Mars Express
Very close to an exciting World

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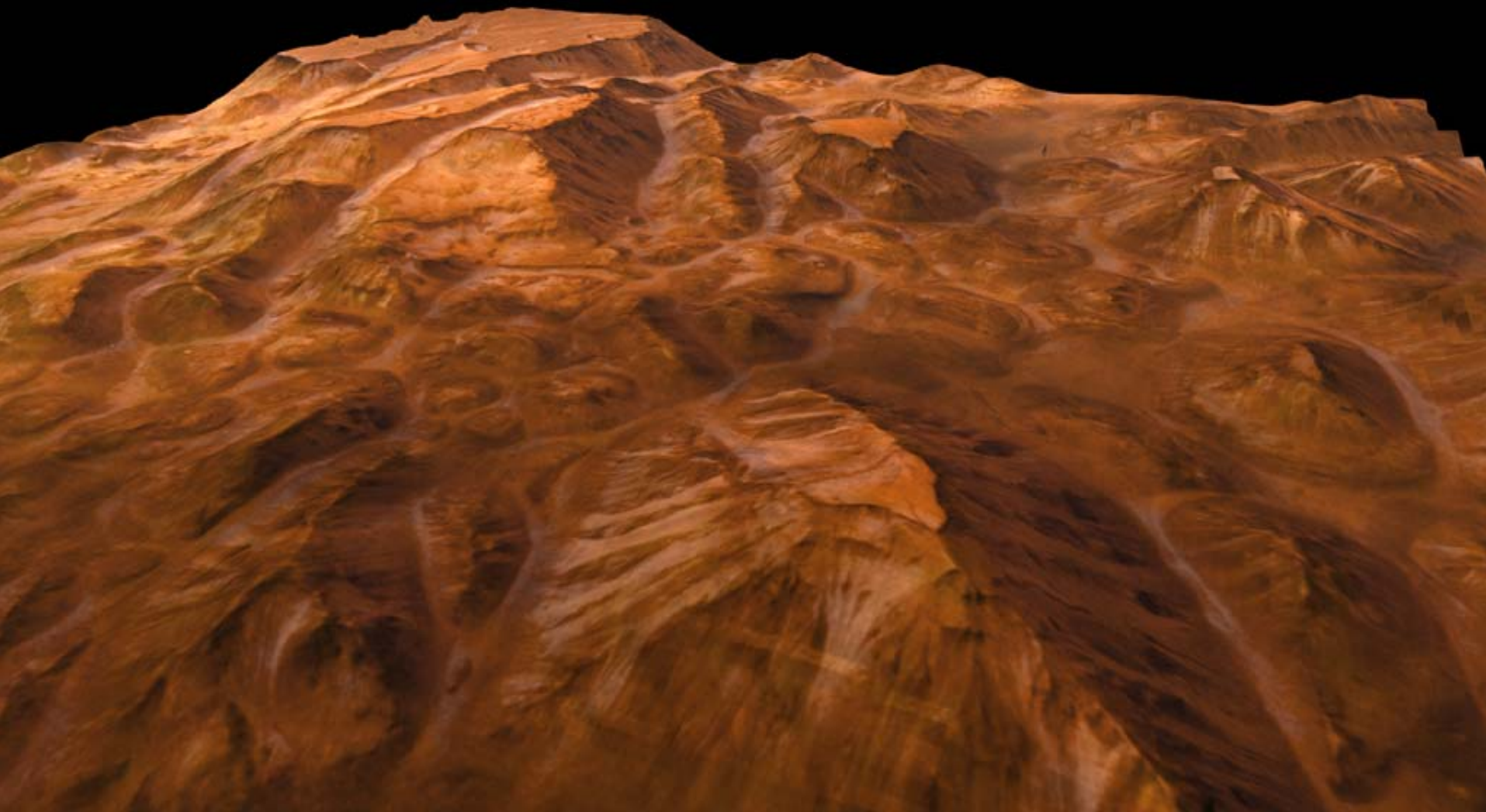
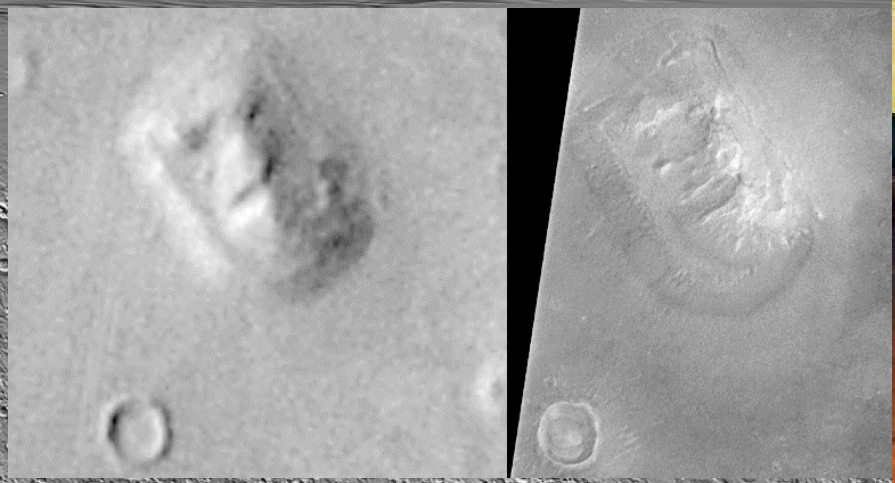
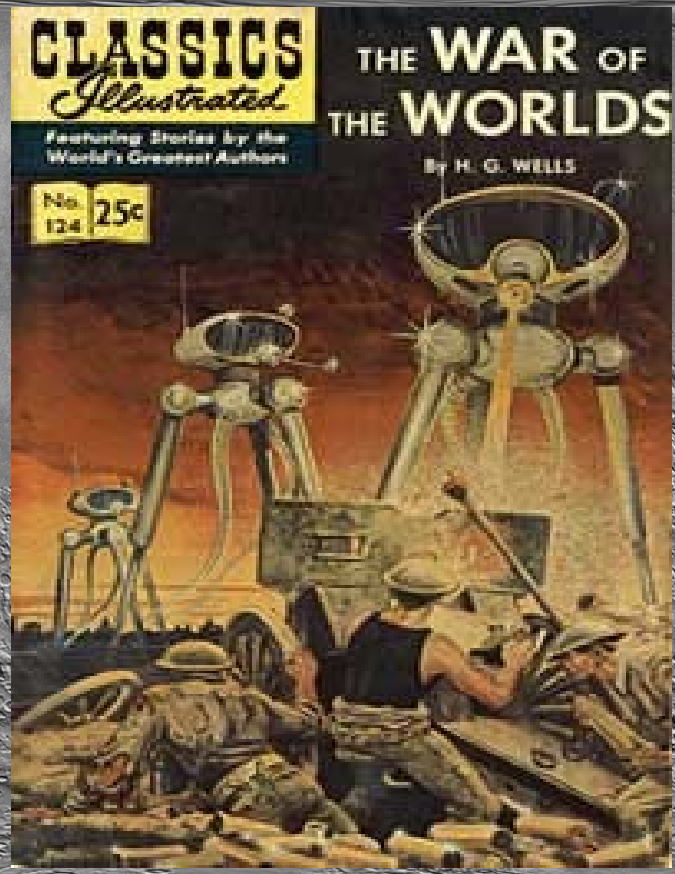
Was Mars a habitable world?



Life on Mars .... ????



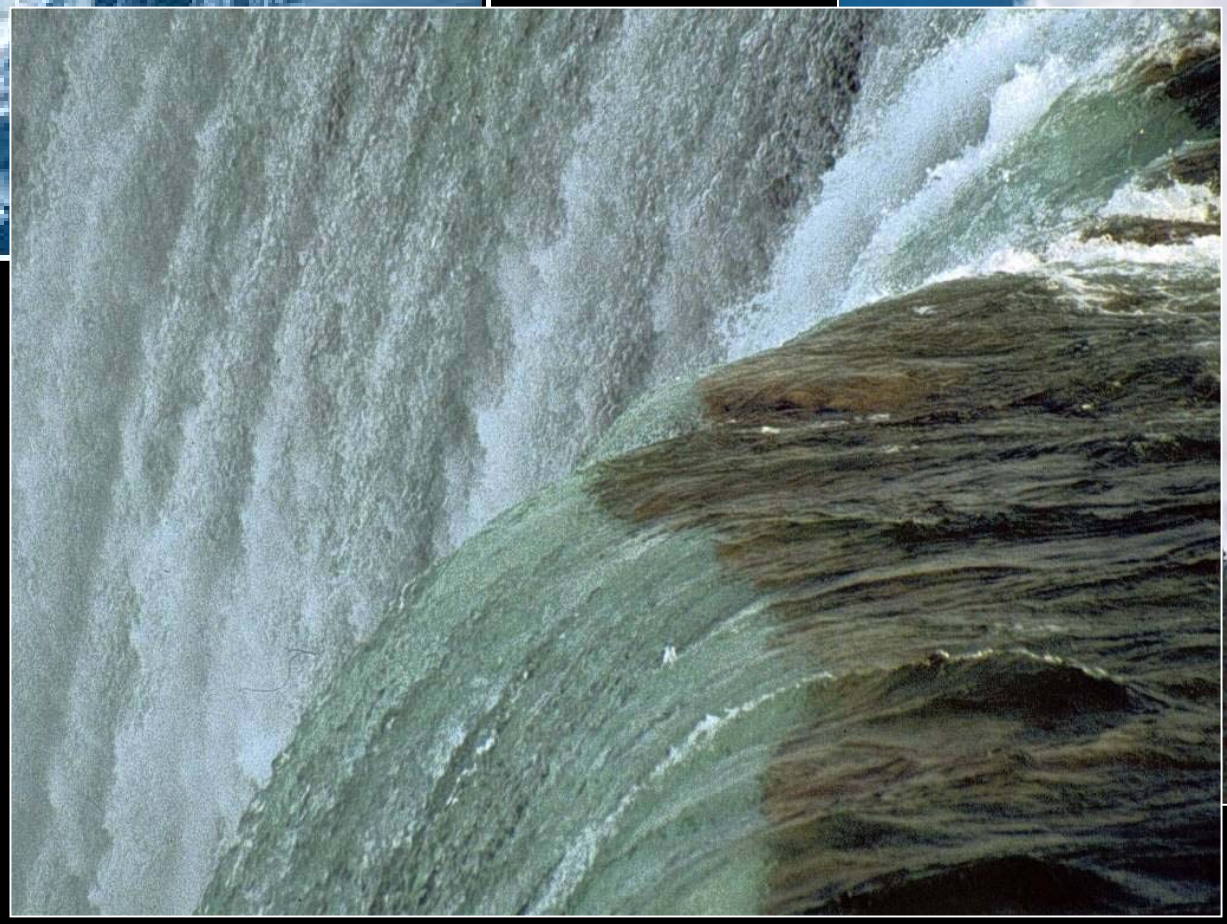


Mars Global Surveyor MOLA-Map, GSFC/NASA/JPL

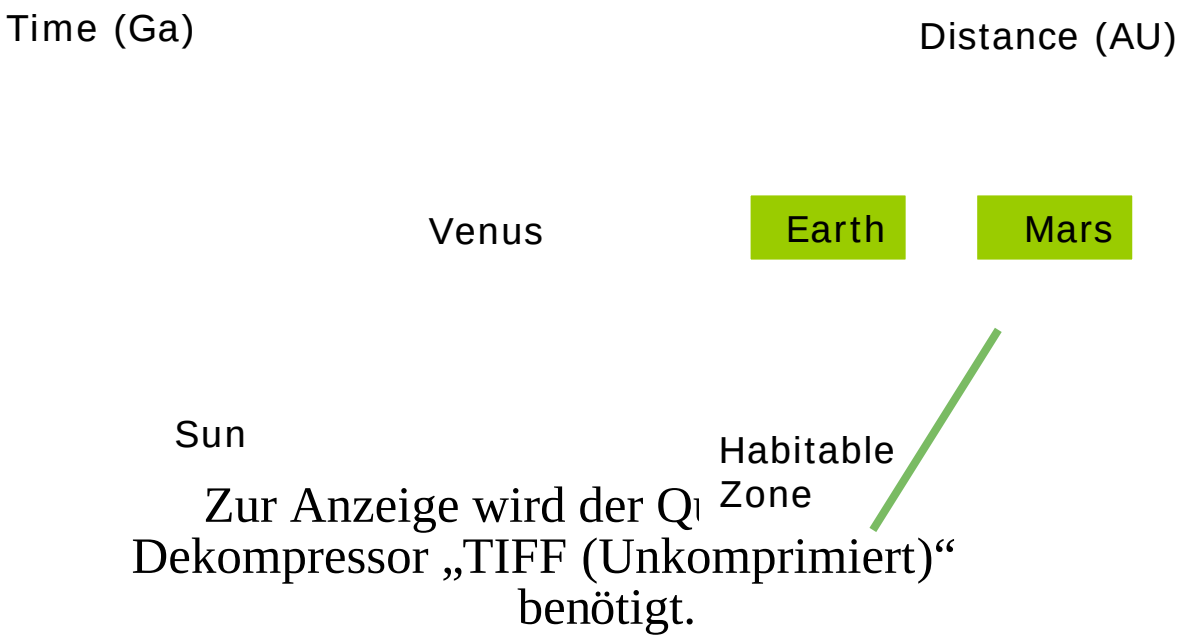
What is needed for life?

- Biochemical reservoirs (C, H, O, N, S, P)
  - Large reservoir, or continuous source
- **Reactive solvent (-> water)**
  - Somewhere, anywhere,
- **Flux (-> water)**
  - Mechanisms for mixing all of the above
  - At least episodically
- Source of energy
- **Time**

Phases of H_2O



Habitability with time

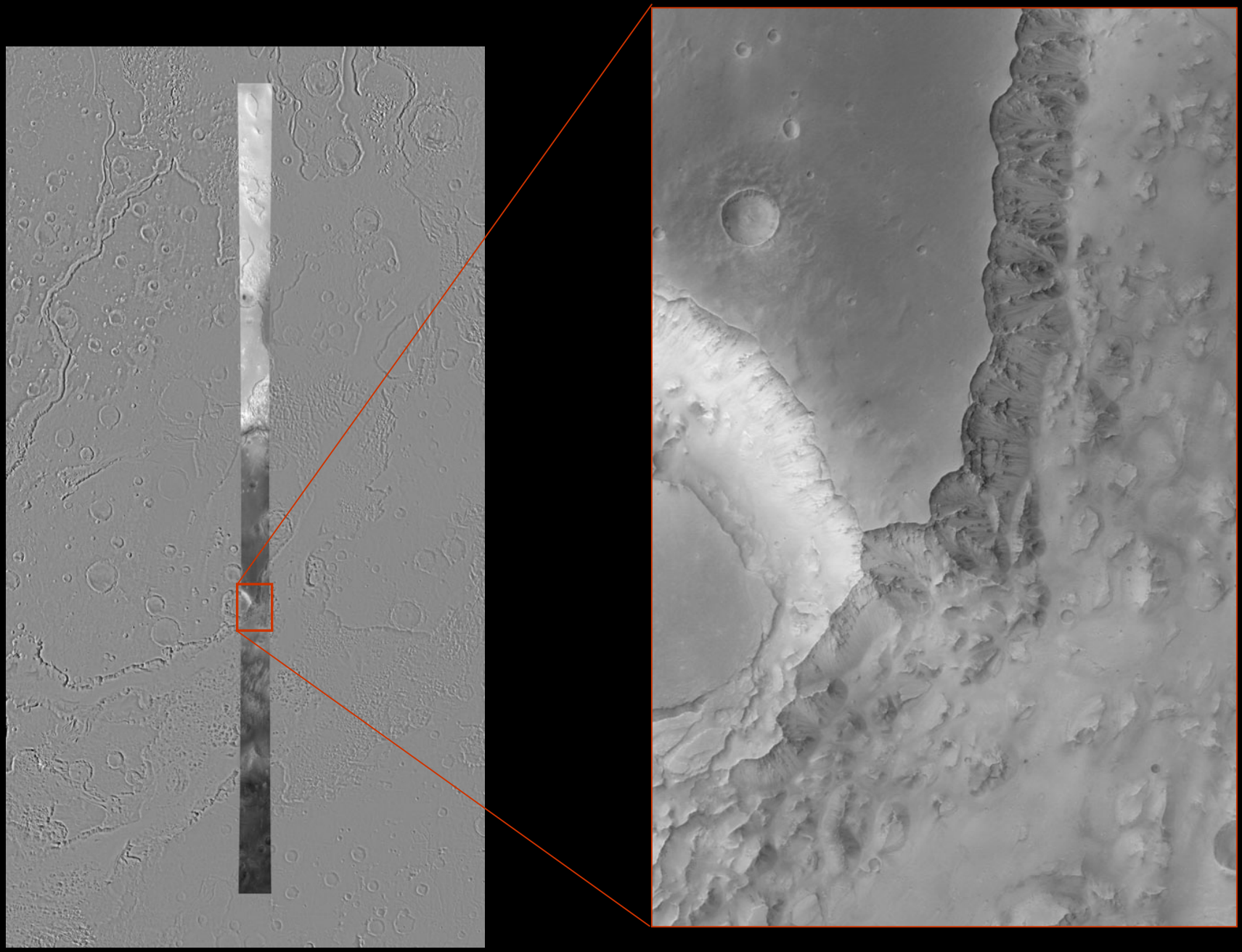


Zur Anzeige wird der Q
Dekompressor „TIFF (Unkomprimiert)“
benötigt.


DLR
Mars Express
ESA‘s 1st mission
to another planet
launch: 2 June 2003 –
arrival: 25 December 2003

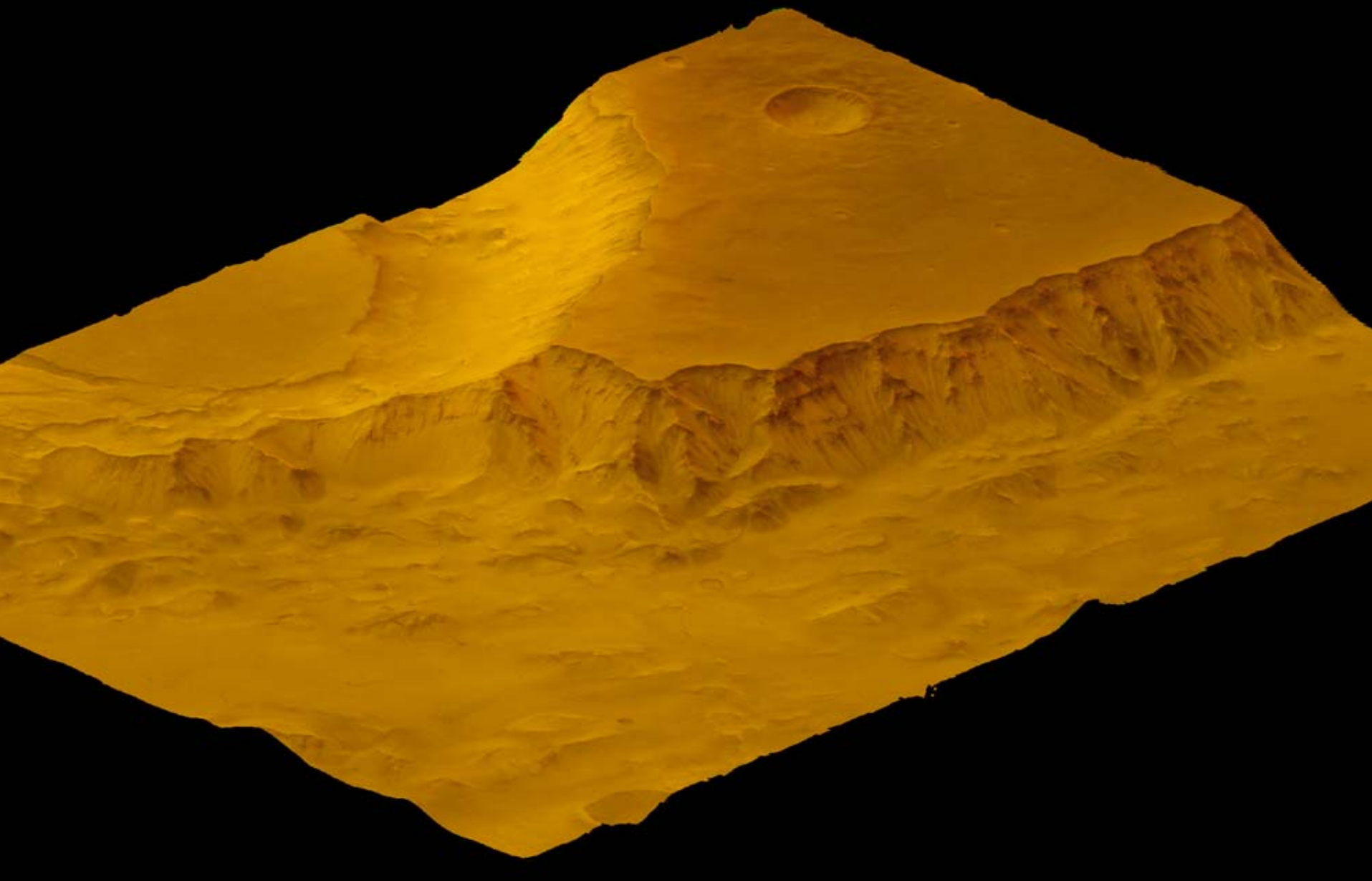
HRSC
High Resolution Stereo Camera

HRSC – High Resolution

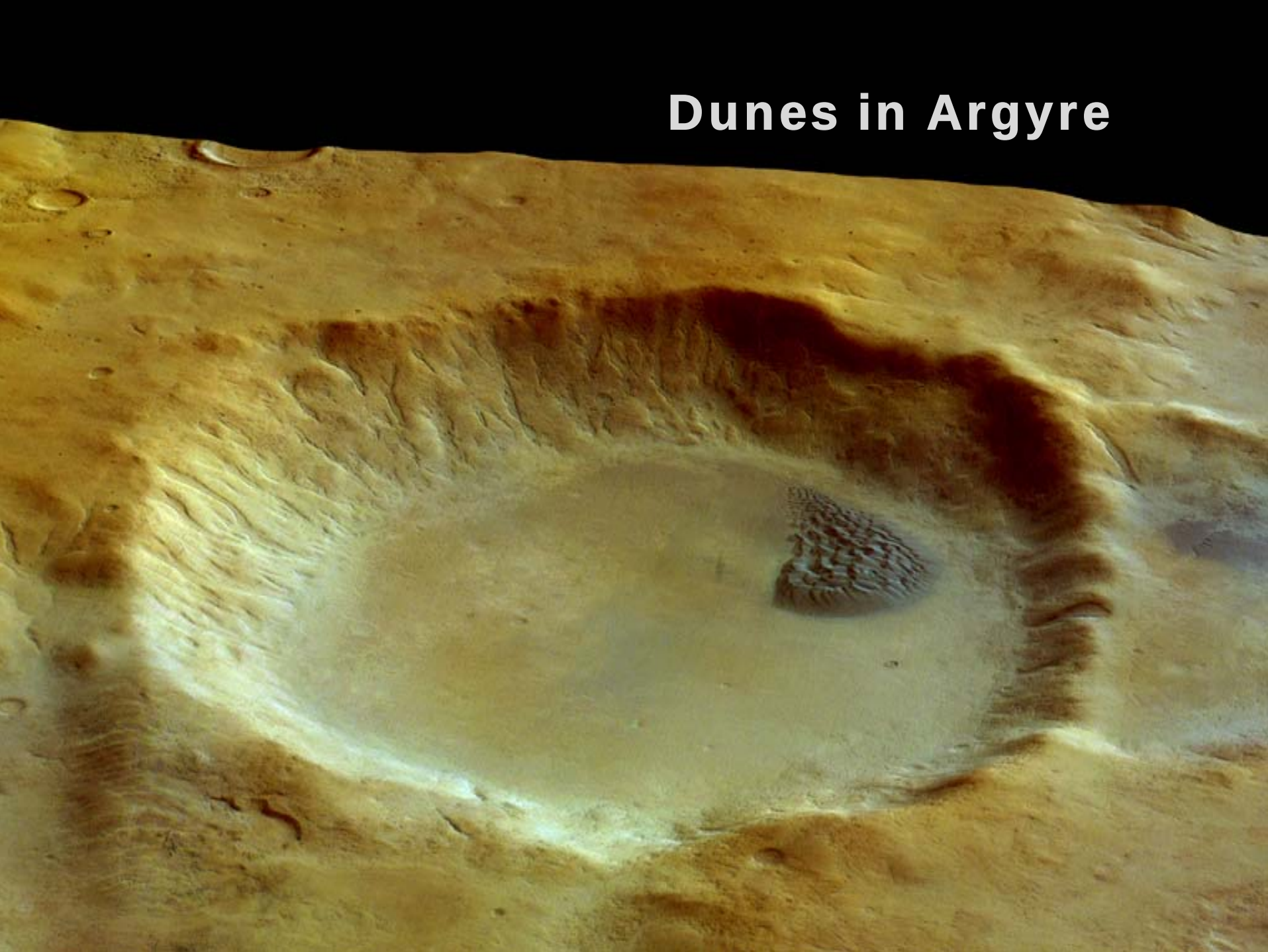


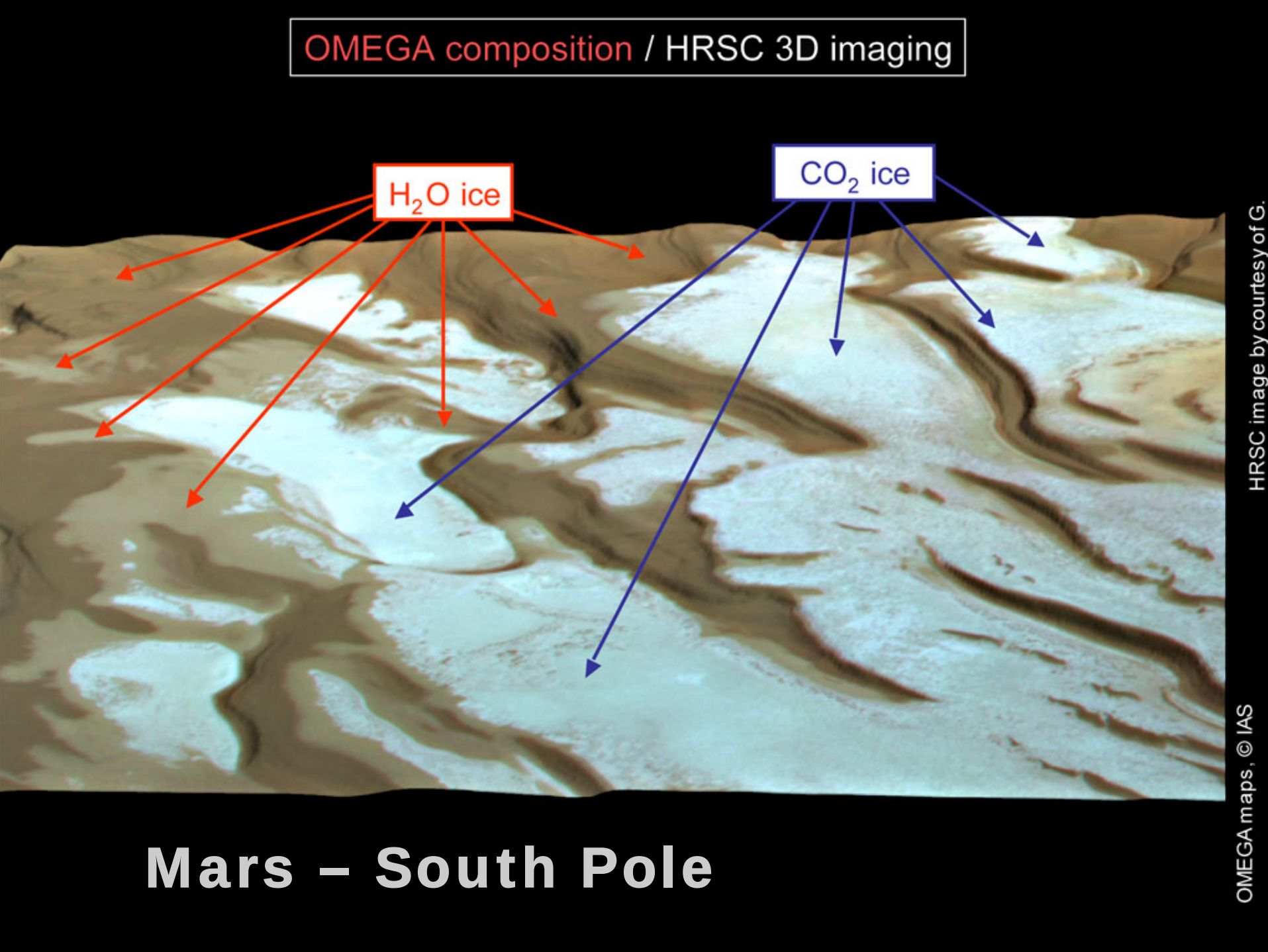
Color

3D-Visualisation



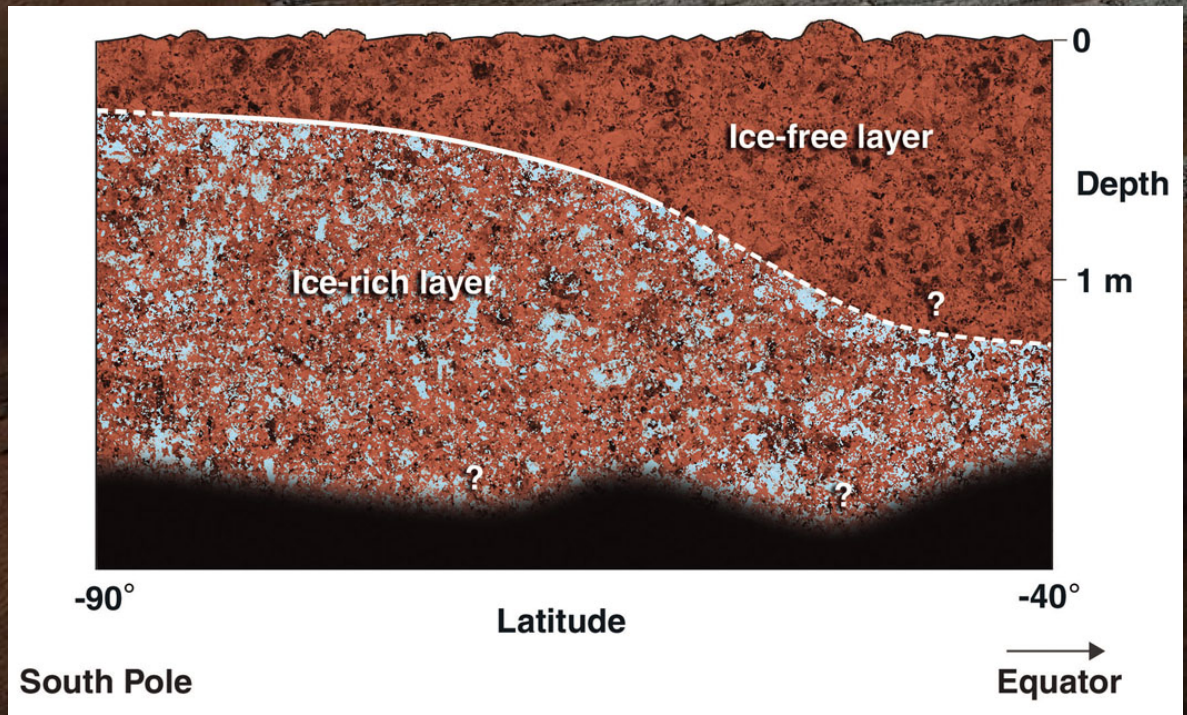
Dunes in Argyre





Mars – South Pole

Orbit 1087

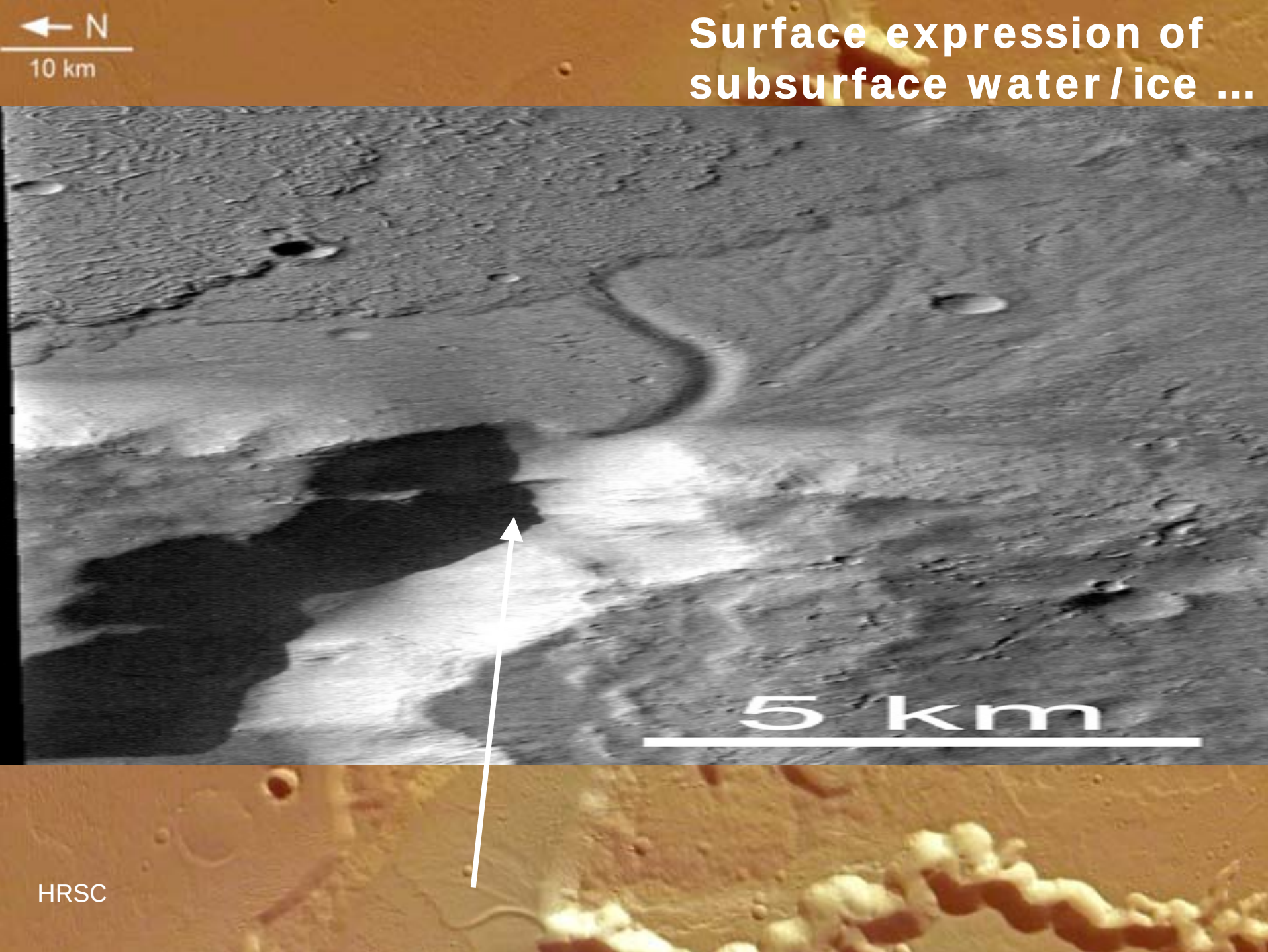


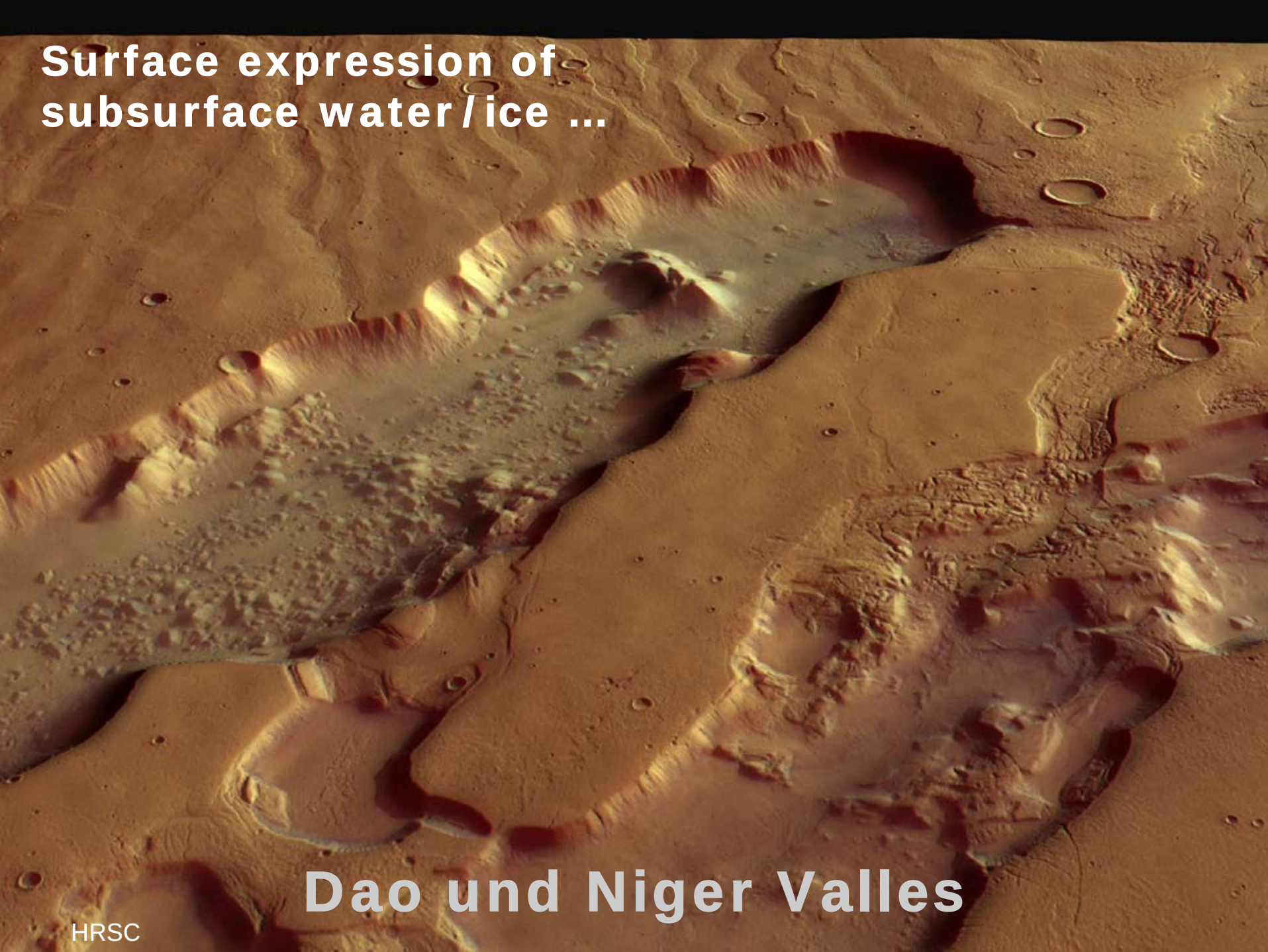
HRSC


N
10 km
Surface expression of subsurface water / ice ...
HRSC
Medusae Fossae


N
10 km
Surface expression of subsurface water / ice ...
5 km
HRSC


N
10 km
Surface expression of subsurface water / ice ...
HRSC
Medusae Fossae


N
10 km
Surface expression of subsurface water / ice ...
5 km
HRSC


Surface expression of
subsurface water / ice ...
Dao und Niger Valles
HRSC

Surface expression of subsurface water / ice ..

10 km

HRSC

Erosion by catastrophic flooding

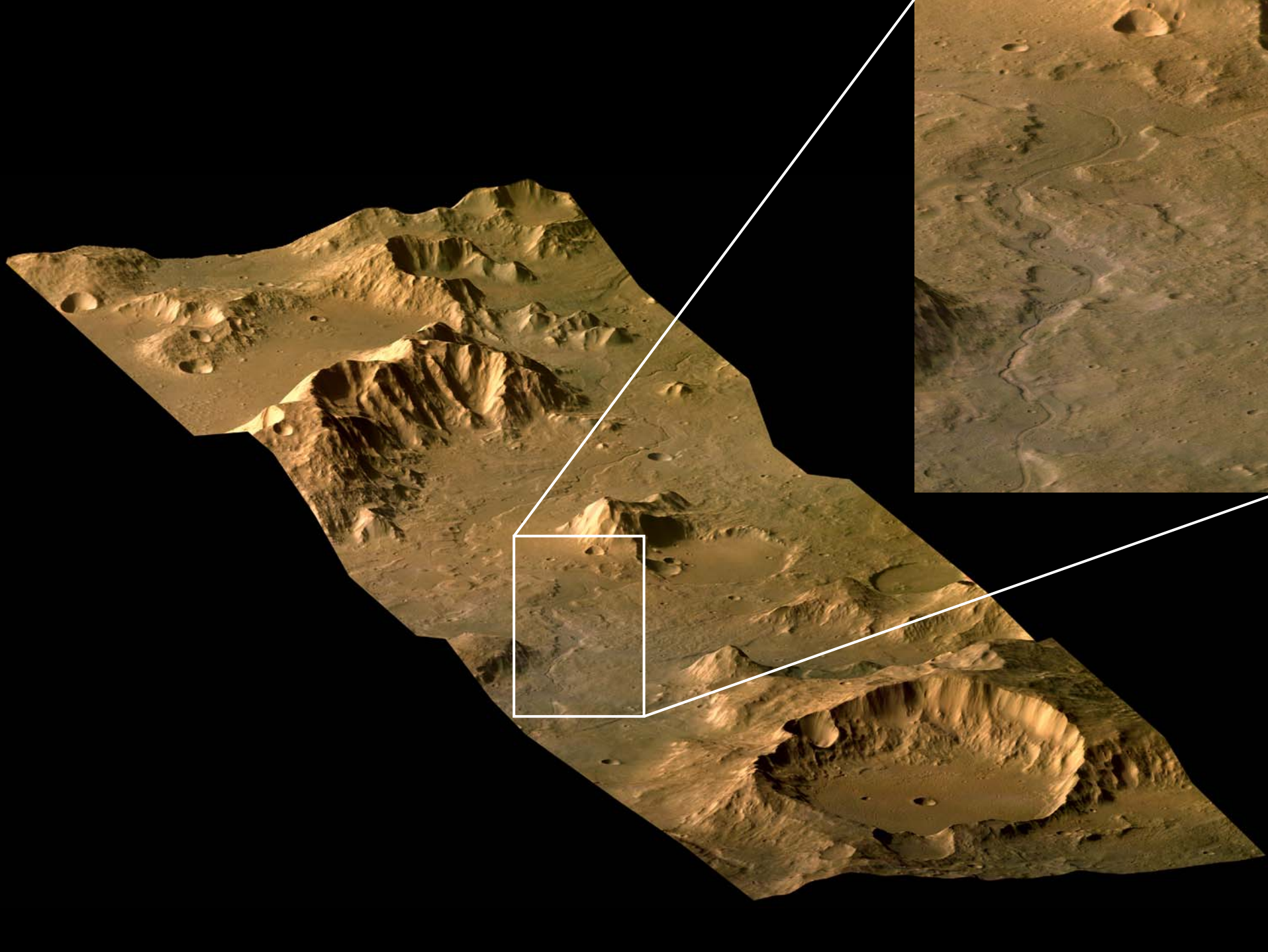
Surface expression of subsurface water / ice .

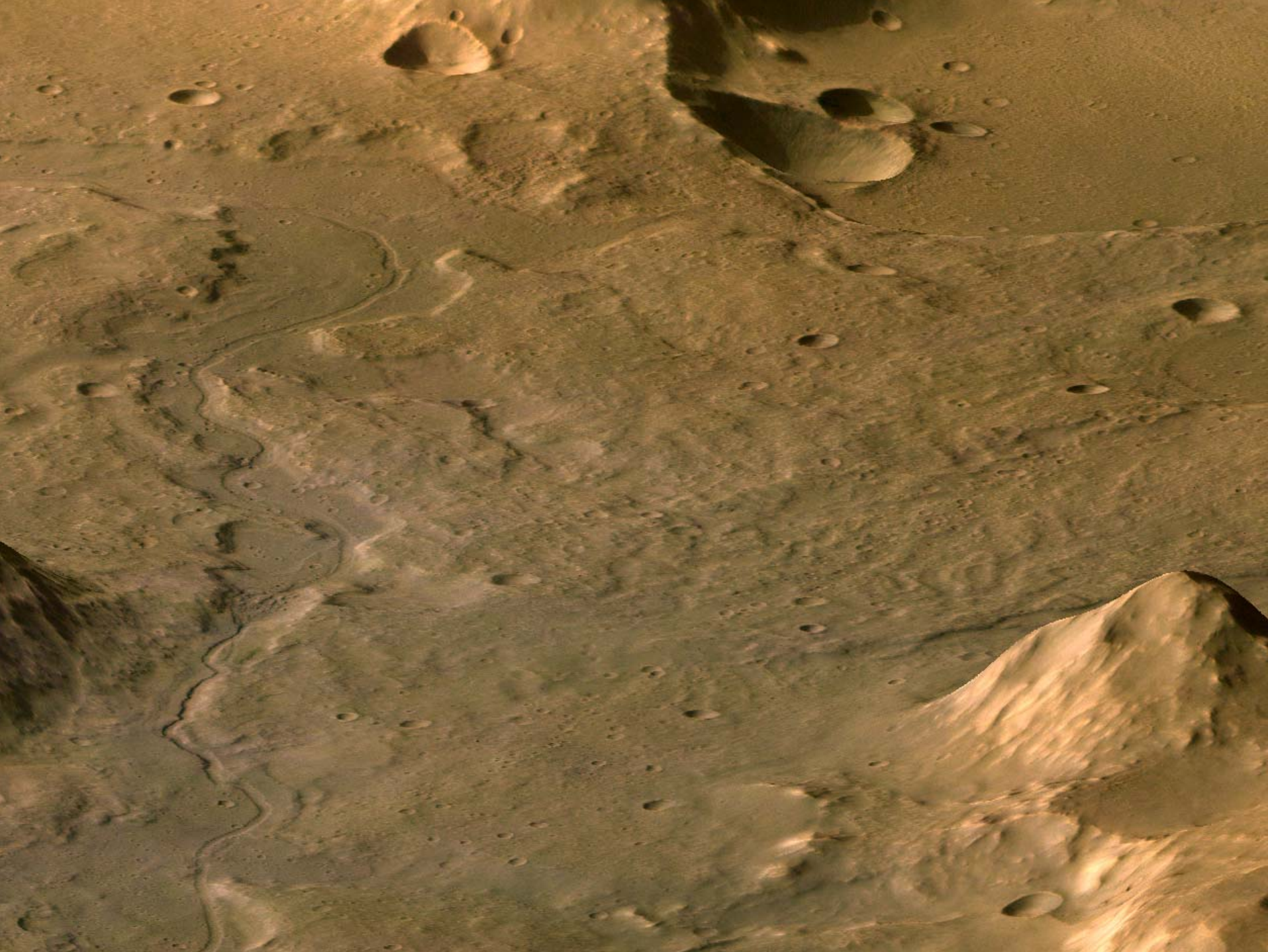
10 km

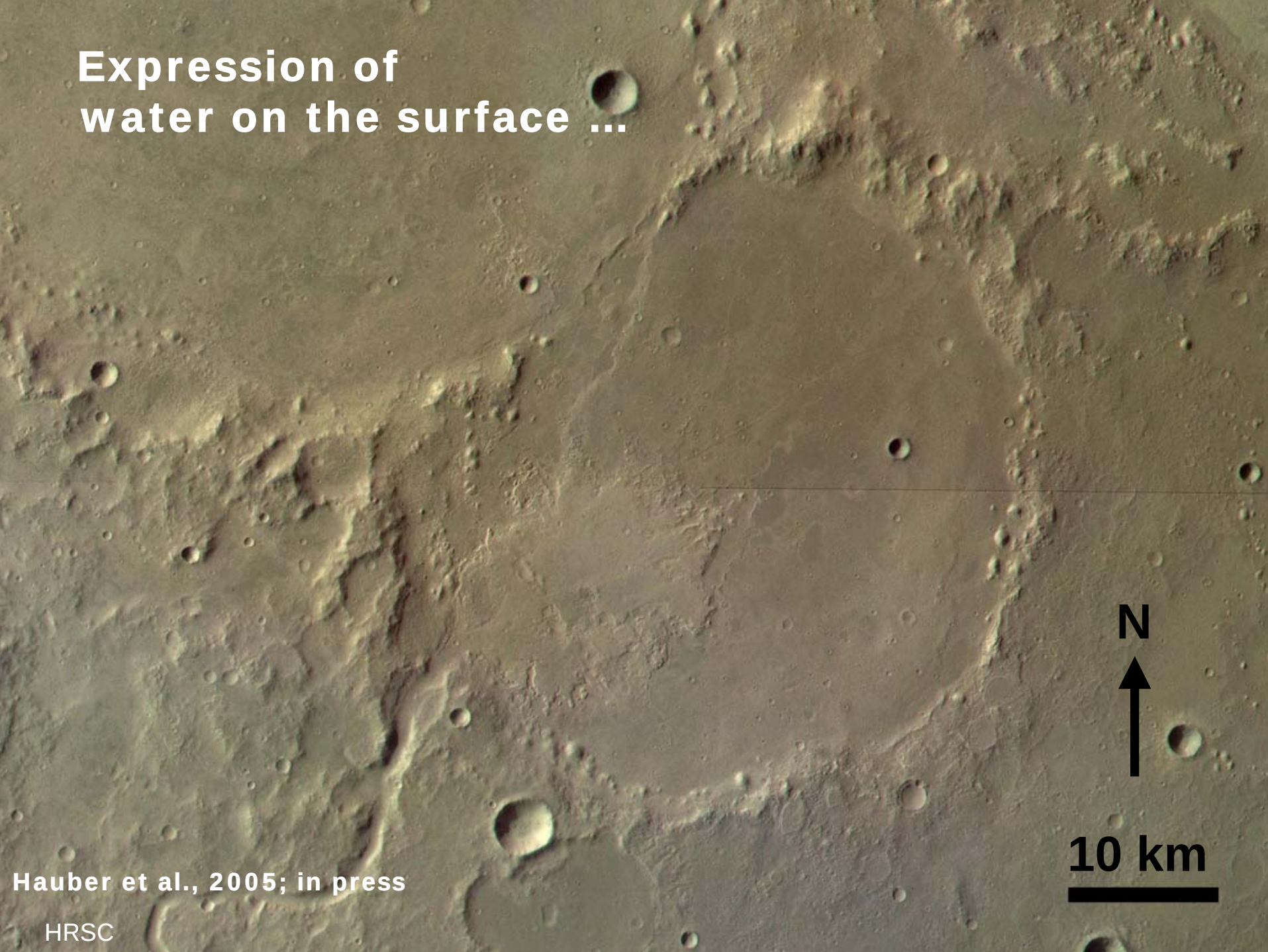
HRSC

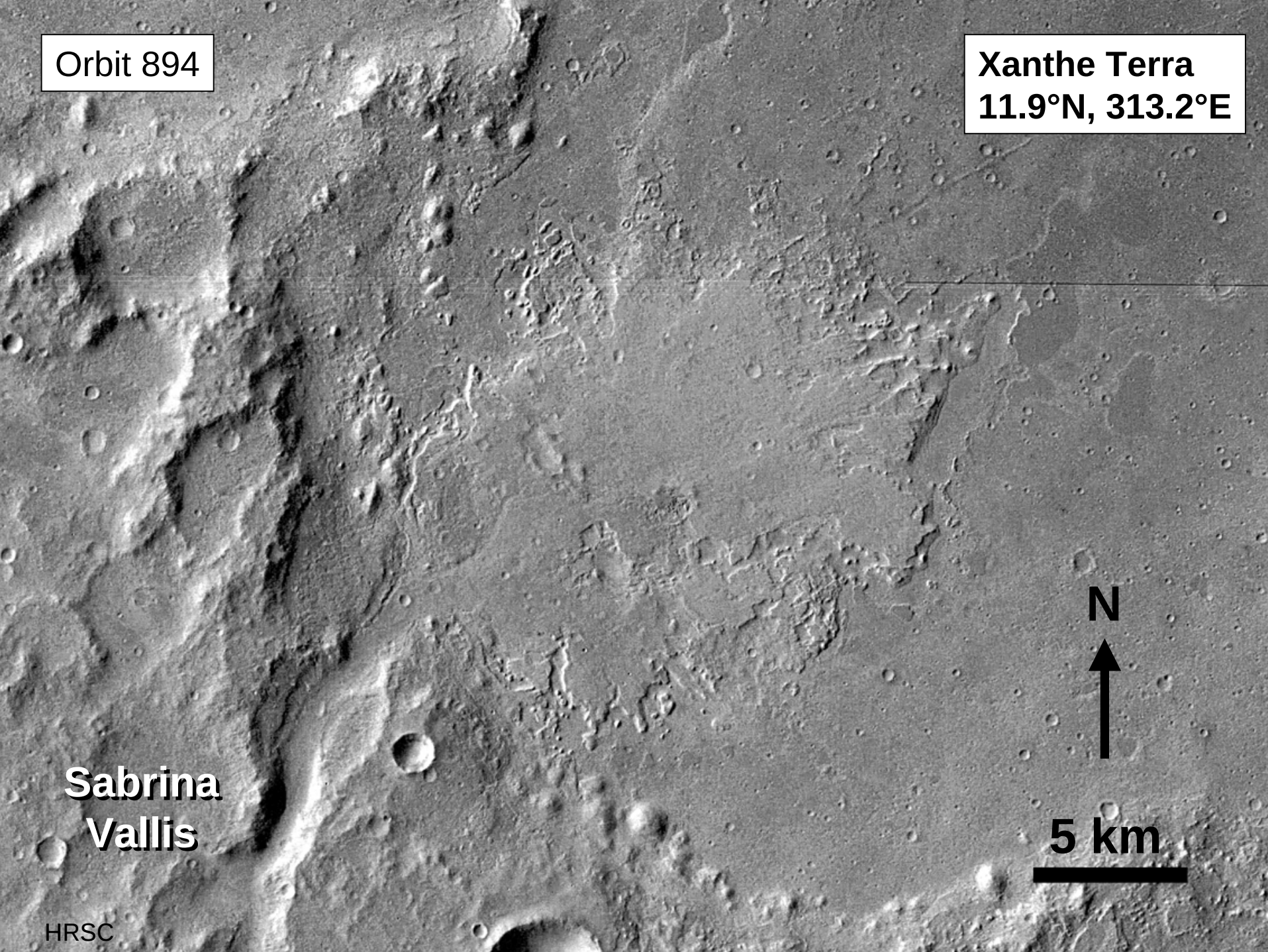
Erosion by catastrophic flooding


Orbit 286:
Mangala Valles
Expression of water
on the surface ...
HRSC

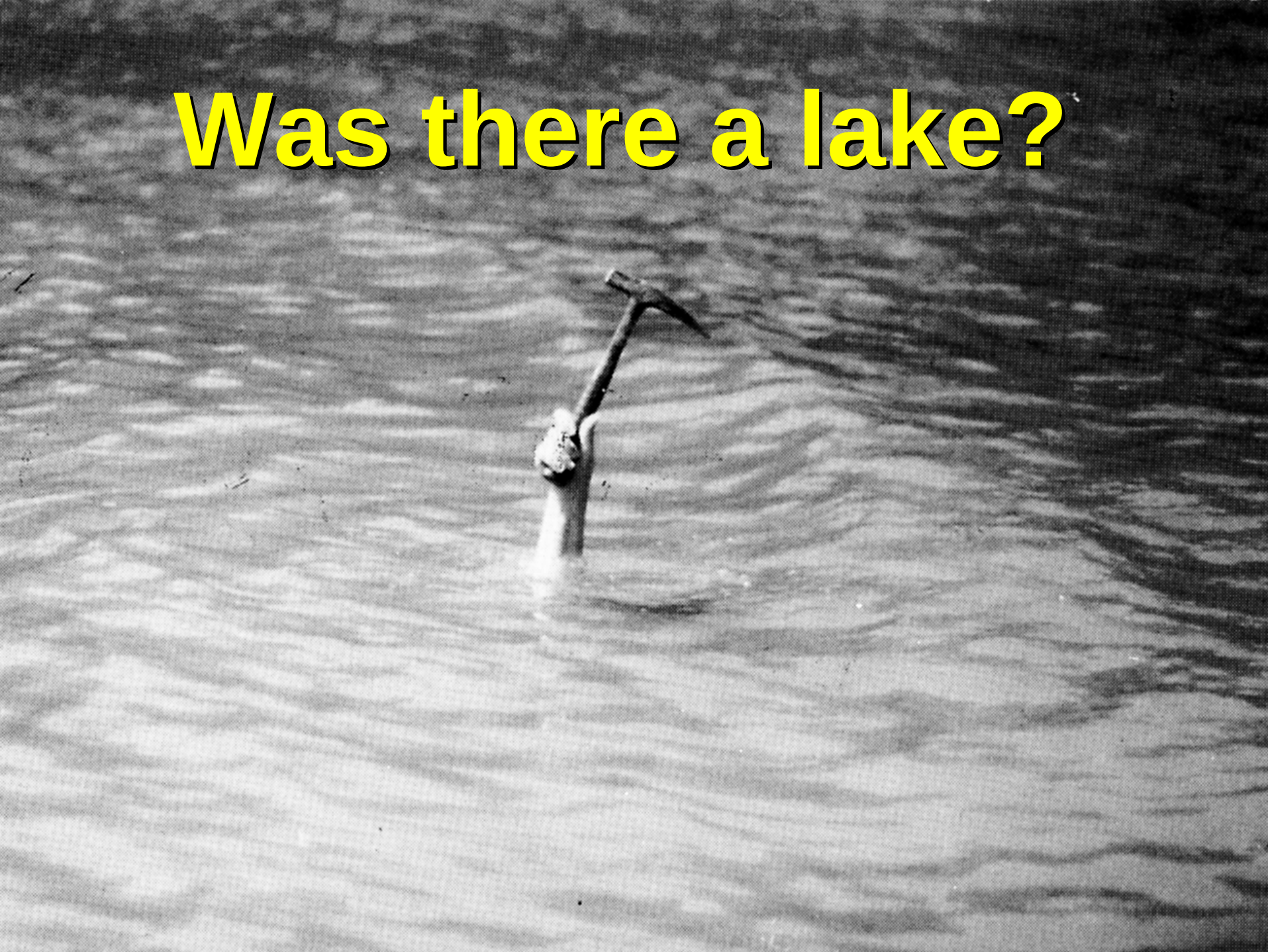


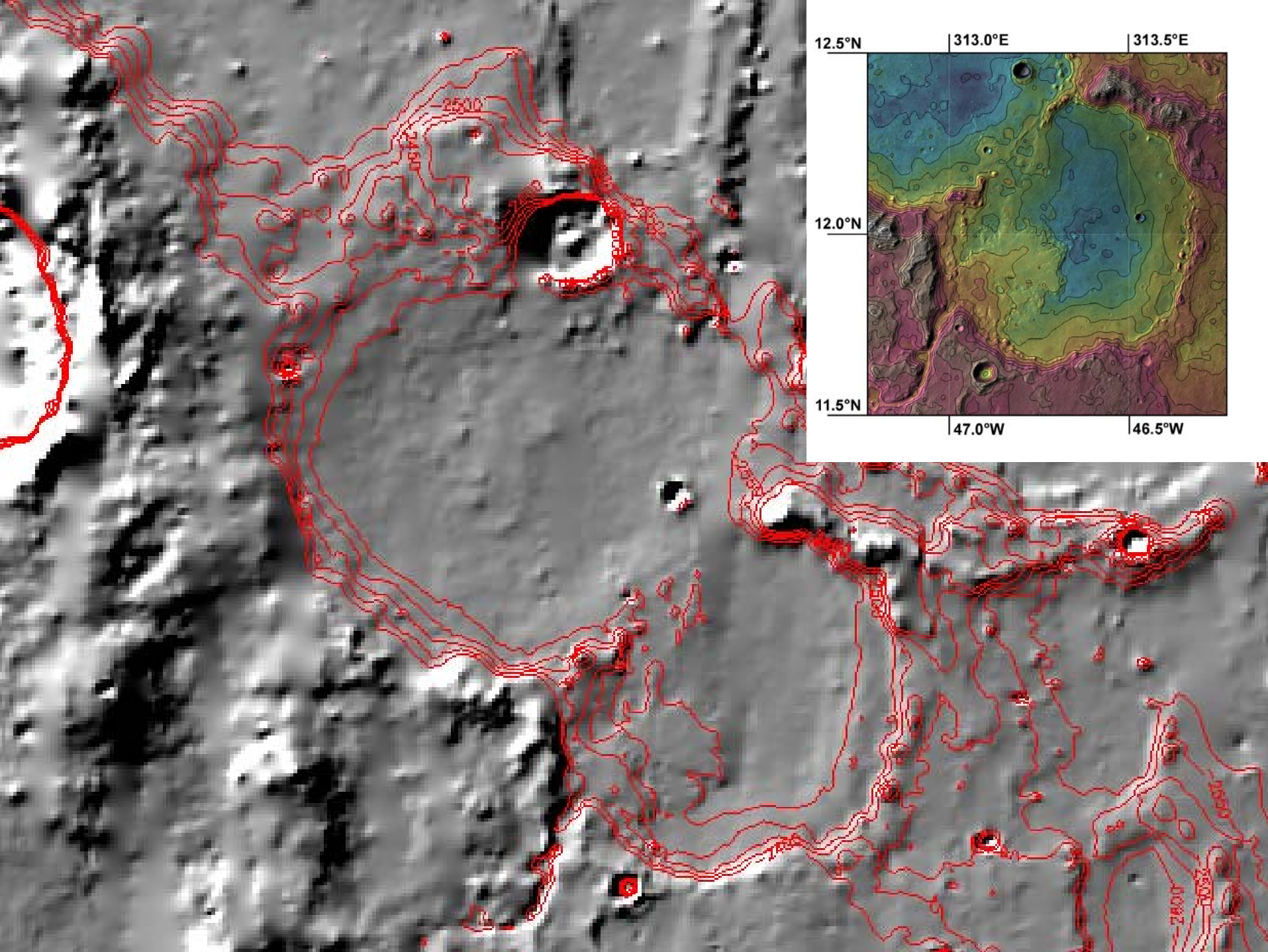



Expression of
water on the surface ...
N
10 km
Hauber et al., 2005; in press
HRSC


Orbit 894
Xanthe Terra
11.9°N, 313.2°E
N
5 km
Sabrina
Vallis
HRSC

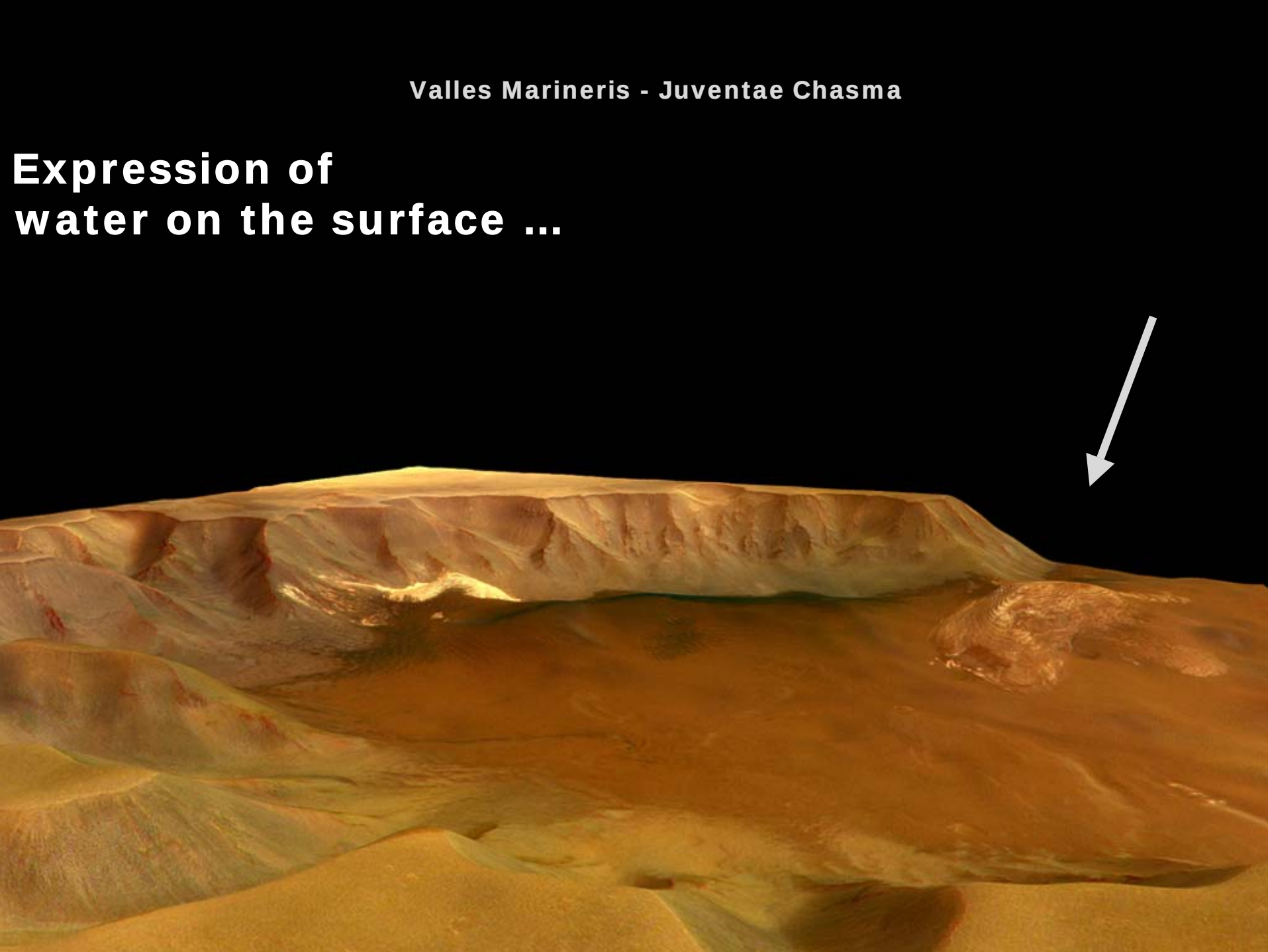
Was there a lake?



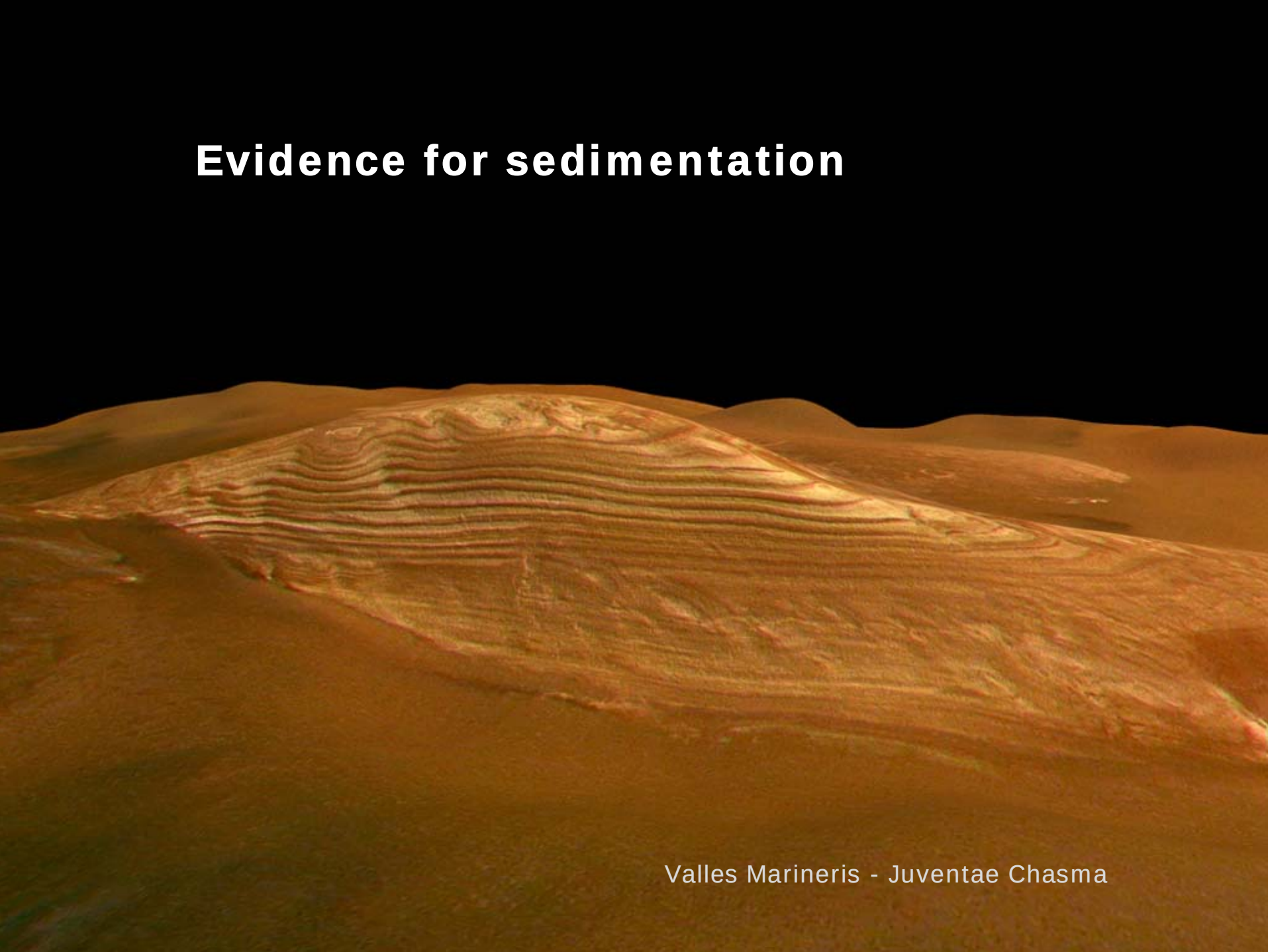

12.5°N
313.0°E
313.5°E
12.0°N
11.5°N
47.0°W
46.5°W

Valles Marineris - Juventae Chasma

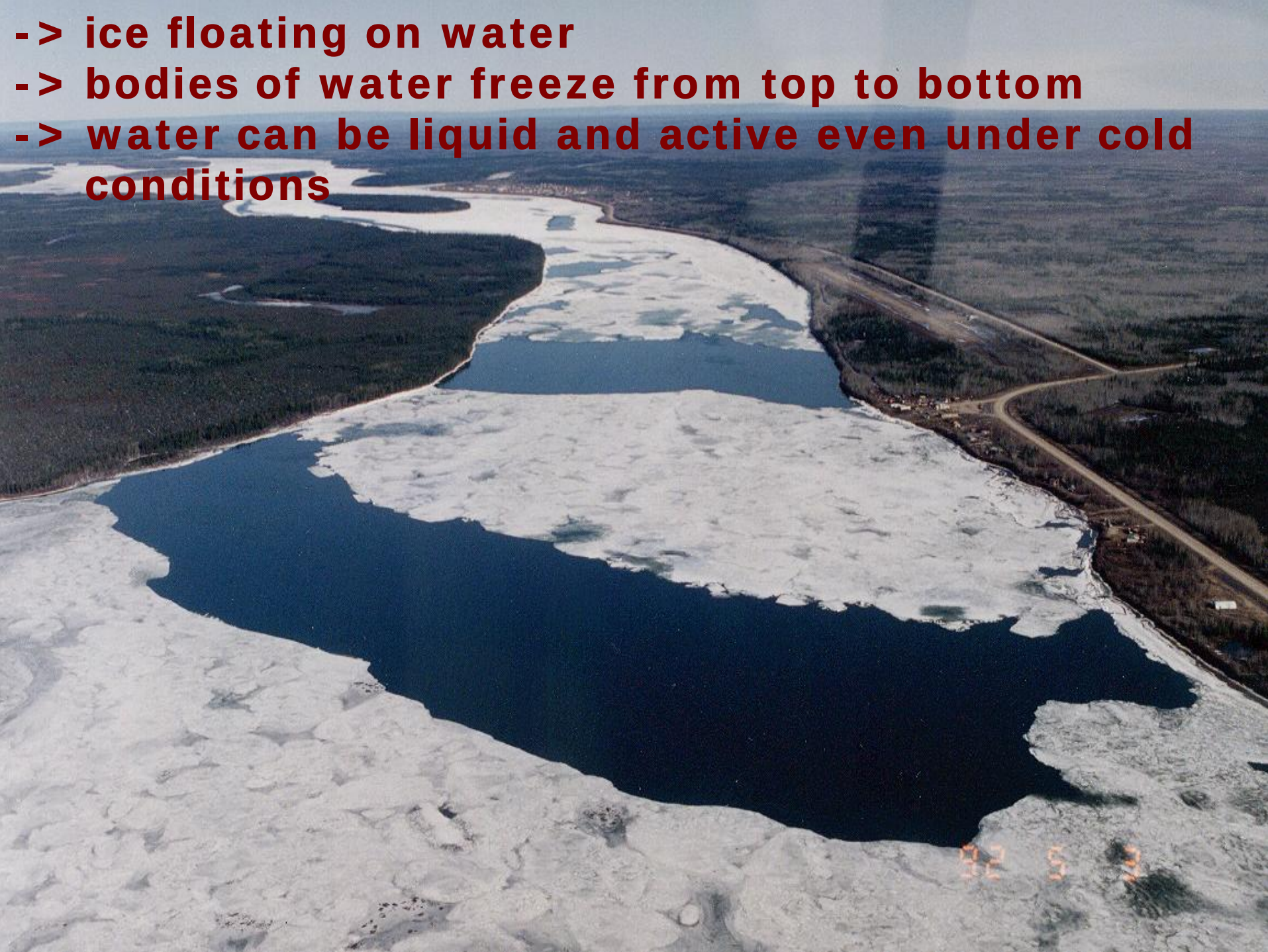
Expression of water on the surface ...



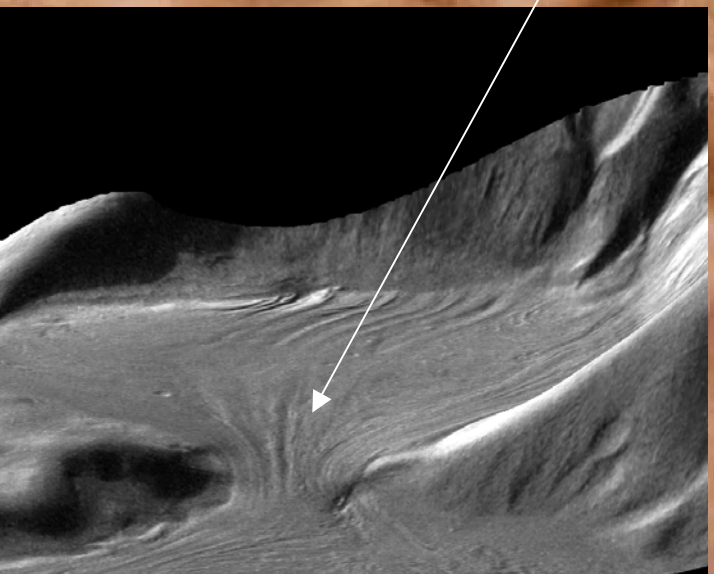
Evidence for sedimentation



Valles Marineris - Juventae Chasma

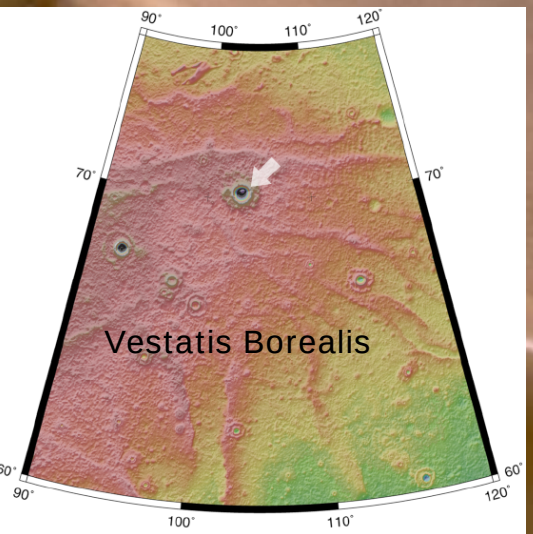

-> ice floating on water
-> bodies of water freeze from top to bottom
-> water can be liquid and active even under cold conditions

Expression of ice on the surface ...



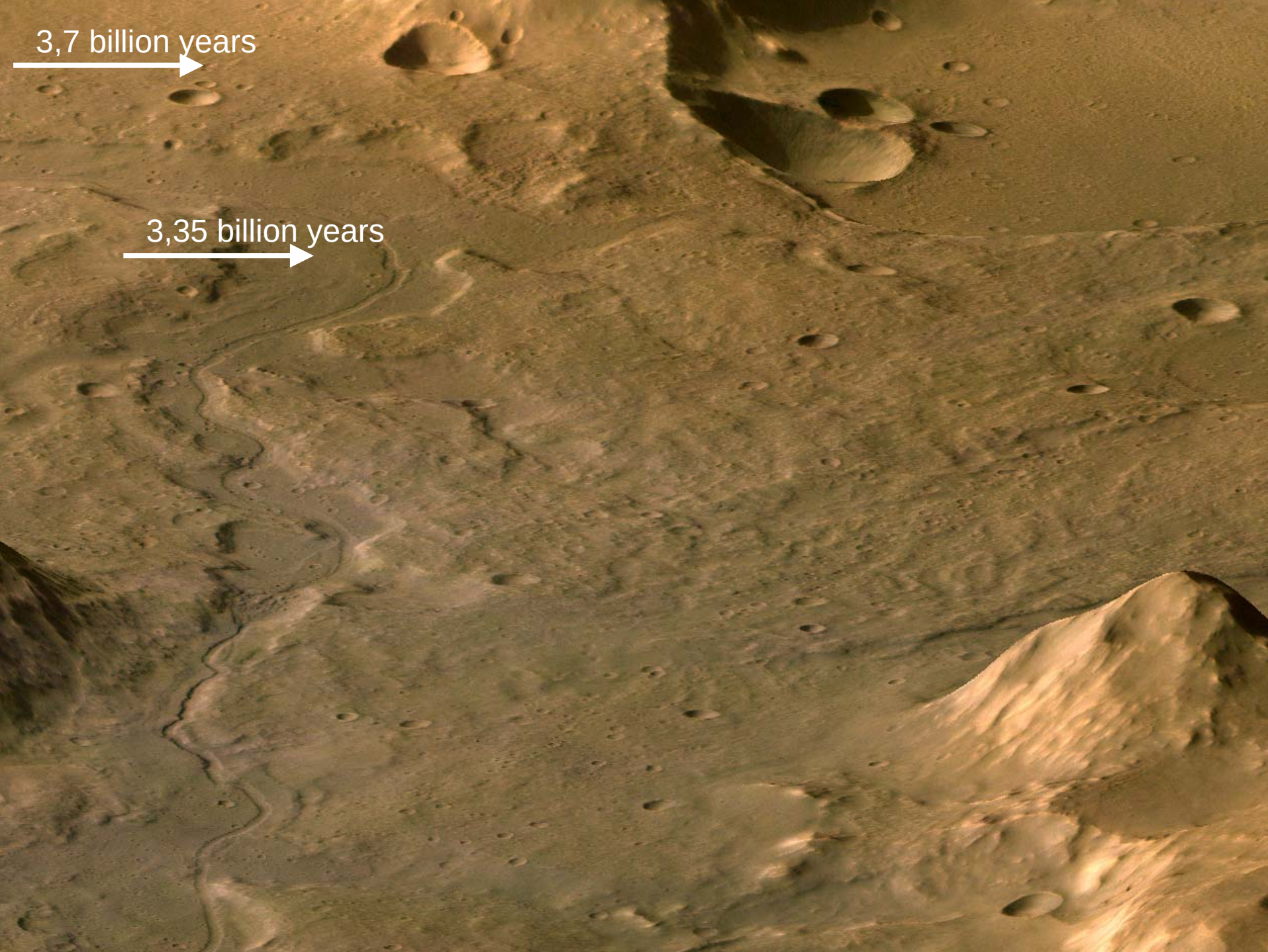
HRSC

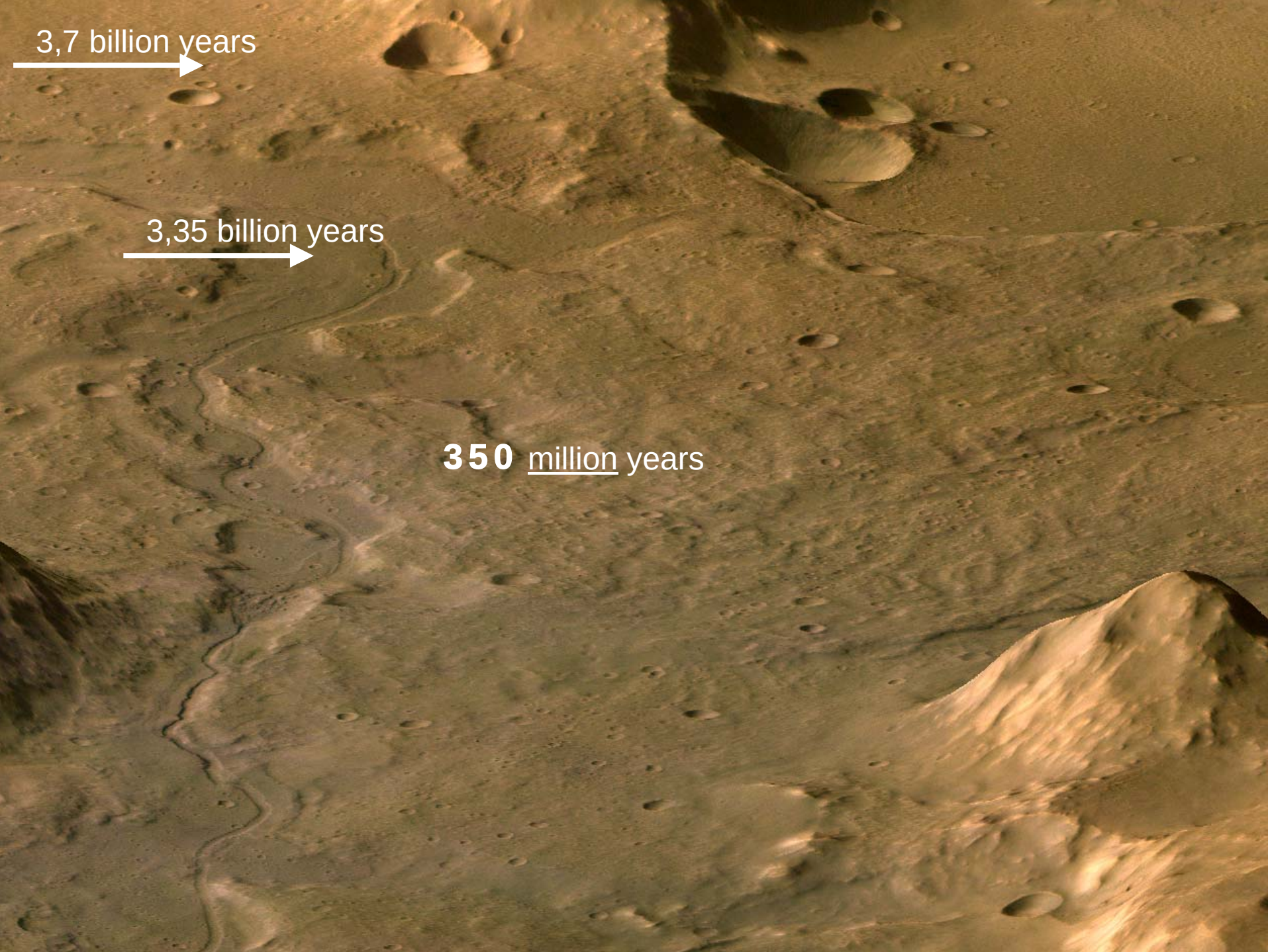
Near-recent water / ice on the surface …

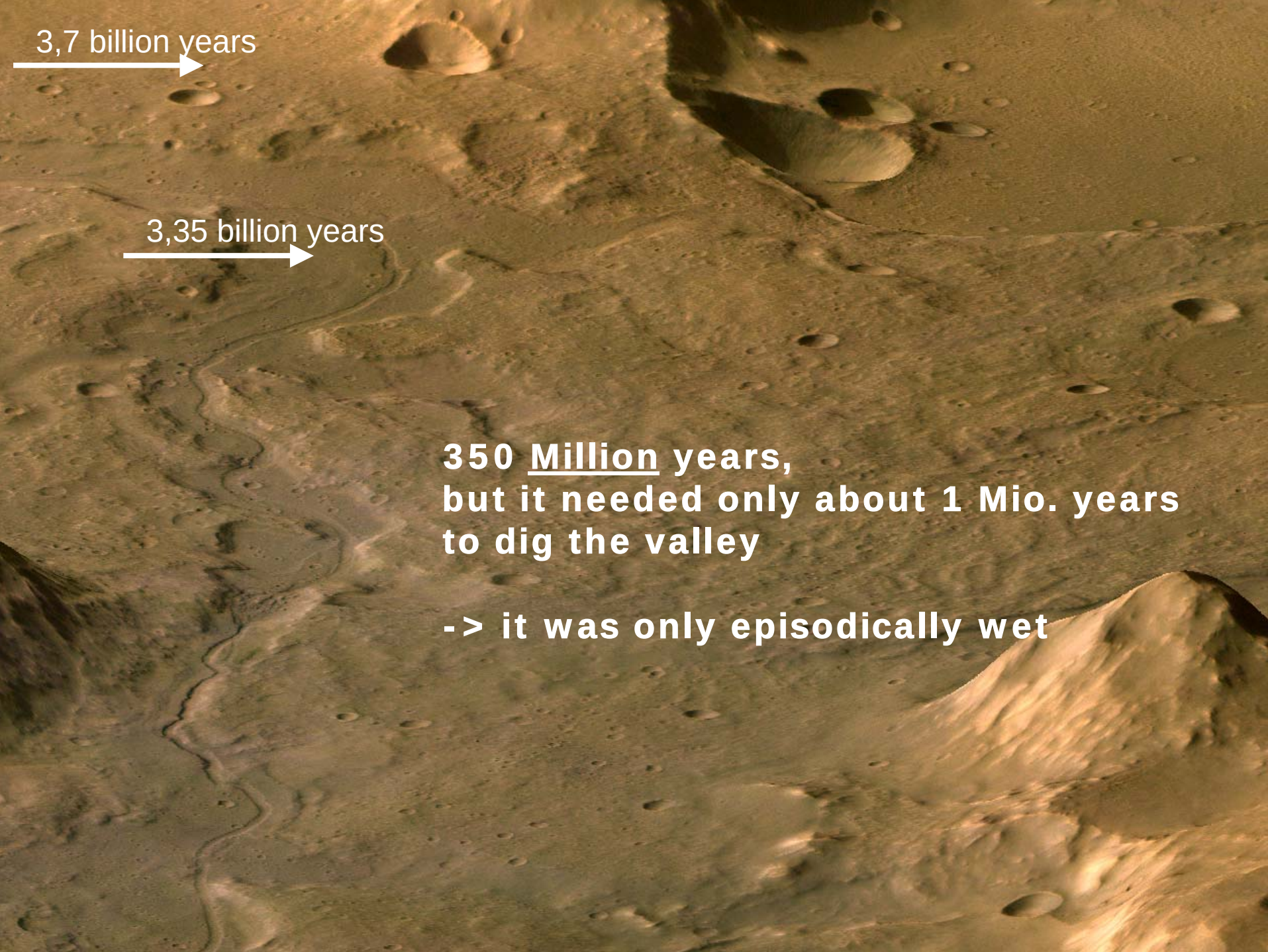


HRSC


Time:
How long acted Water on the surface?


3,7 billion years
3,35 billion years

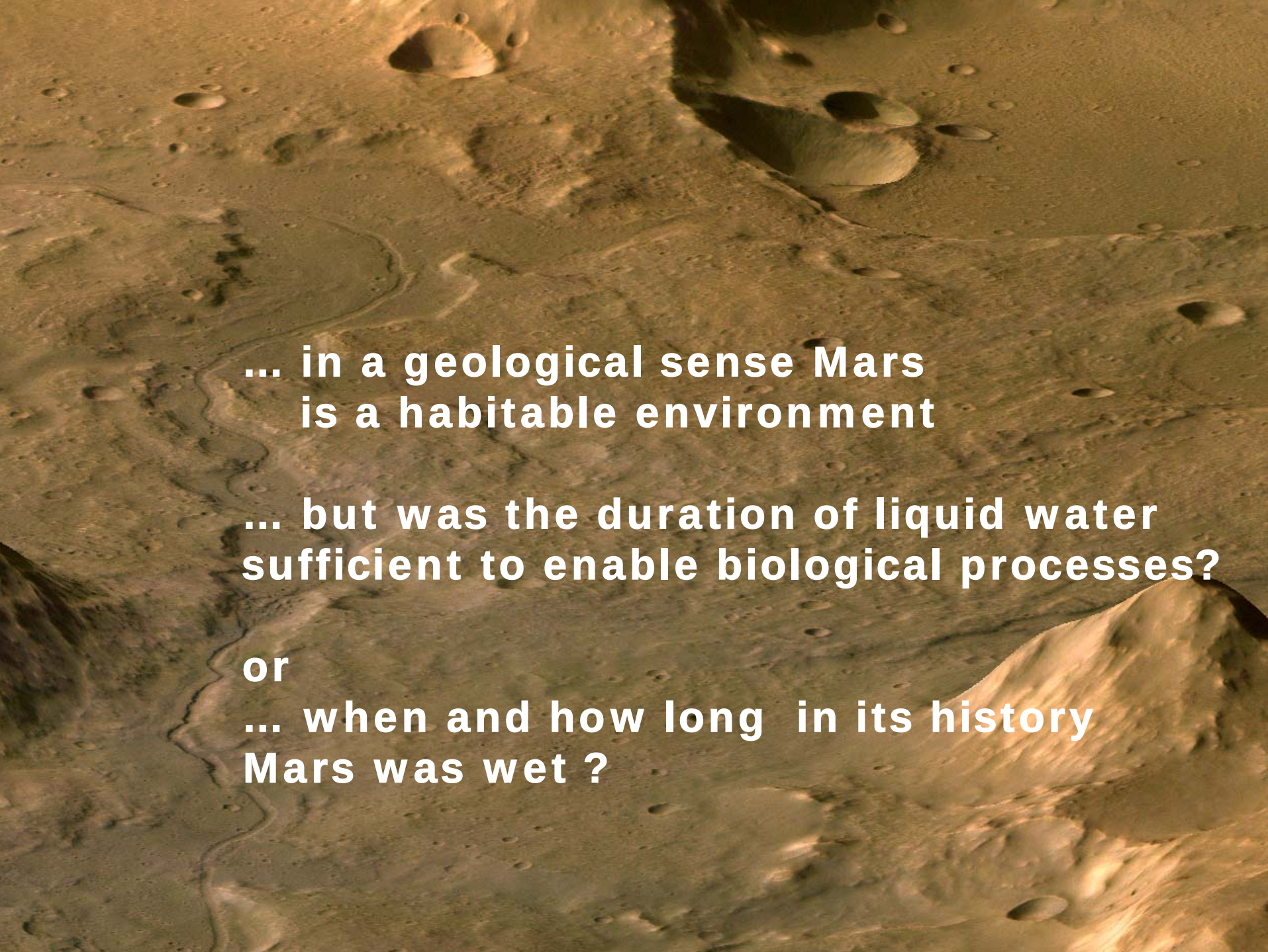

3,7 billion years
3,35 billion years
350 million years



350 Million years,
but it needed only about 1 Mio. years
to dig the valley

-> it was only episodically wet


... in a geological sense Mars
is a habitable environment


... in a geological sense Mars
is a habitable environment
... but was the duration of liquid water
sufficient to enable biological processes?
or
... when and how long in its history
Mars was wet ?