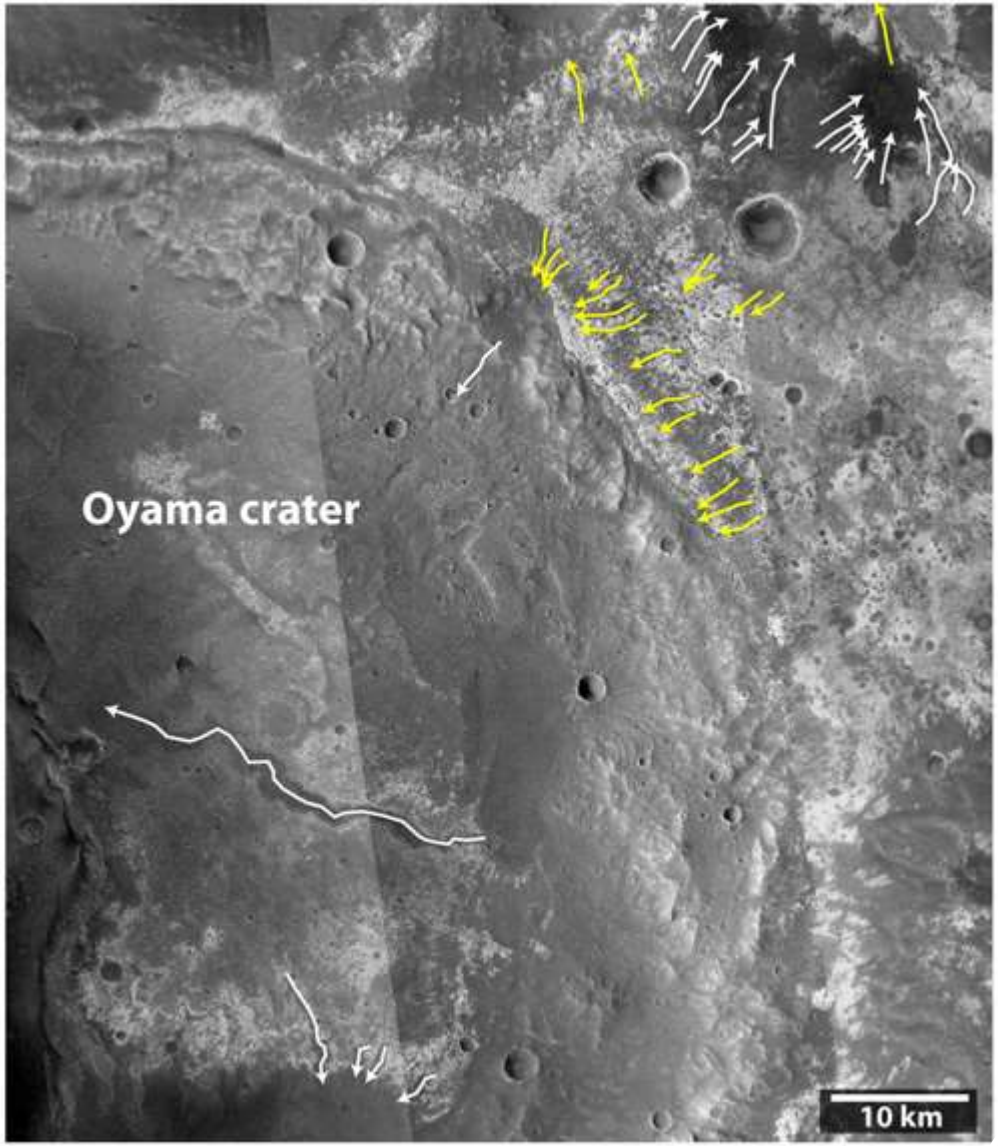
OYAMA ELLIPSE

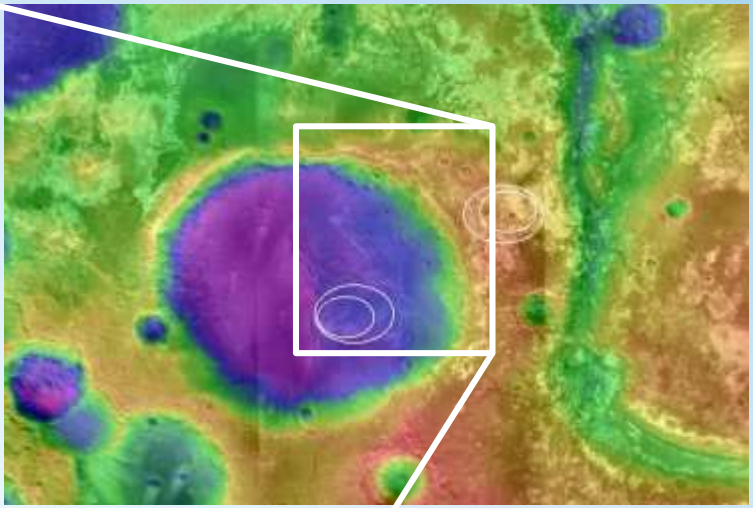


THEMIS nighttime temperature

OYAMA ELLIPSE

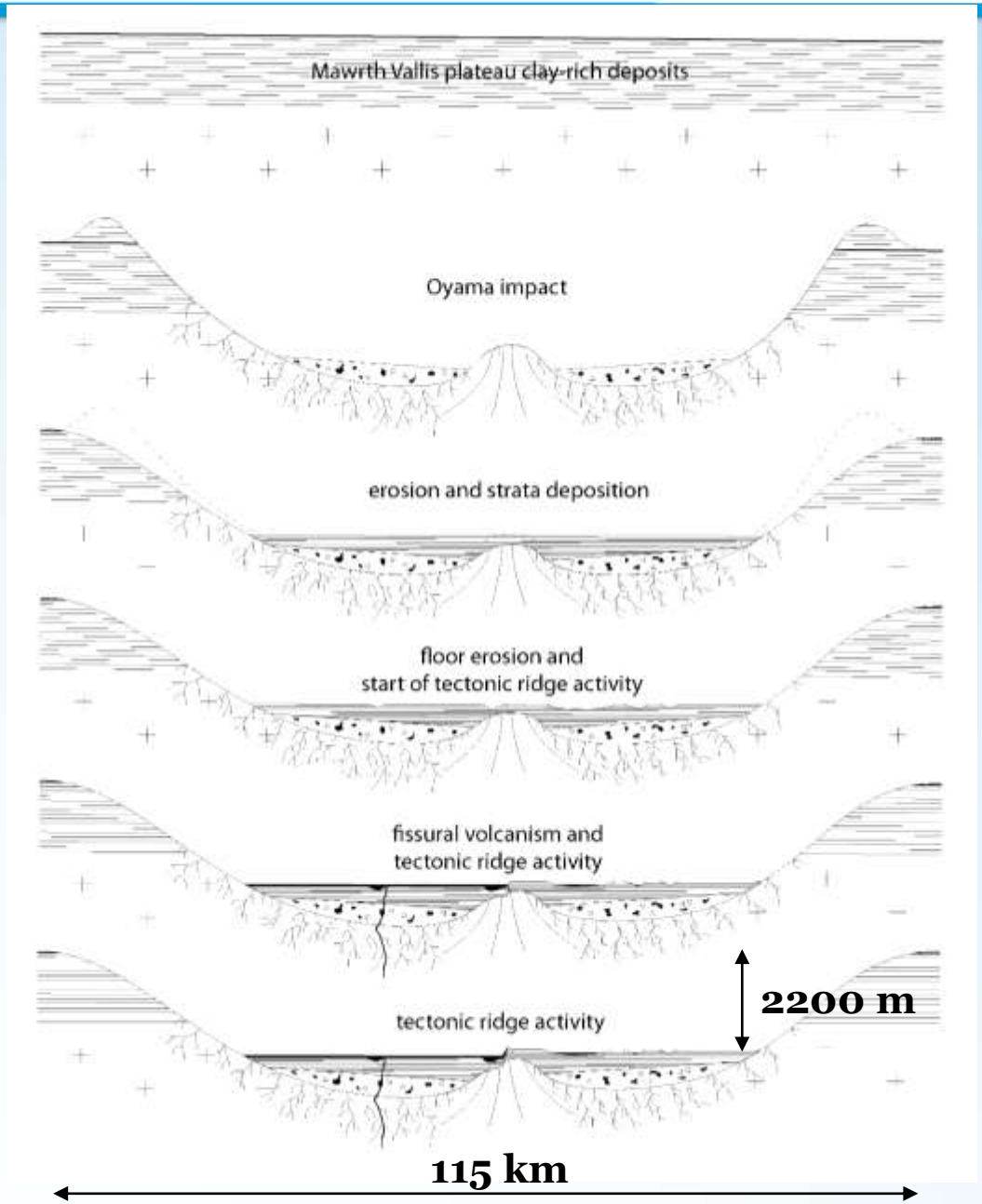
MARS 2020 at OYAMA CRATER



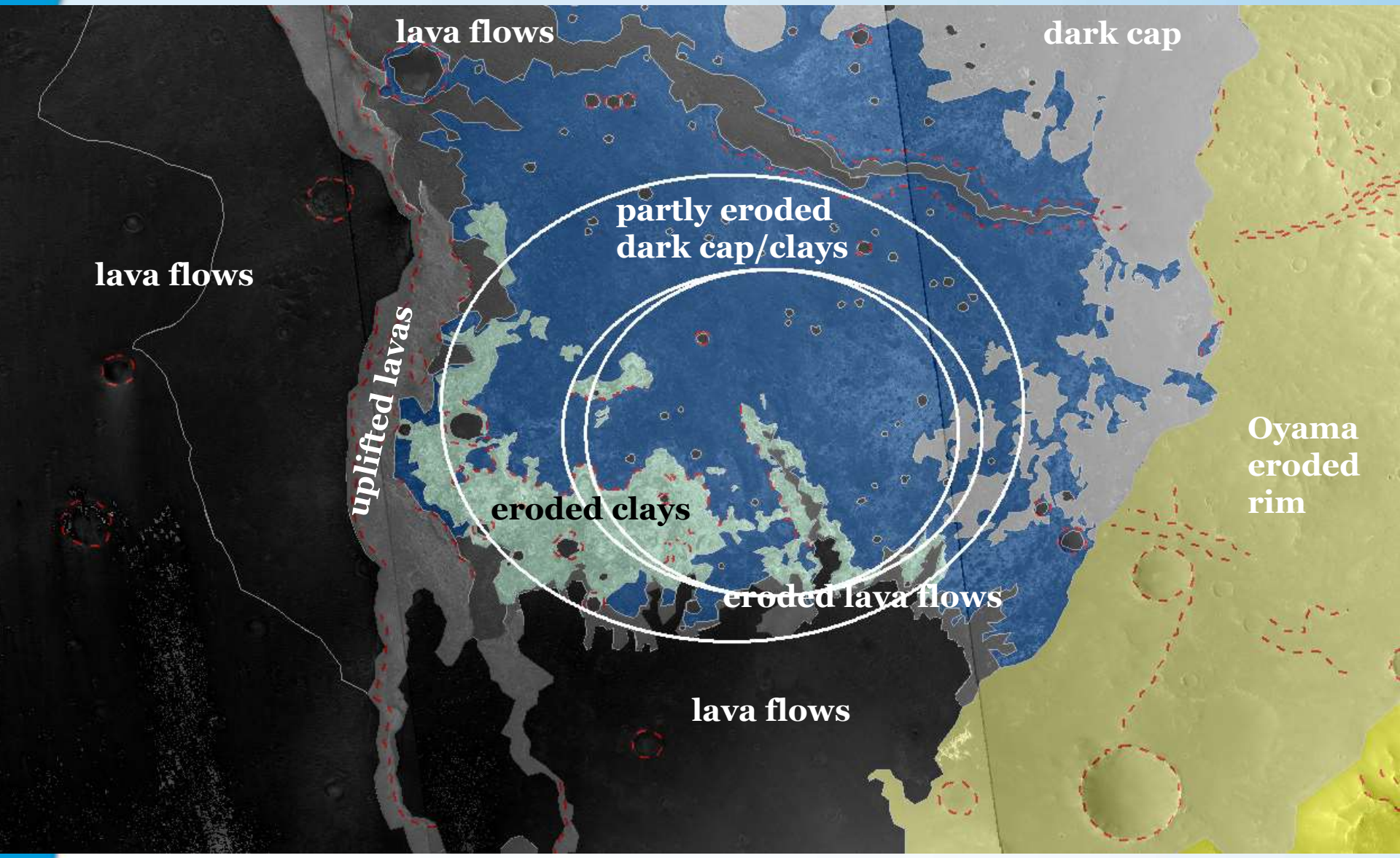


- **fluvial erosion of the plateau and lake or fluvial sediments inside Oyama**
- **organic concentration**

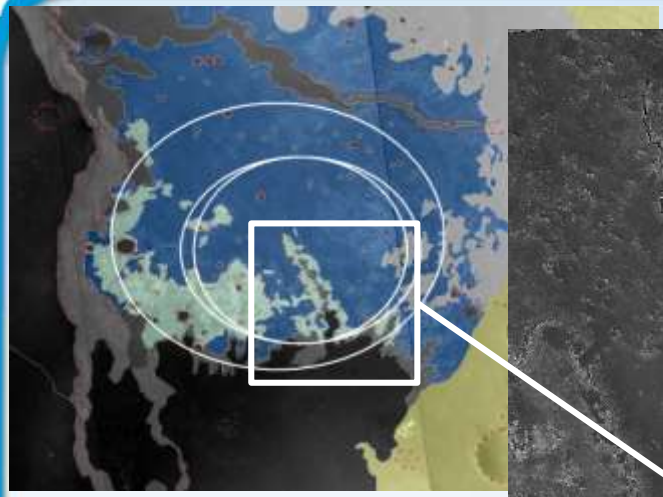
GEOLOGIC HISTORY

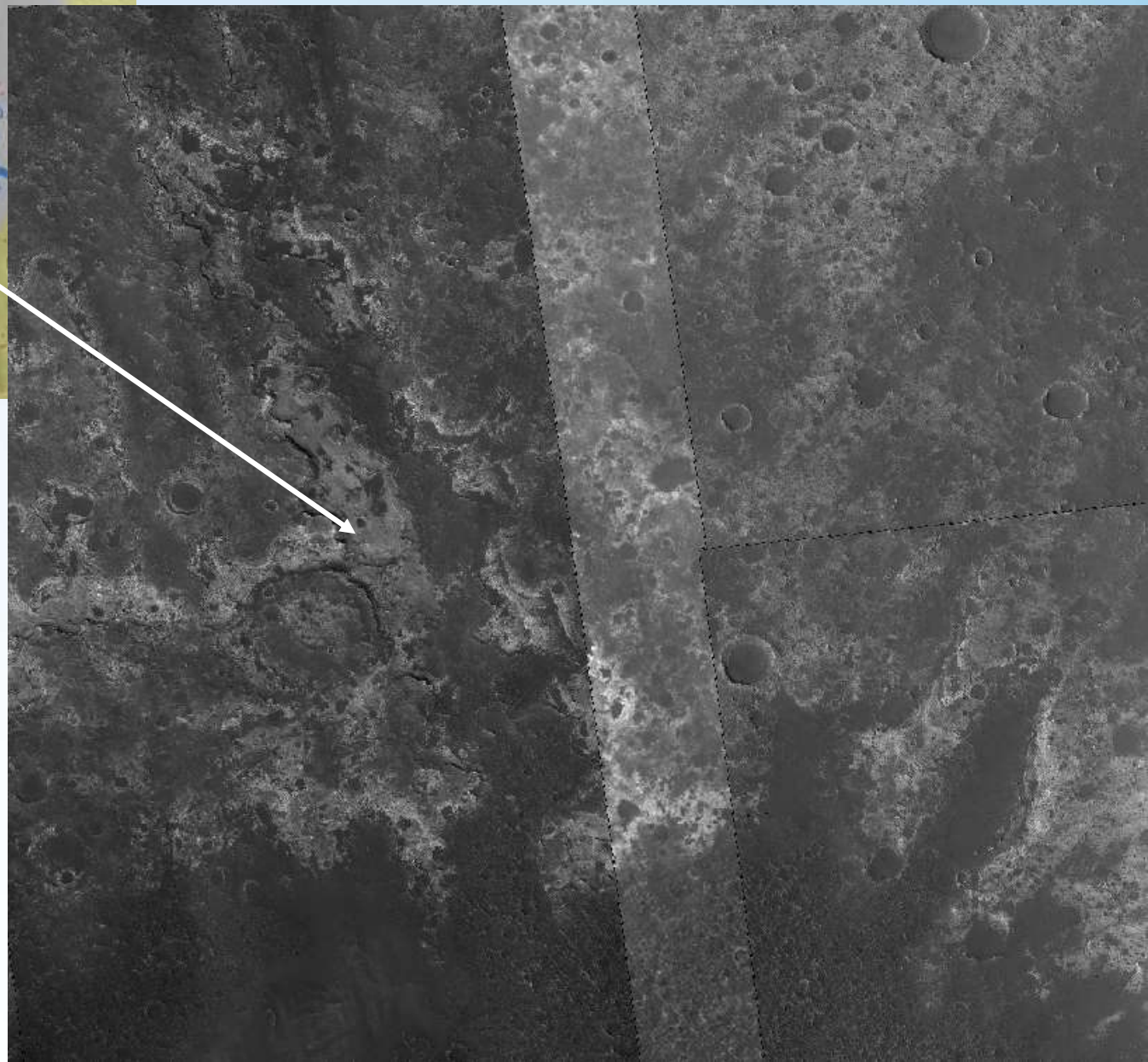


OYAMA ELLIPSE



ROI: valley filled by lava flows





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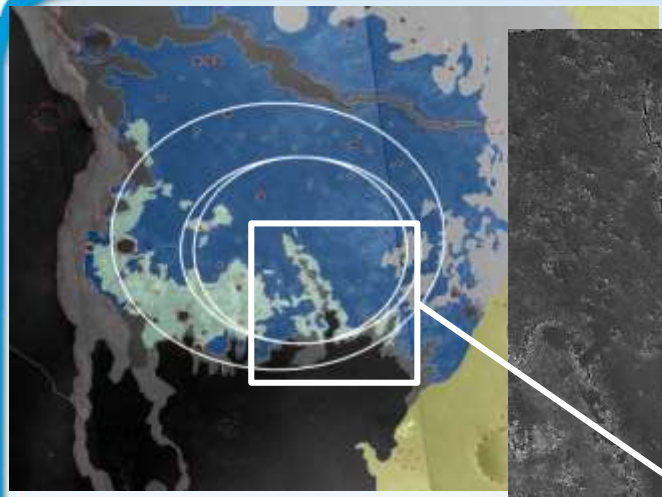
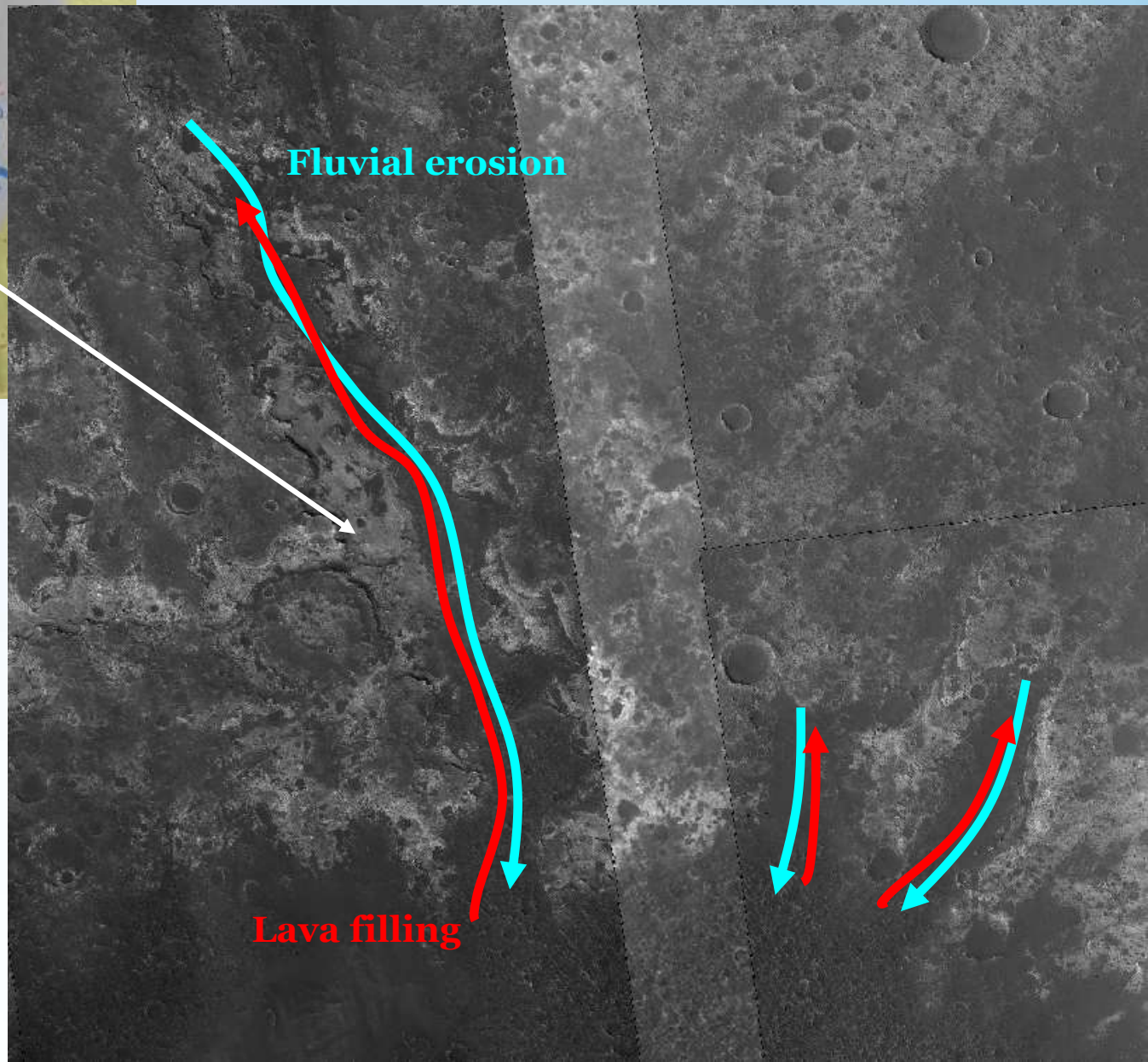
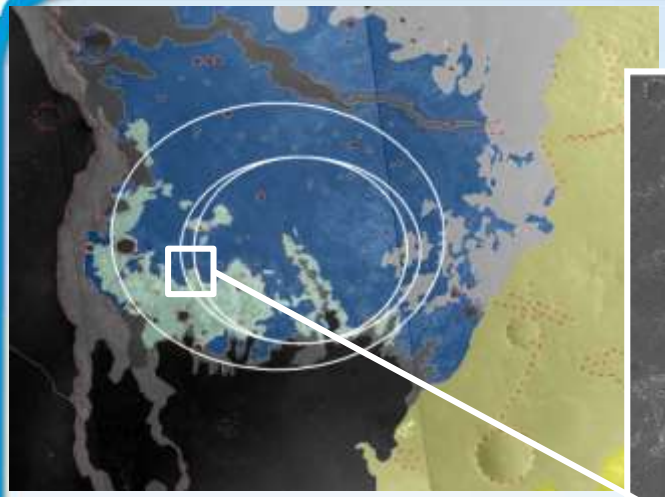
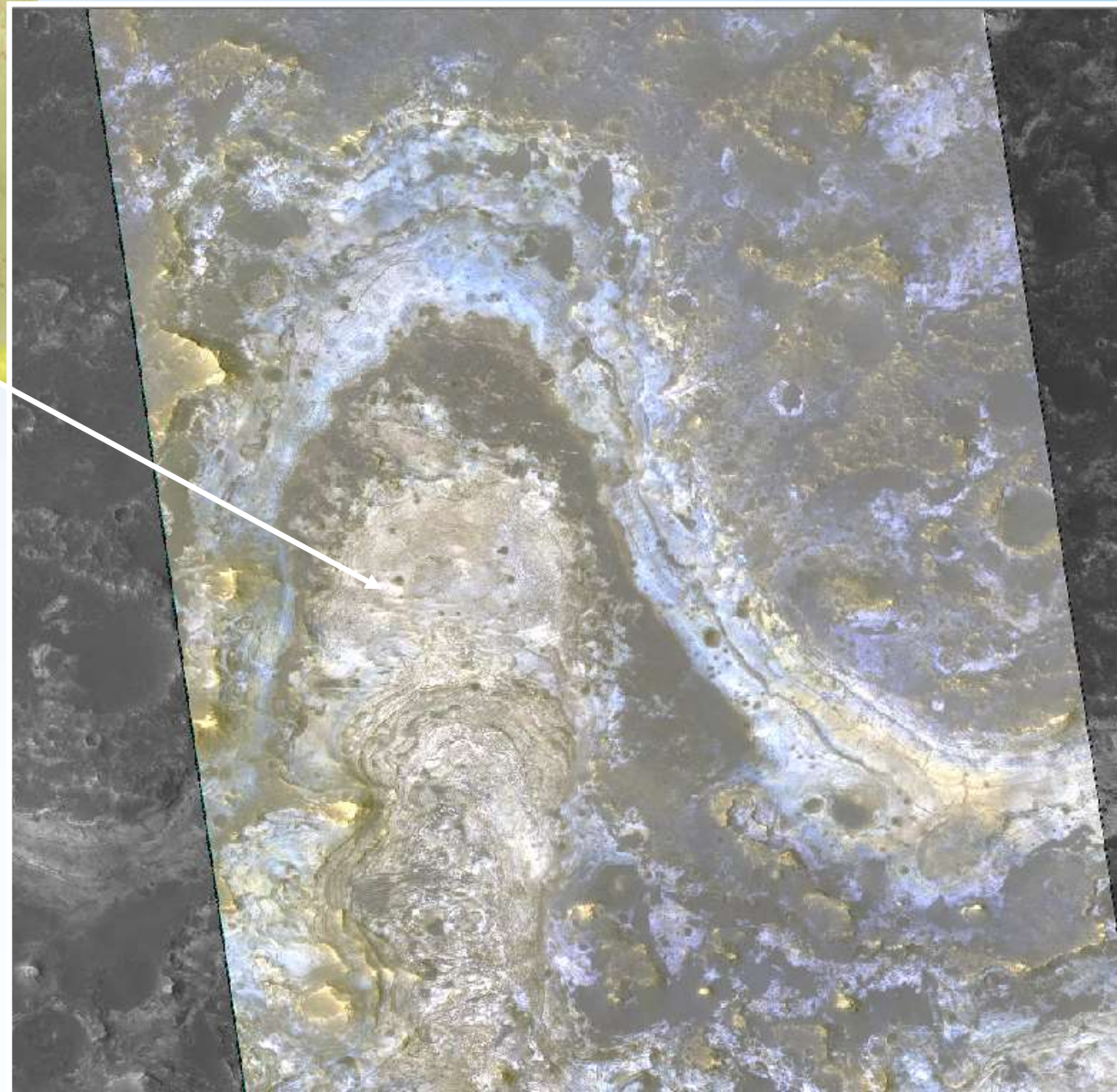


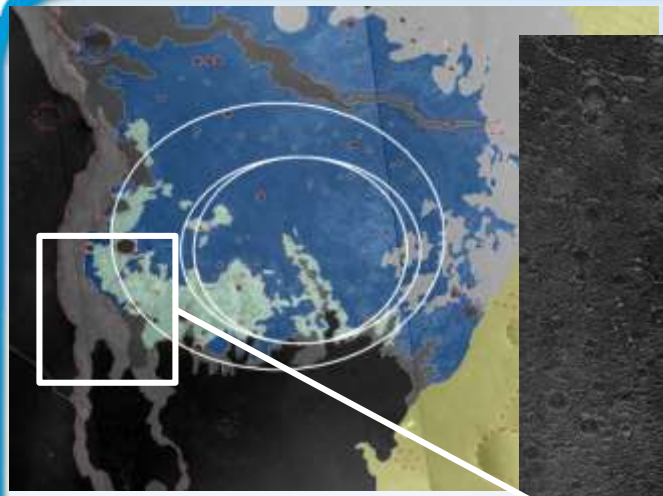


ROI: eroded valley





ROI: ridge

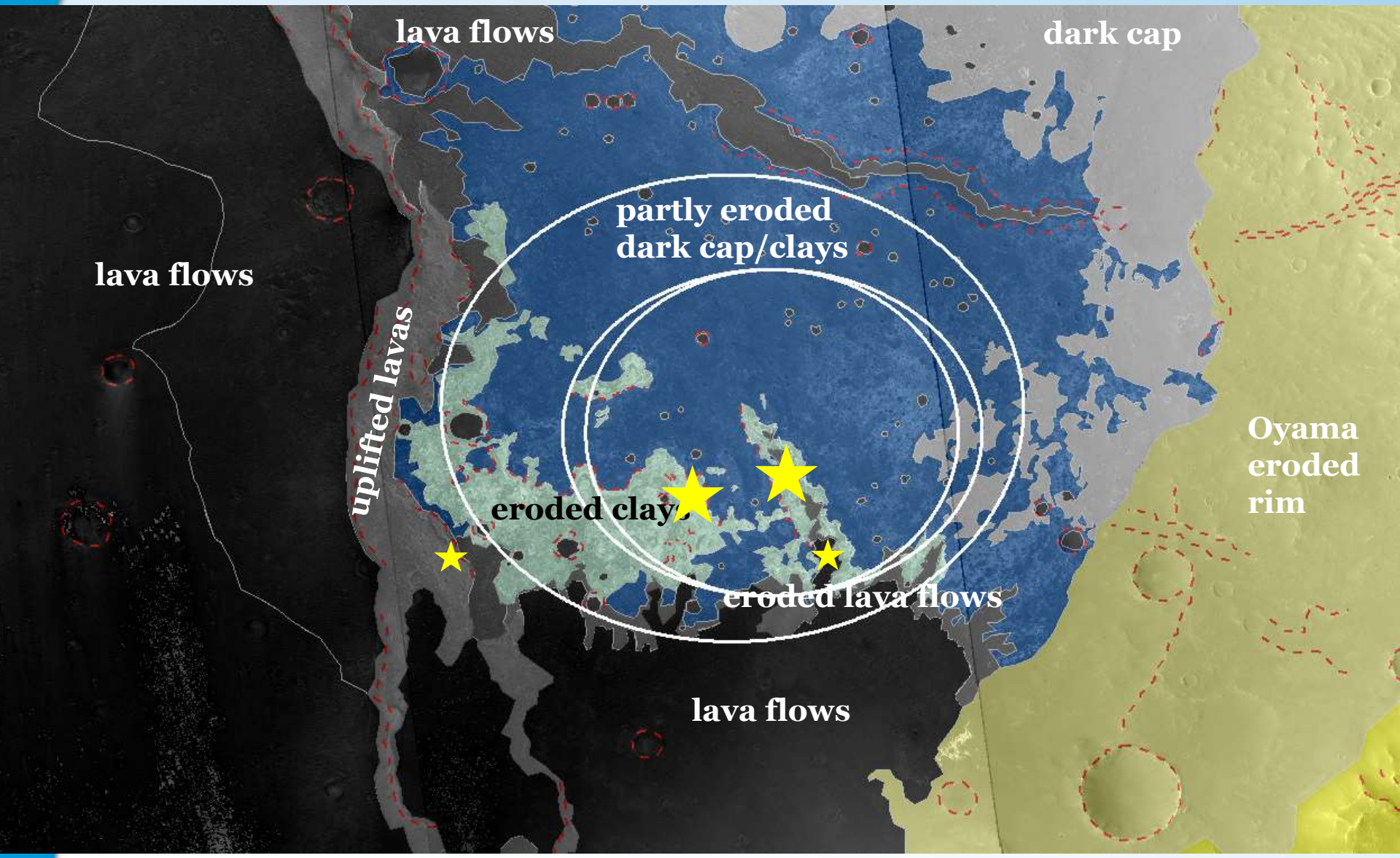


ROIs

MARS 2020 at OYAMA CRATER

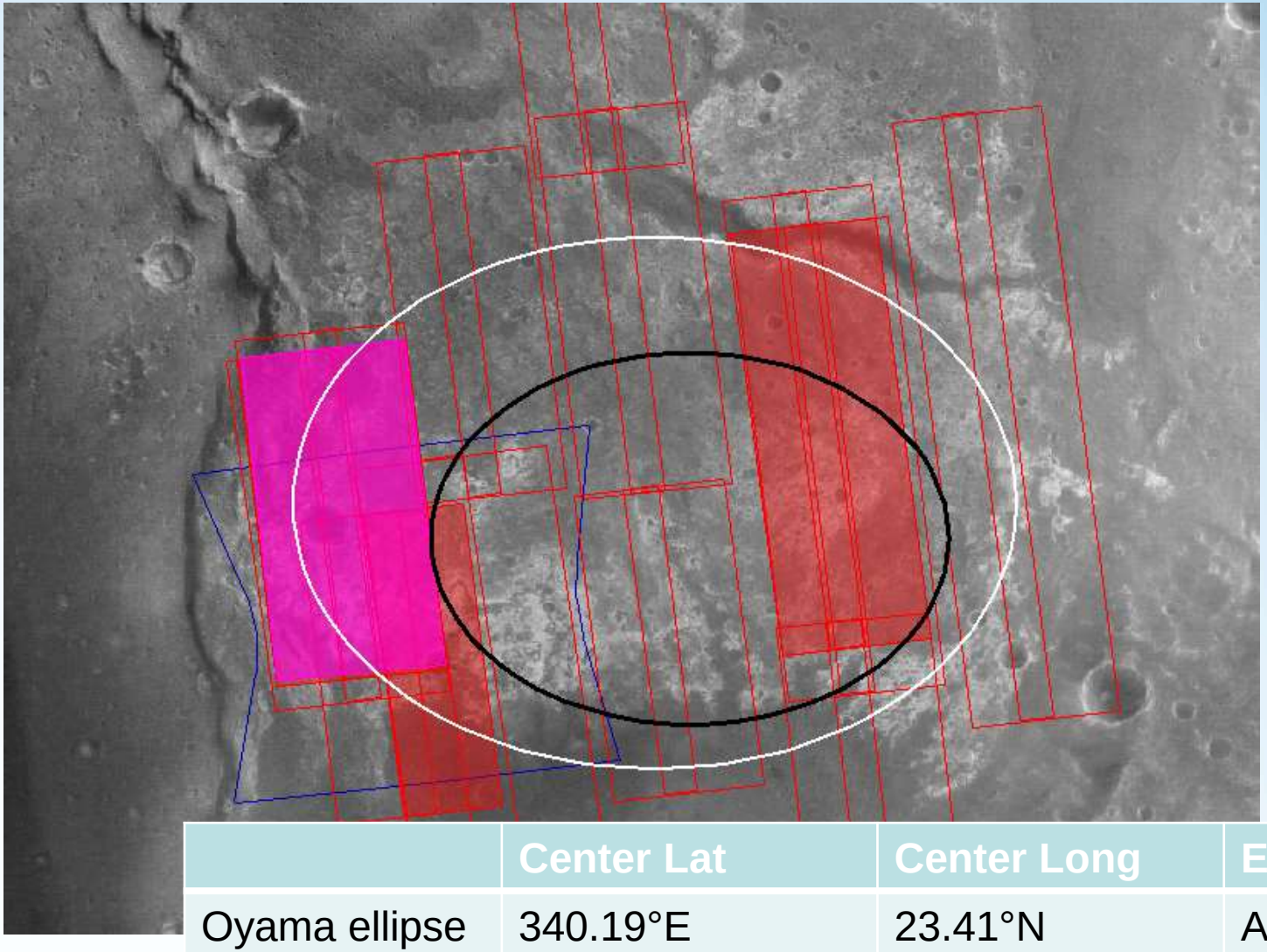
Unit	Morphology	Mineralogy	Objectives	Priority (1 is the highest)
Partly covered clays	Top of the clay deposits, some craters and filled craters	No visible hydrated signature, but most probably light soil over clays	Habitability, biosignatures, sample caching	2
Layered clays	Eroded layered clays along ancient valleys	layers of Al-rich phyllosilicates and layers of Fe-rich smectites	Habitability, biosignatures, sample caching	1
Lava flows	Dark cap that covered the whole lowest part of Oyama floor, strong layer that retains craters	No hydration, pyroxene signature in barkan dunes on the south-western side of the floor of Oyama	Sample caching	3
Soft crater fill	Dark sand sheets and dunes in craters	No hydration	…	5
Wrinkle ridge	Compressional fault crossing Oyama in a north-south direction, dividing its floor in two parts of equal area, higher in altitude in the east.	No hydration	Sample caching	4

ROIs


lava flows
dark cap
partly eroded
dark cap/clays
lava flows
uplifted lavas
eroded clays
eroded lava flows
Oyama
eroded
rim
lava flows

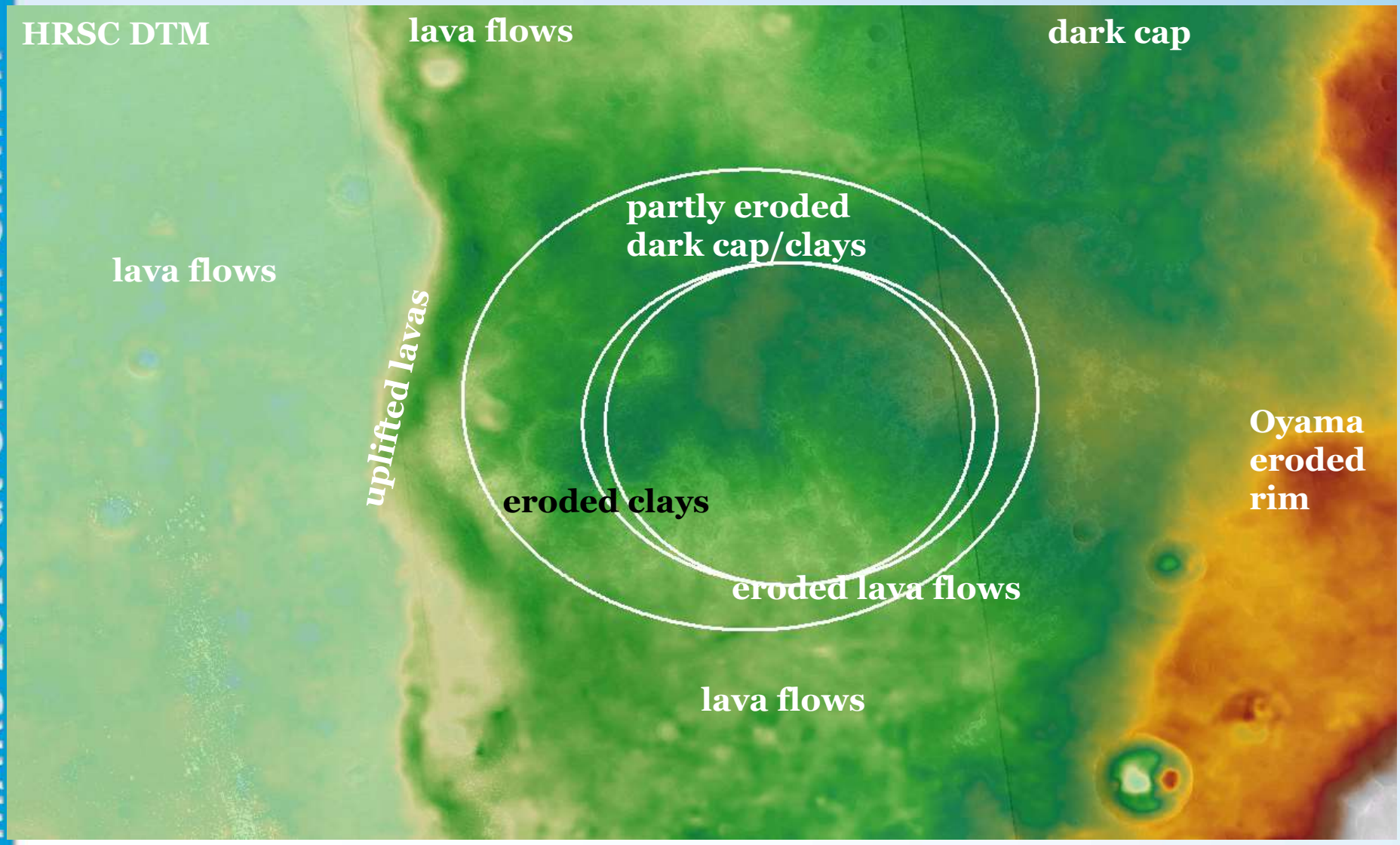
DATASETS

MARS 2020 at OYAMA CRATER



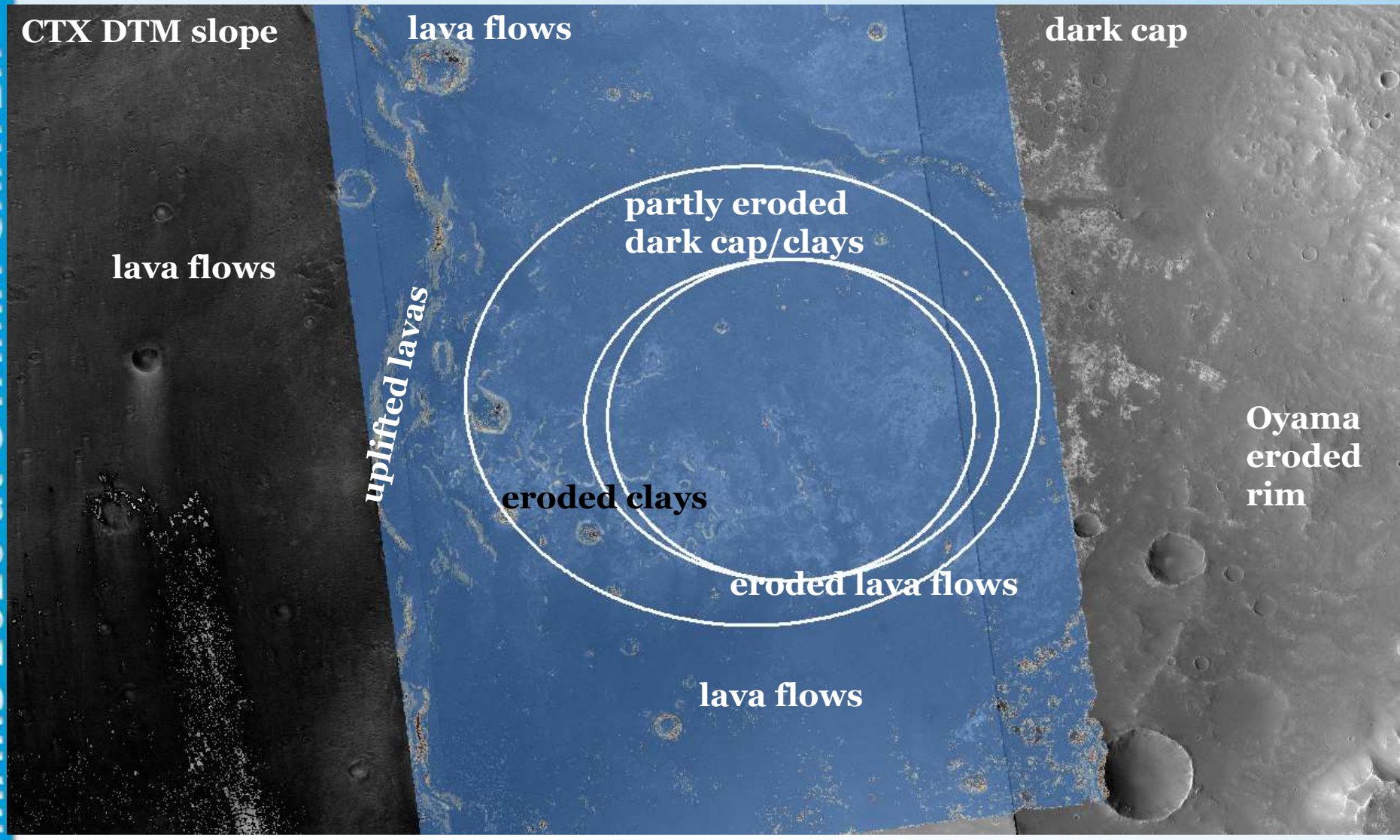
	Center Lat	Center Long	Elevation
Oyama ellipse (25 km x 20 km)	340.19°E	23.41°N	Avg: -3877 m (max: -3745 m, min: -4072 m)
Oyama ellipse (18 km x 14 km)	340.21°E	23.40°N	Avg: -3866 m (max: -3760 m, min: -3983 m)

OYAMA ELLIPSE



MARS 2020 at OYAMA CRATER

OYAMA ELLIPSE



TO SUMMARIZE

- strong aqueous alteration
- high geological variety (due to deposition, erosion & alteration)
- Rapid burial, reducing conditions, and very high clay content - high preservation potential
- potential concentration of biosignatures during deposition
- fresh surfaces (continuous erosion of clays)
- unique window into climate of early Mars
- Dateable ~EH lava flow surface and capping unit

TO SUMMARIZE

MARS 2020 at OYAMA CRATER

Landing Site Factor	Mars 2020 Mission and Decadal Priority Science Factors																								
	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	Al 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)
Oyama deposits	~	?		?	●	●	~	●		●	●			?	?	?	?	●	●		LN	EH	●	●

- to address in detail the questions of habitability & the potential origin and evolution of life on Mars
- minimizes the quantity of driving to maximize the quantity of field characterization and coring

THANK YOU!

erc

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