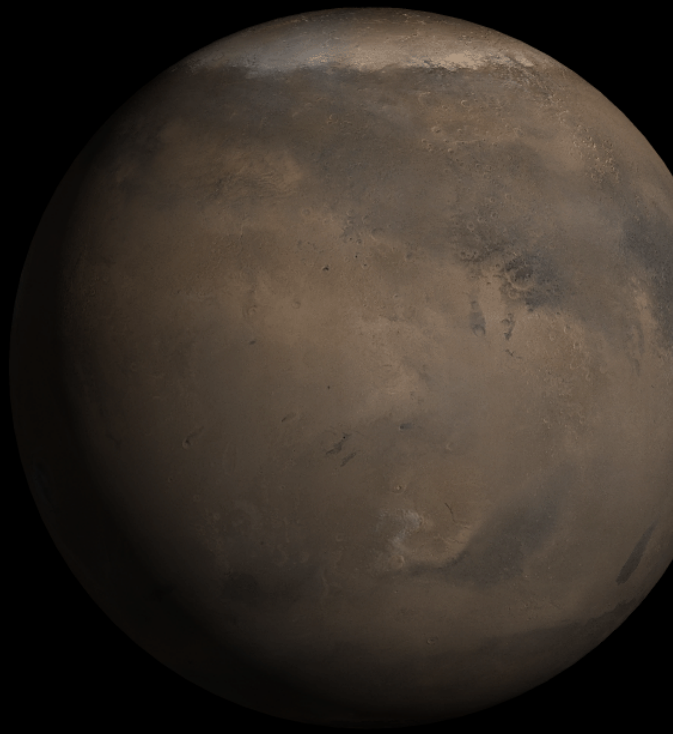

INTERNATIONAL SCHOOL OF ASTROBIOLOGY «JOSEP COMAS I SOLÀ». MARS EXPLORATION: THE UNVEILIN AN HABITAT PLANET

Project: Selection of Landing Site for Mars Science Laboratory mission

Group 1
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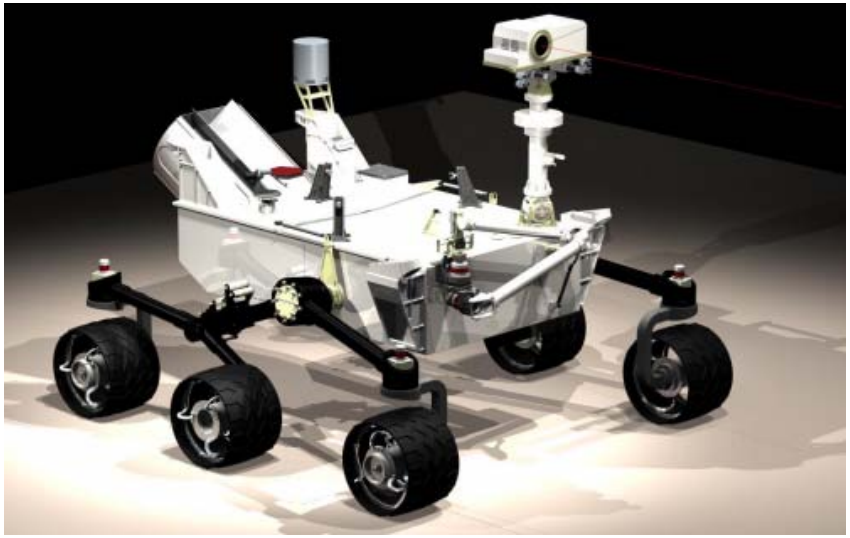
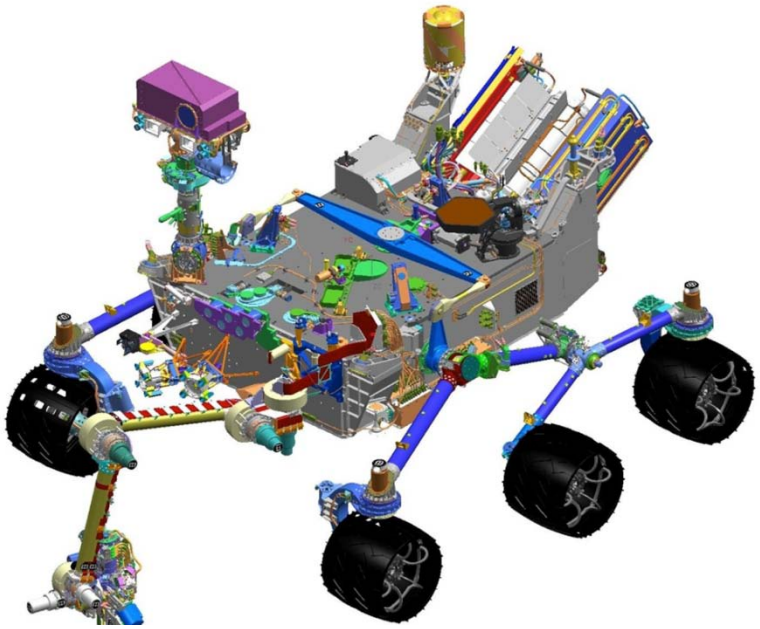
MSL objectives

Generalities

- To assess the **biological potential** of the site.
- To characterize **geology and geochemistry**.
- To investigate the **role of water** and climate.
- To characterize the **spectrum of surface radiation**.





MSL landing sites

Selection criteria

TECHNICAL CONSTRAINTS

- Latitude
- Elevation
- Hour
- Season
- Topography
- Rocks
- Atmospheric parameters
- RADAR reflect
- Thermophysical properties

SCIENCE CRITERIA

- Diversity
- Context
- Habitability
- Preservation

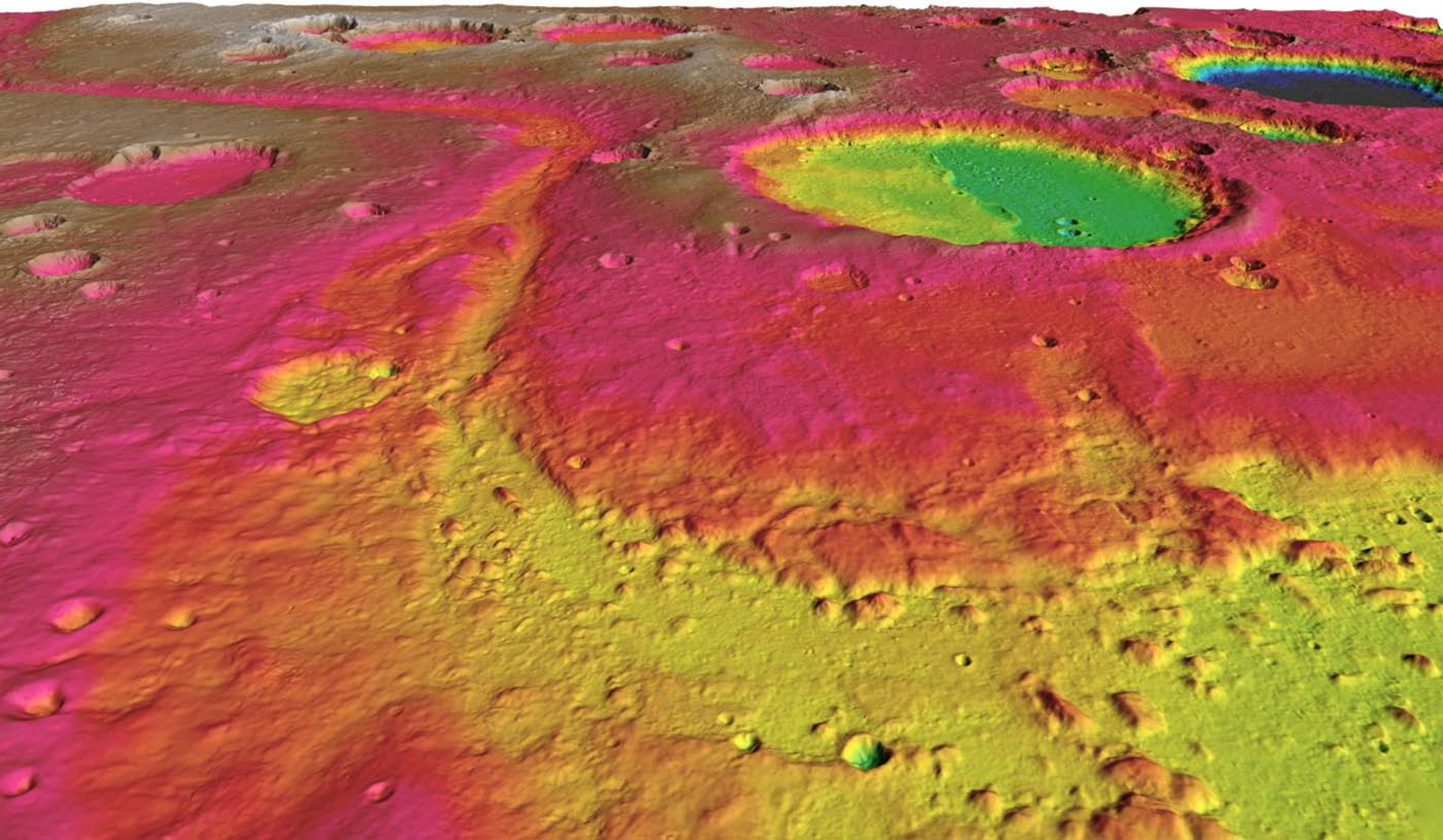
Selection:

2nd LSW → **33 LS (94)**
3rd LSW → **7 LS**
5th LSW → **4 LS**

MSL landing sites

Final four

Mawrth Vallis



MSL landing sites

Selection criteria

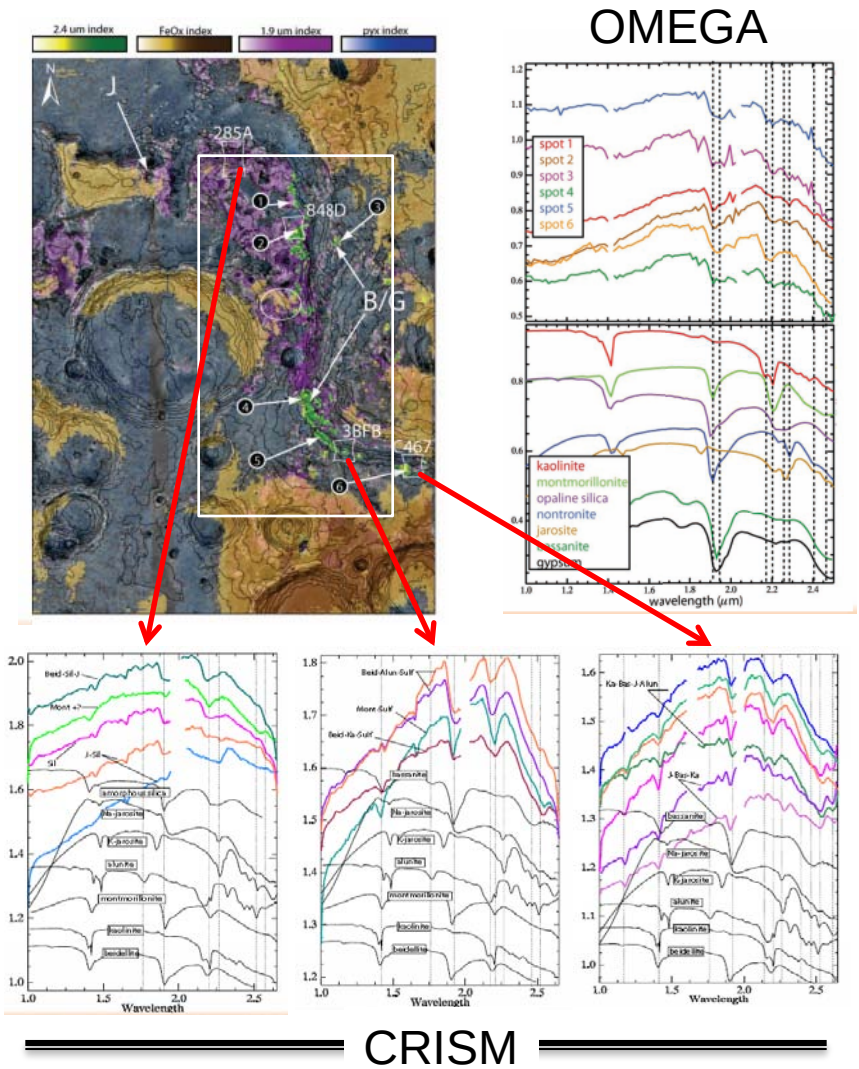
- The landing ellipse should be prioritized versus go-to sites.
  - 10 km → 200 sols (time consuming and risky).
- The landing site decision should be driven by the presence of phyllosilicates.
  - They have not yet been detected in situ.

(Ruff, 5thLSW)

Diversity

Mineralogical and geomorphologic

- High diversity of Al-philosillicates detected from TES, OMEGA and CRISM (Michalski, 5thLSW)
  - Whereas Holden and Eberswalde have limited diversity of phillosilicates.
- Although abundance results of VNIR and TIR do not match, this appears to be solved with THEMIS data. (Viviano & Moersch, 5thLSW)



Context

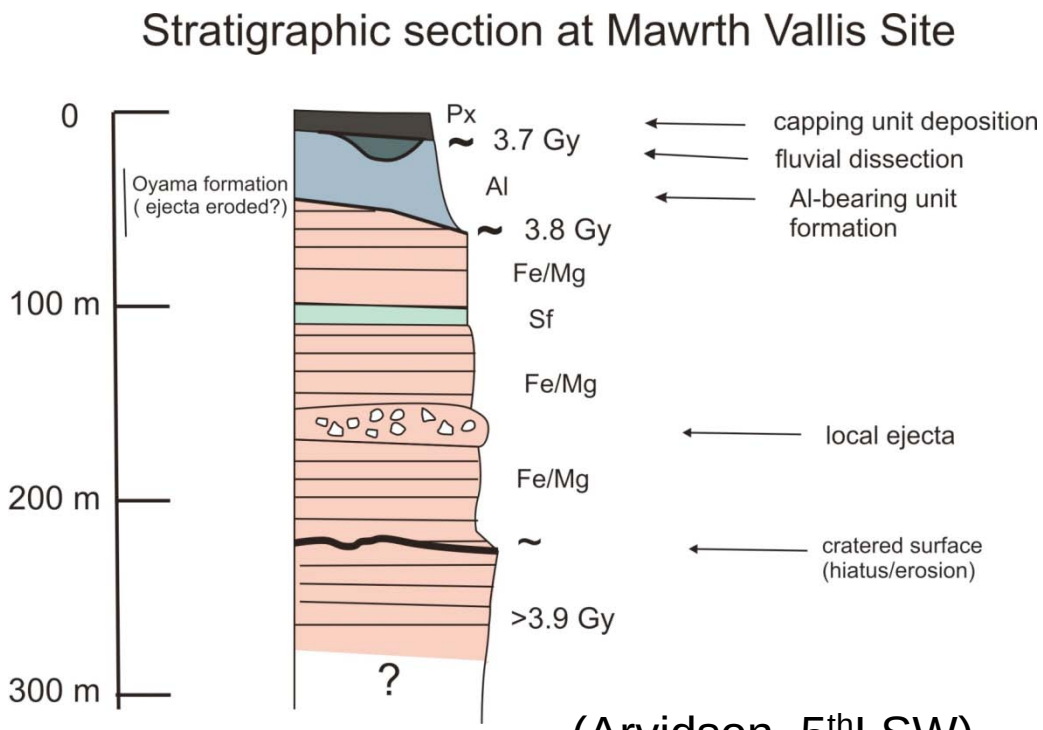
Geologic representativity and well know origin

- One of the largest and most altered locations on Mars.

  (Ruff, 5th LSW)
- Representaove of regional-scale straographic section.

  BUT…
  - Very near to Oyama crater, affected materials?

    (Sumner, 5th LSW)
  - Current models for emplacement history may not be well defined…

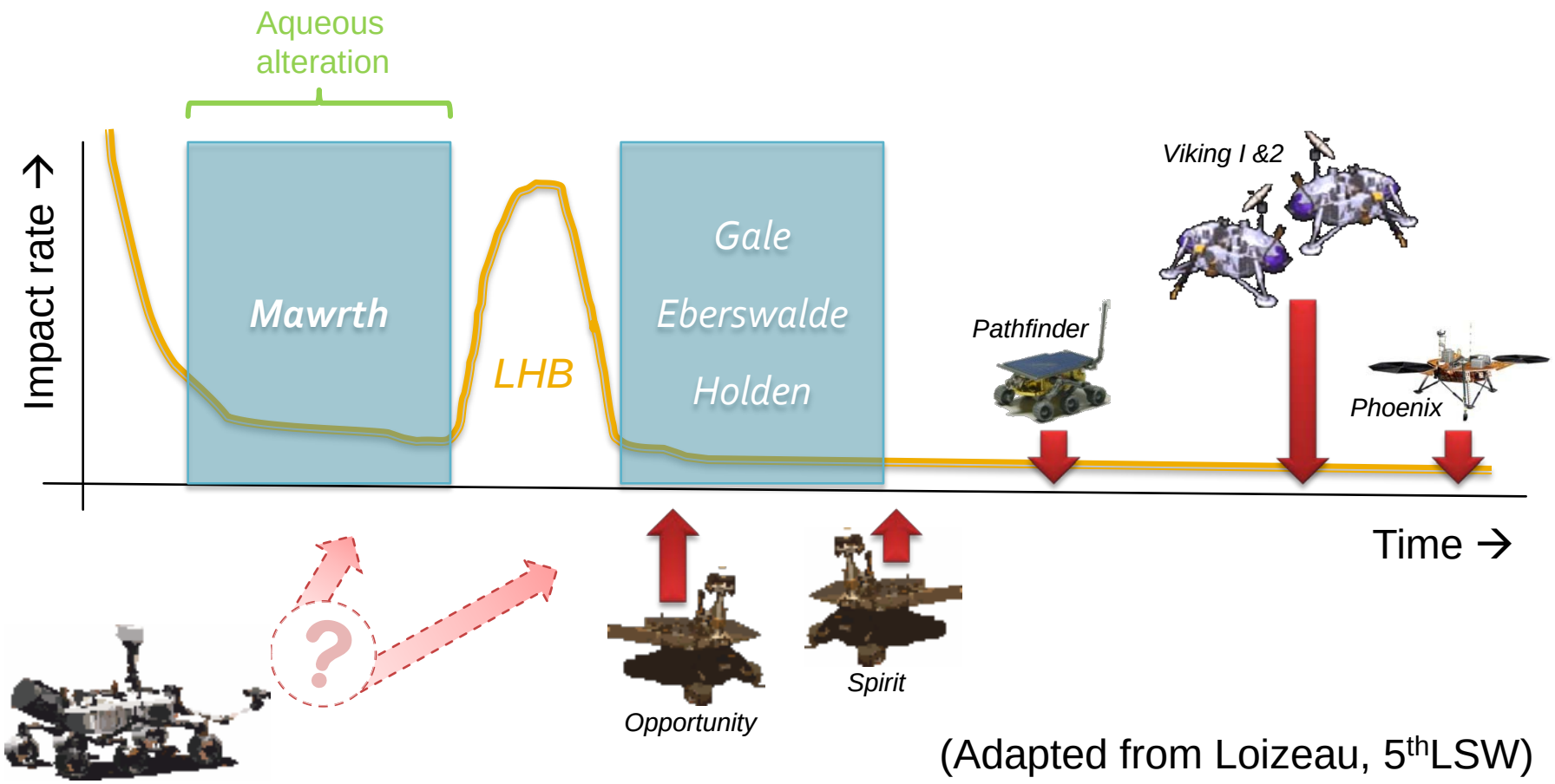


(Arvidson, 5th LSW)

Context

Geologic representativity and well know origin

- Sedimentation during Noachian, the older materials of the LSs.



(Adapted from Loizeau, 5thLSW)

Habitability

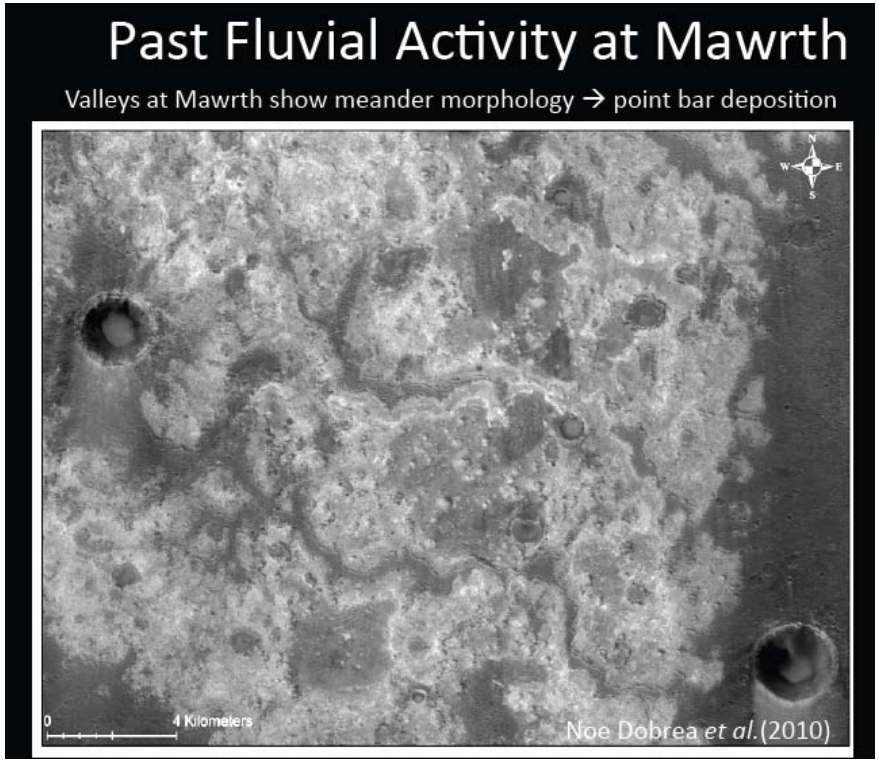
Evidences of past habitats favorable for life

- Past fluvial activity, although sediment origin is not well known.
- Phyllosilicates diversity is presented sequentially, in very definite layers.

Traverse in space = Traverse in time

- Largest number of pristine spots.
- Reconstruct aqueous and environmental conditions present during a wide period of Martian history, along with the environmental evolution.

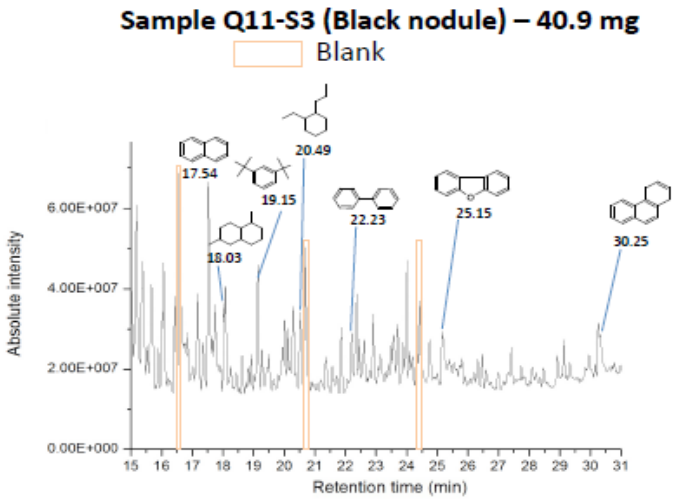
(Bibring, 5th LSW)

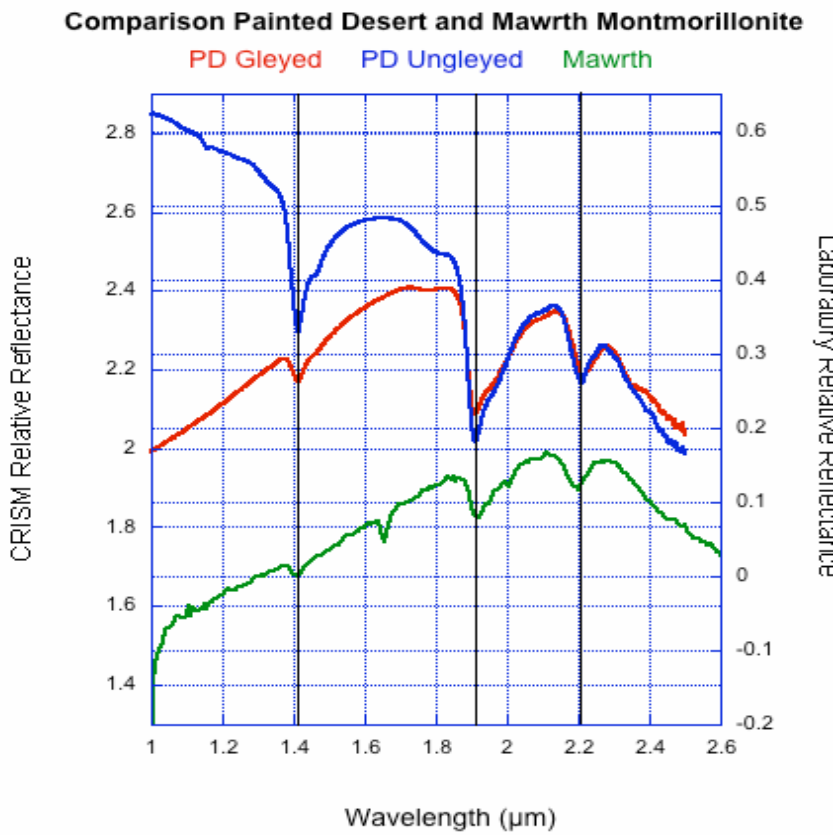


Preservation

Capability to conserve biosignatures

Painted Desert (Arizona)





(Noe Dobrea, 5th LSW)

In conclusion

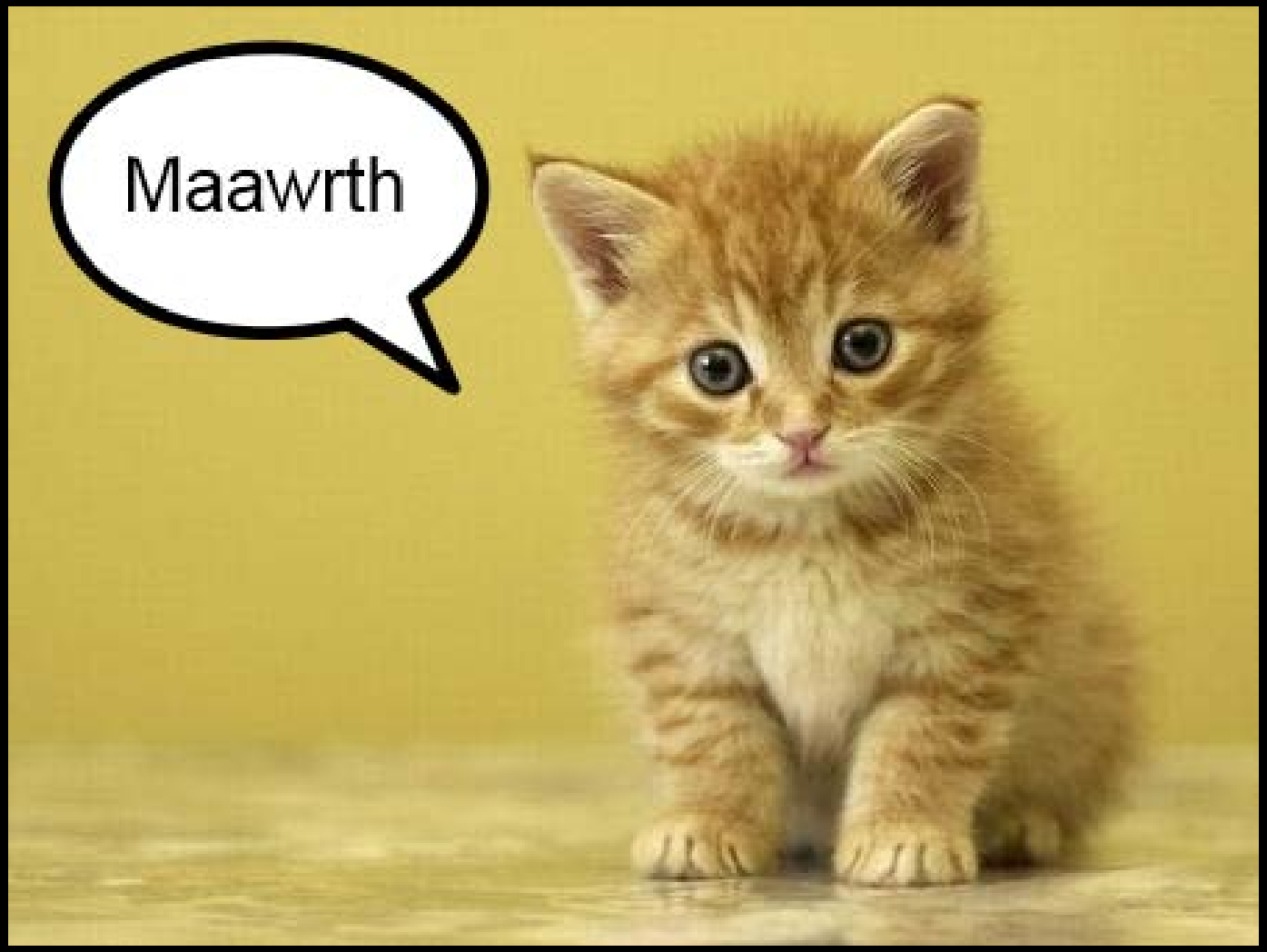
Main strength of Mawrth Vallis

- Less risky (science in landing ellipse, pristine spots).
- Likelihood of exciting results: it's time to explore Noachian era!

"If we failed to detect bio-signatures at Mawrth Vallis, it will likely indicate that not all the ingredients were present at Mars to enable life to emerge. On the opposite, if we decided not to land in Mawrth Vallis, and failed to detect bio-signatures, we will regret for ever not to have explored Mawrth Vallis".

(Bibring, 5th LSW)

So…

In conclusion

Thank you!