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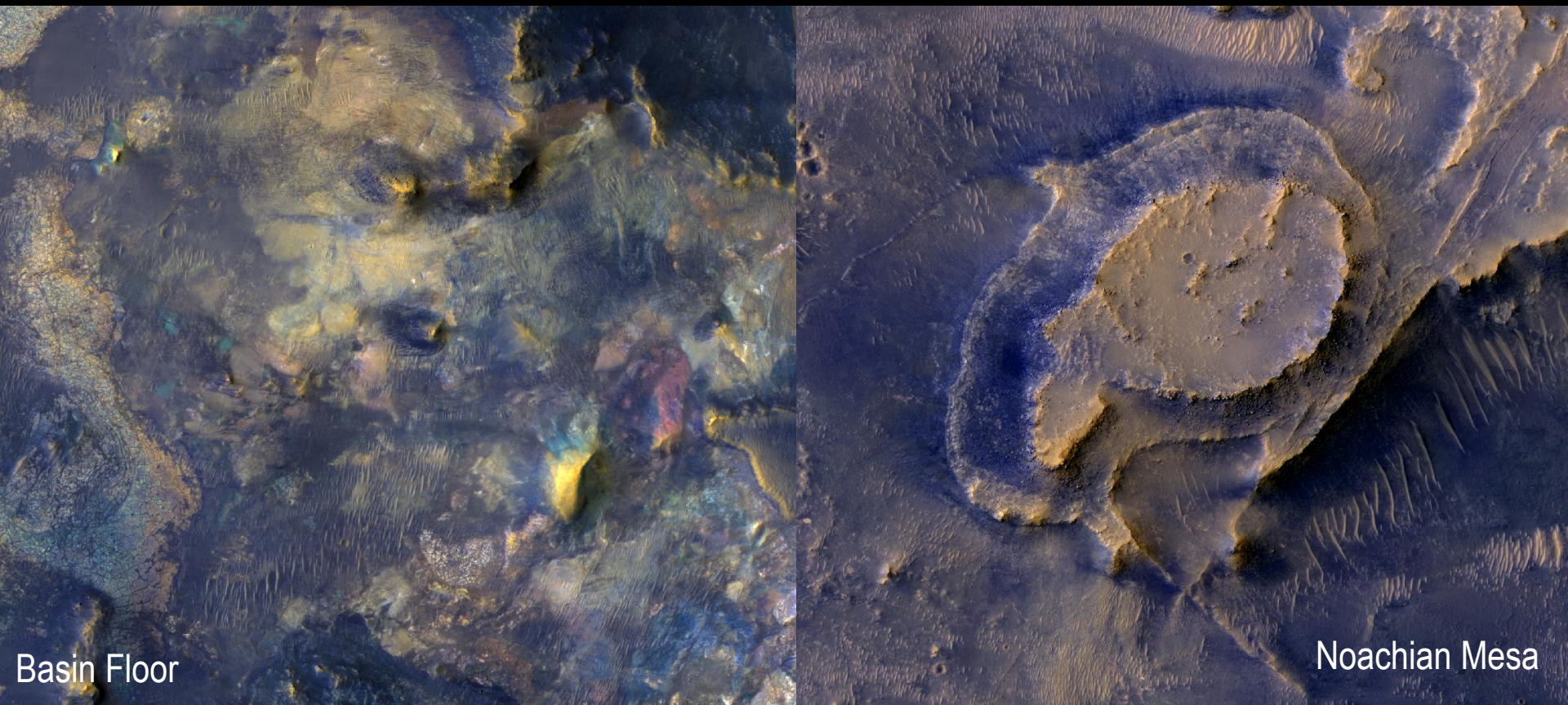
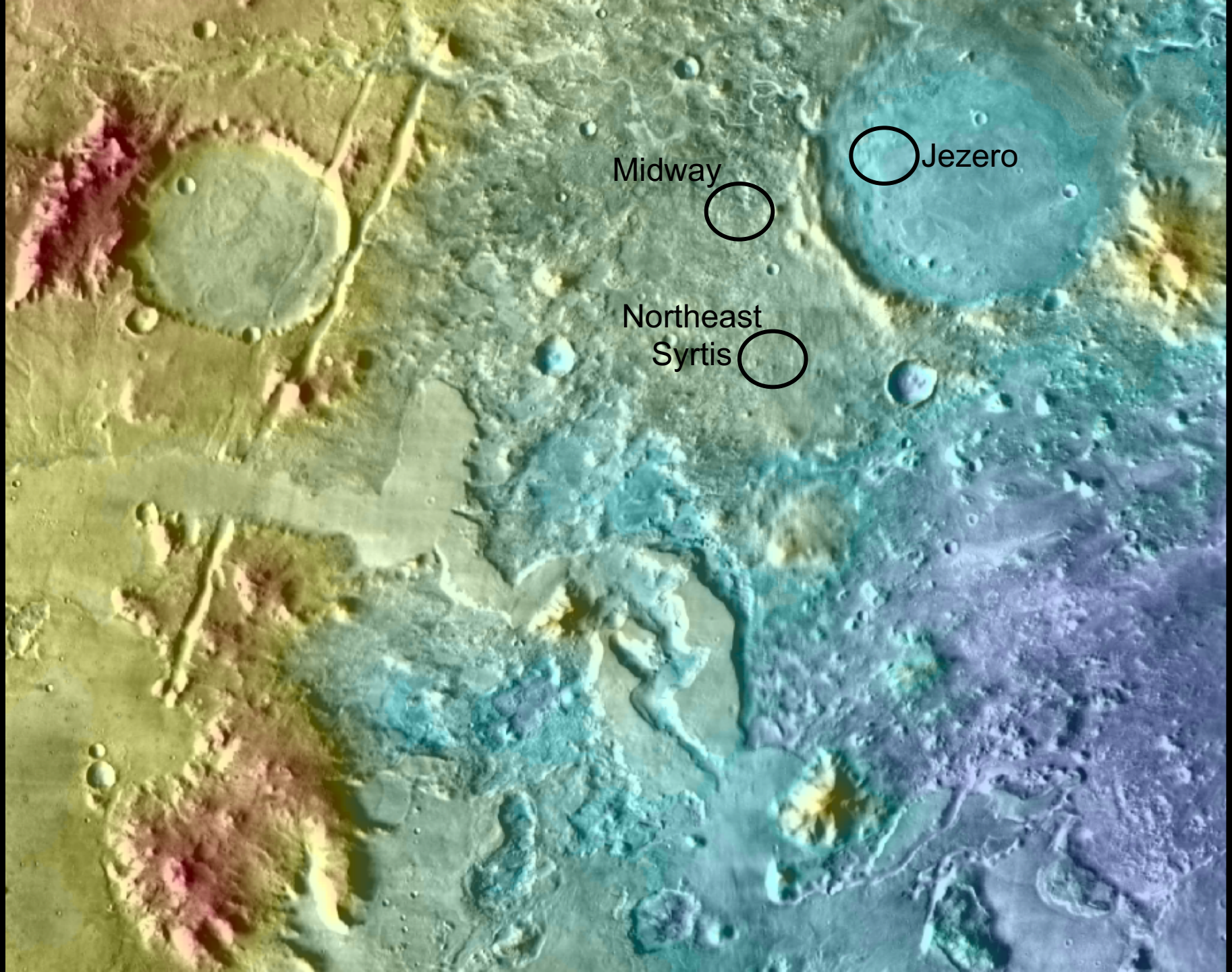
THE ENVIRONMENTAL EVOLUTION OF THE NE SYRTIS REGION

J.R. Skok, Conner Matherne, Suniti Karunatillake and Jack Mustard

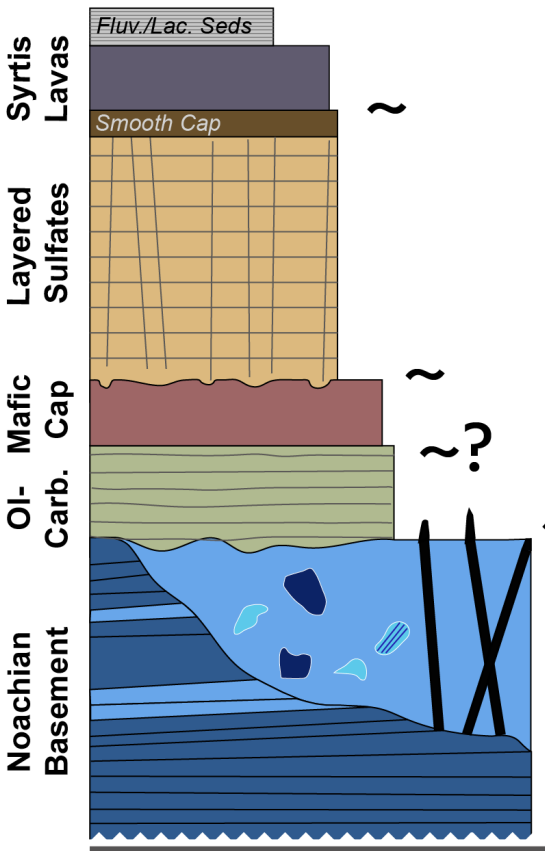
4th Mars2020 Landing Site Workshop

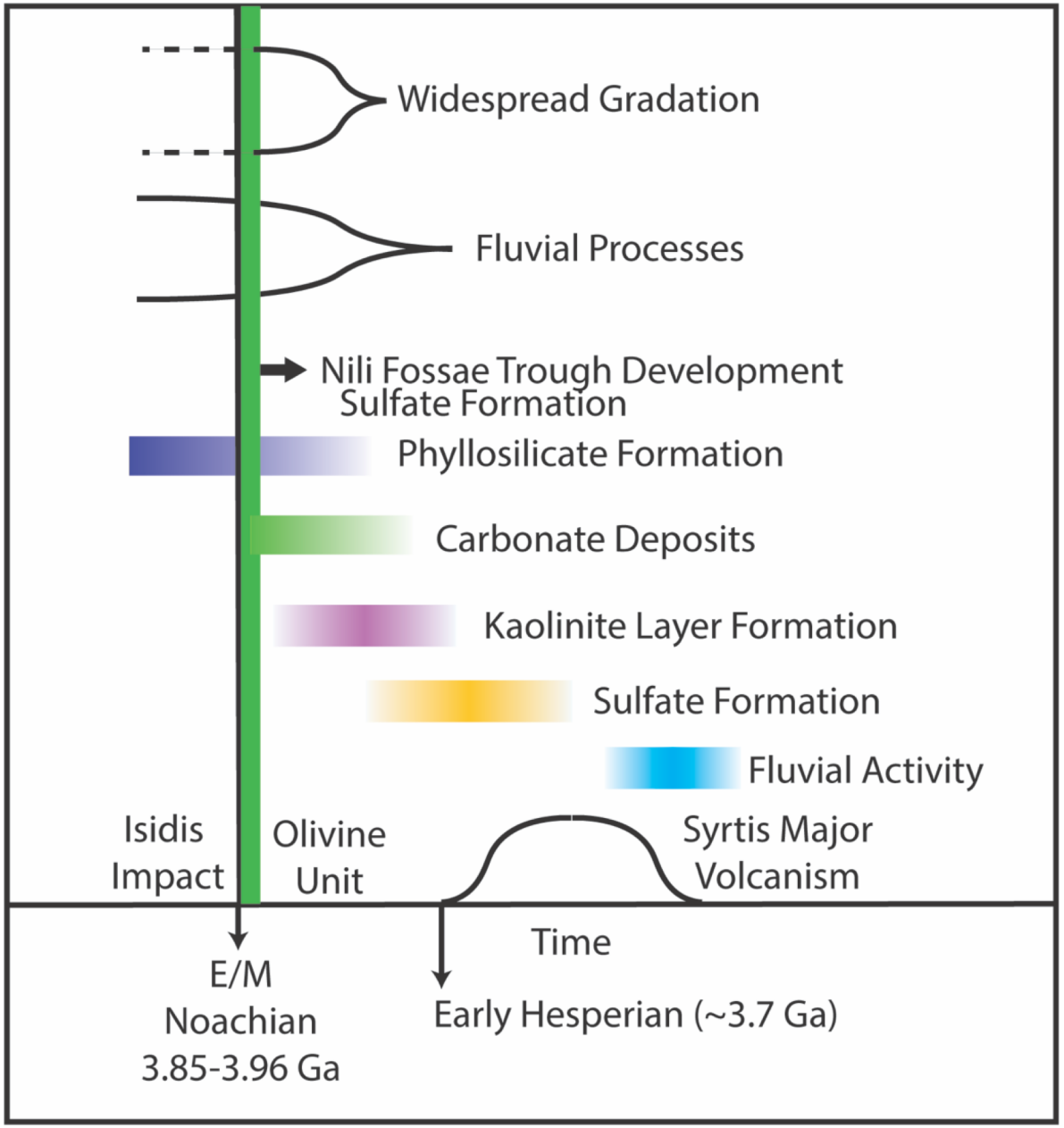
October 17th, 2018



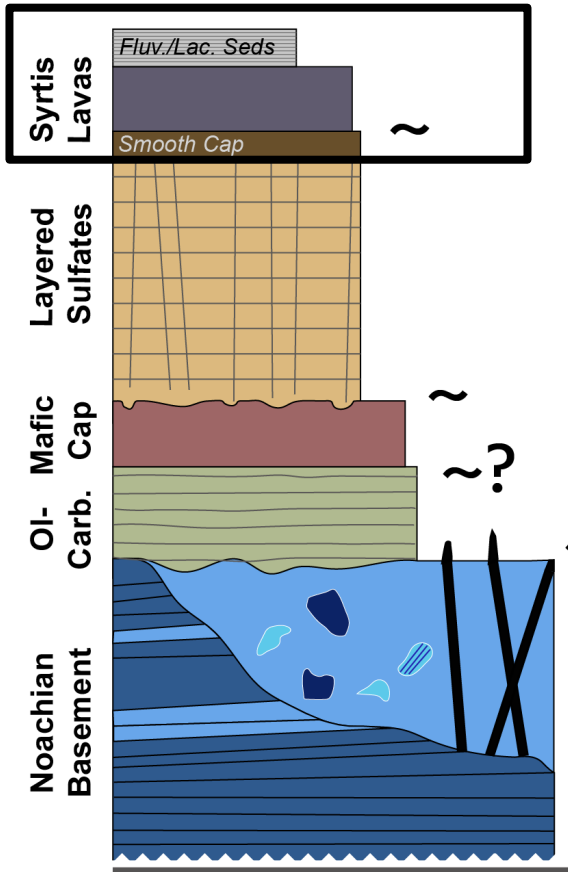

Jezero
Midway
Northeast
Syrtis

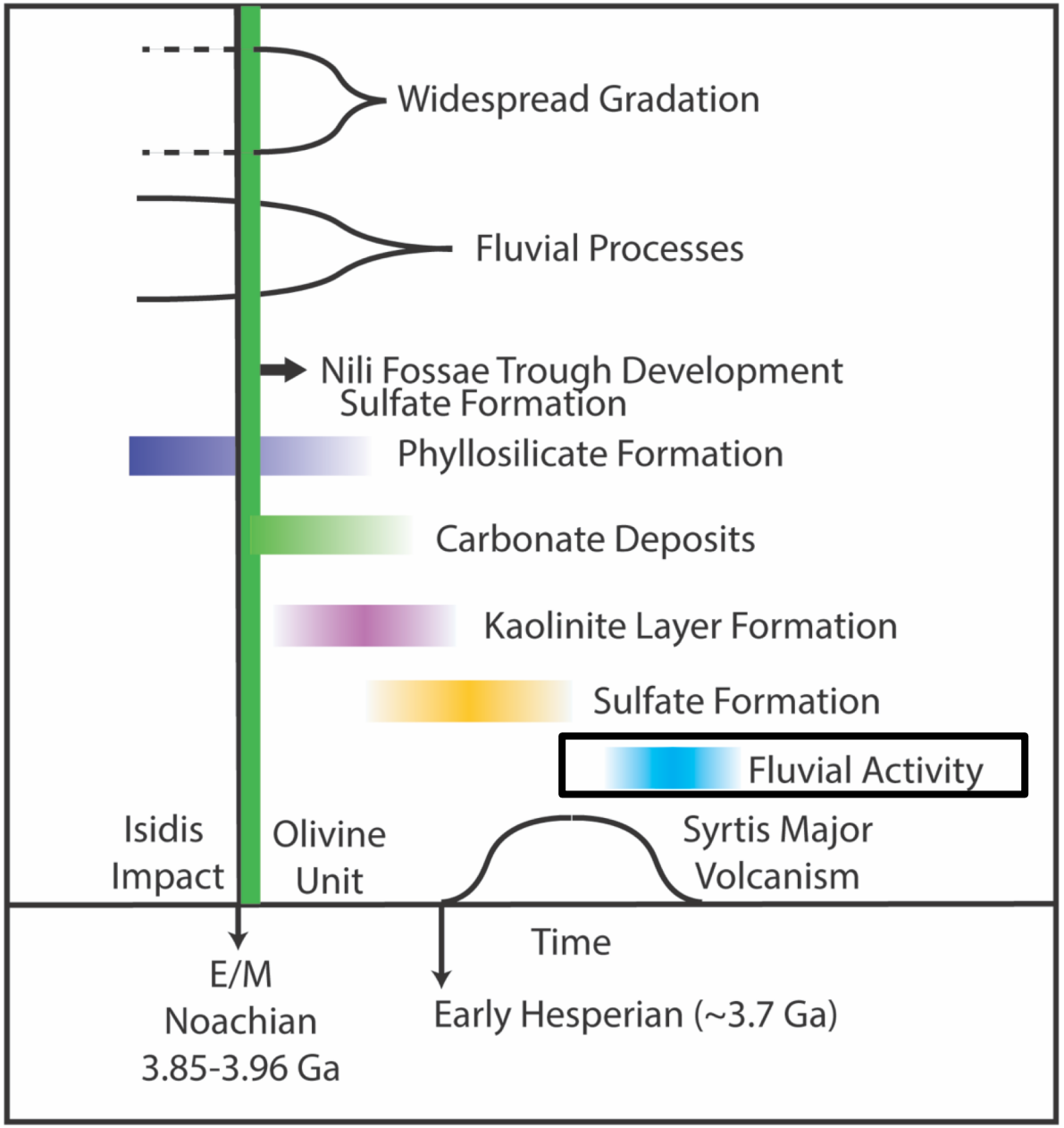
Northeast Syrtis Stratigraphy

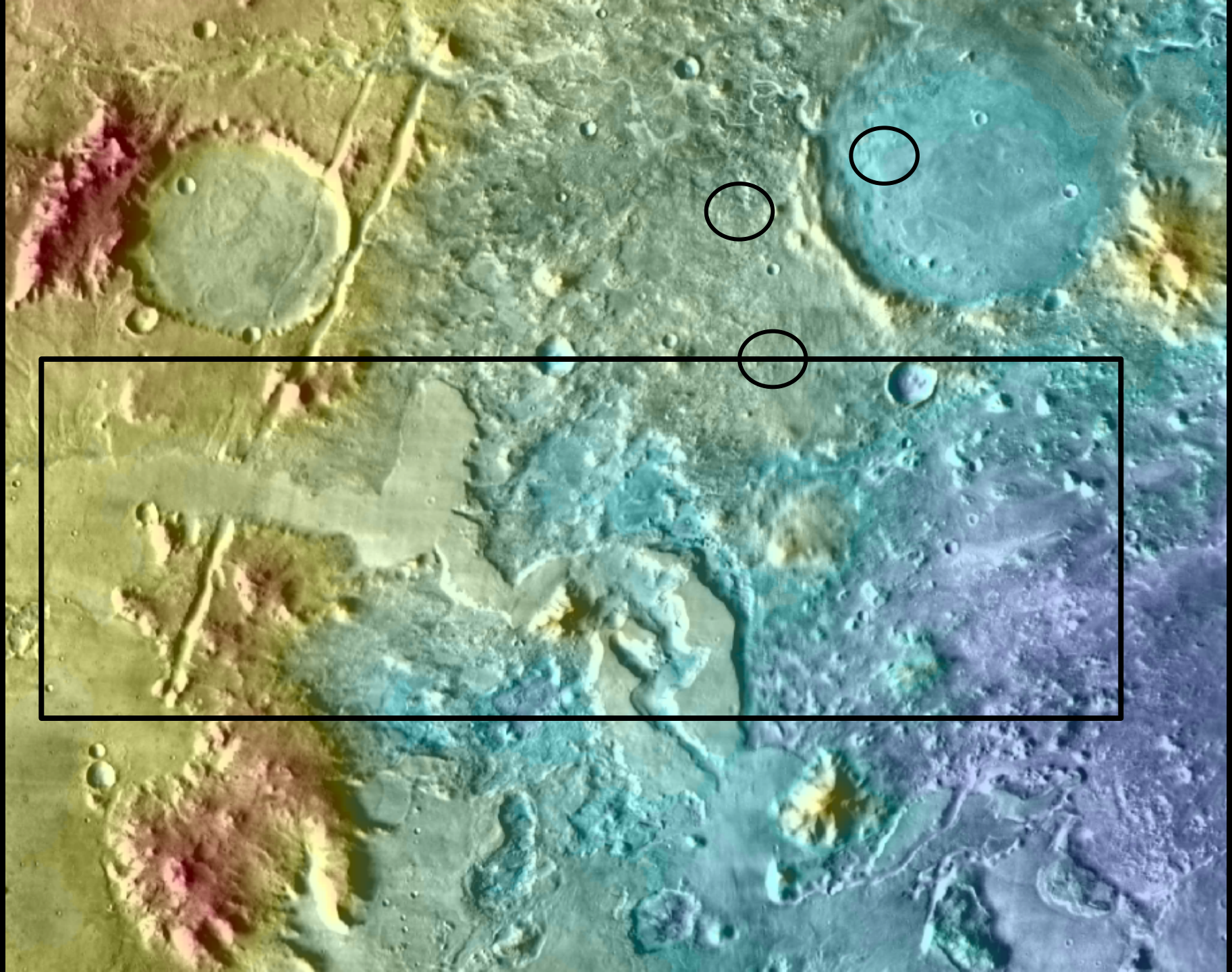




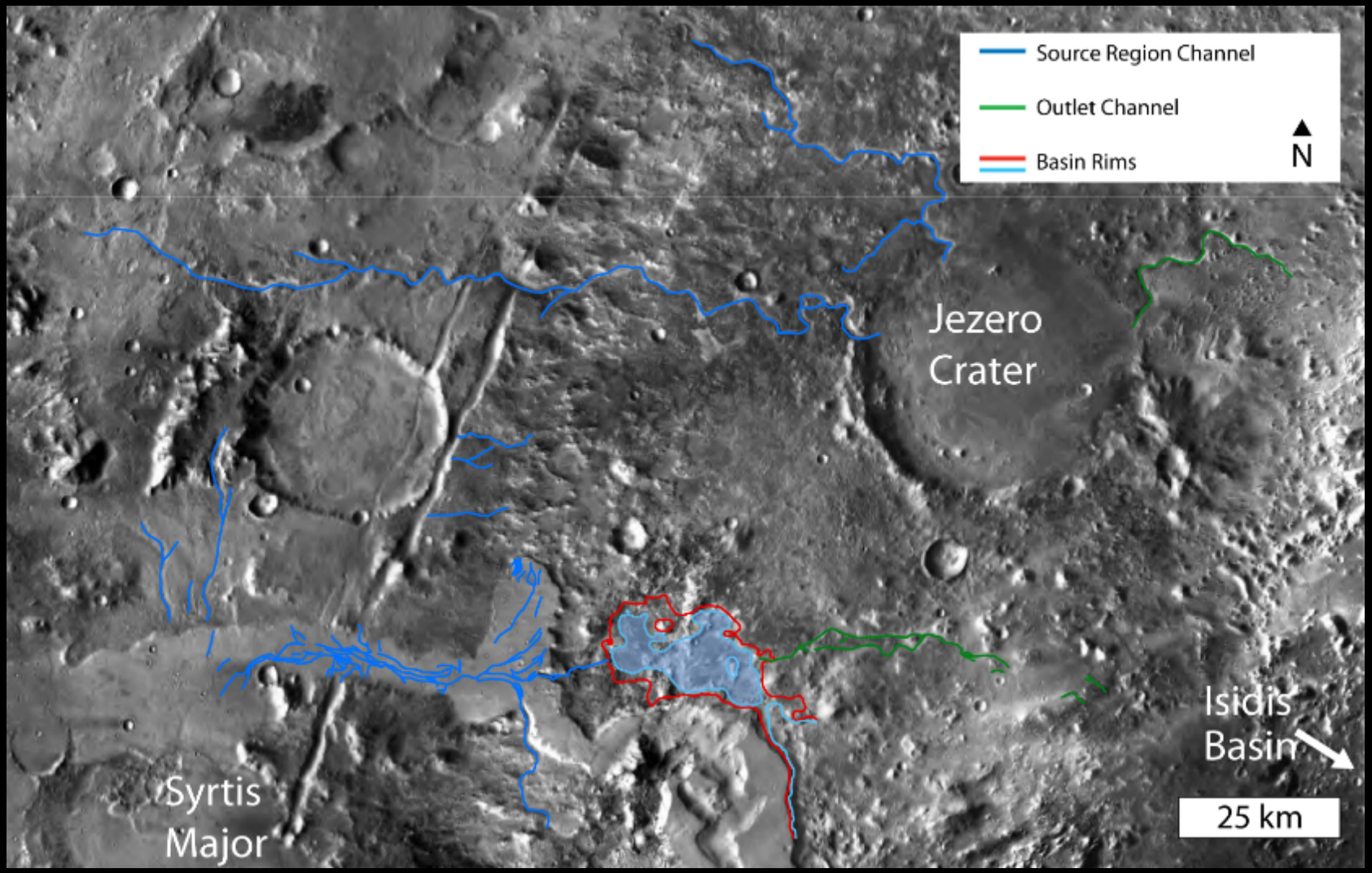
Northeast Syrtis Stratigraphy



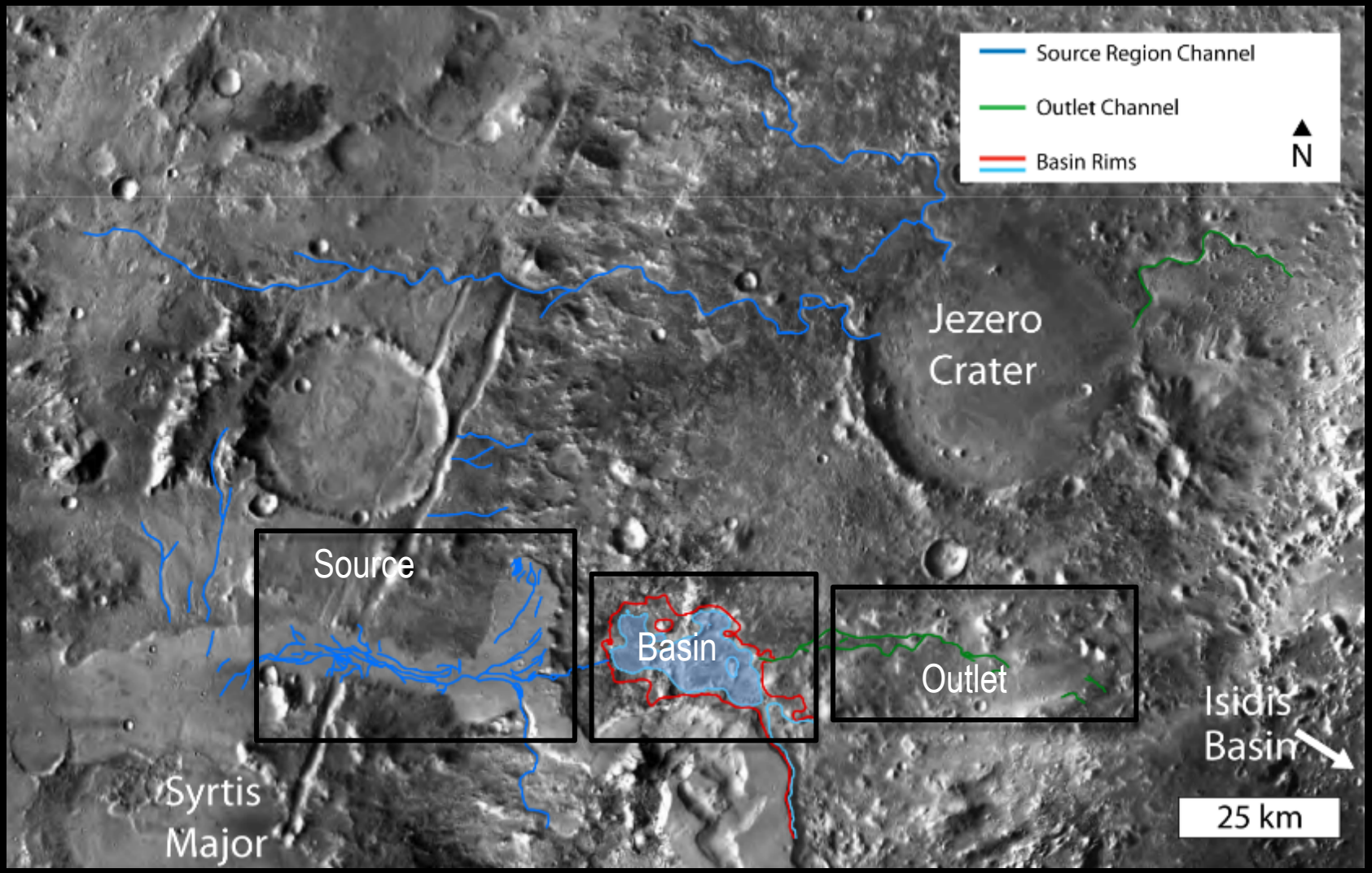




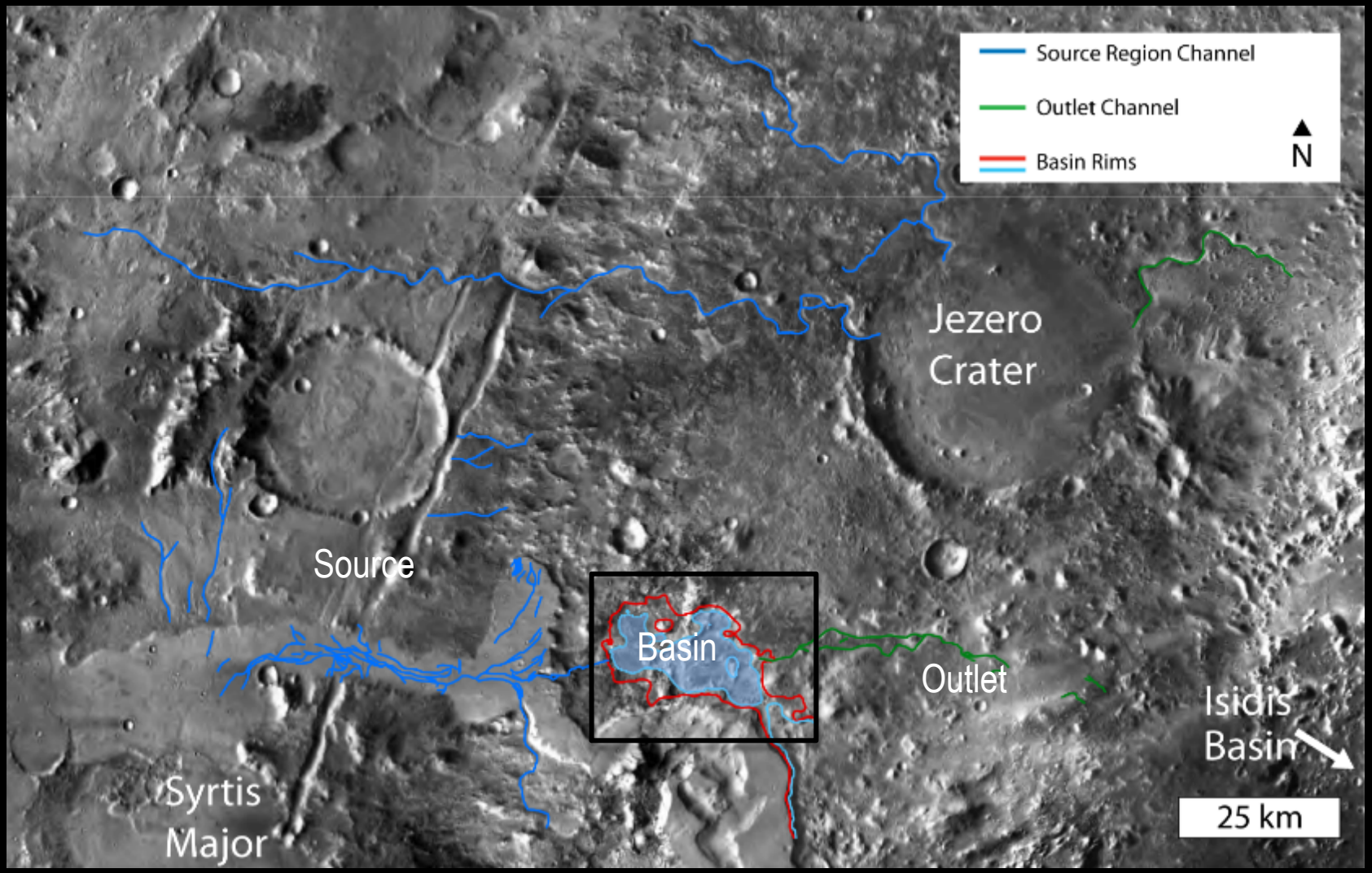
Northeast Syrtis Hydrology



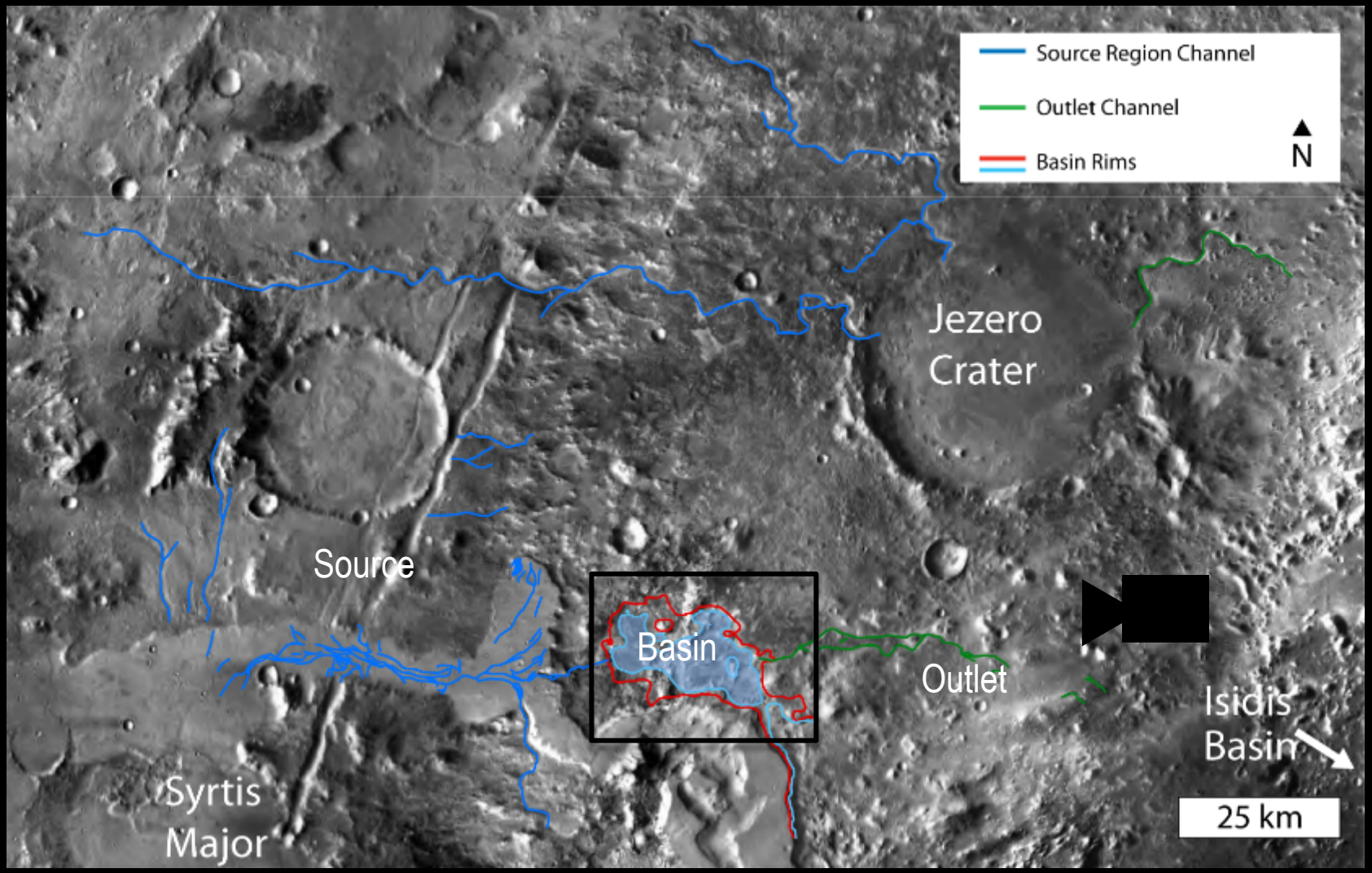
Northeast Syrtis Hydrology

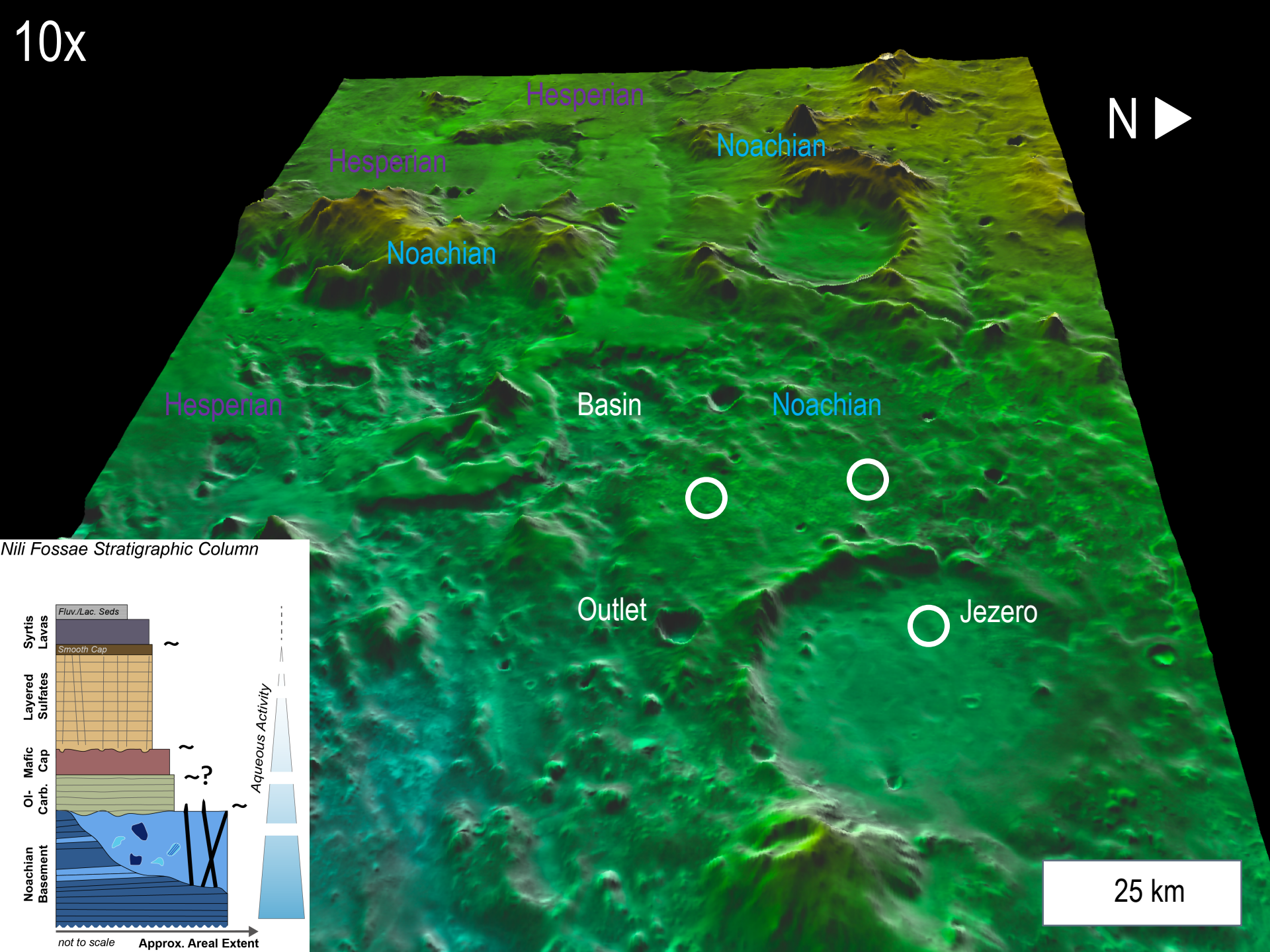


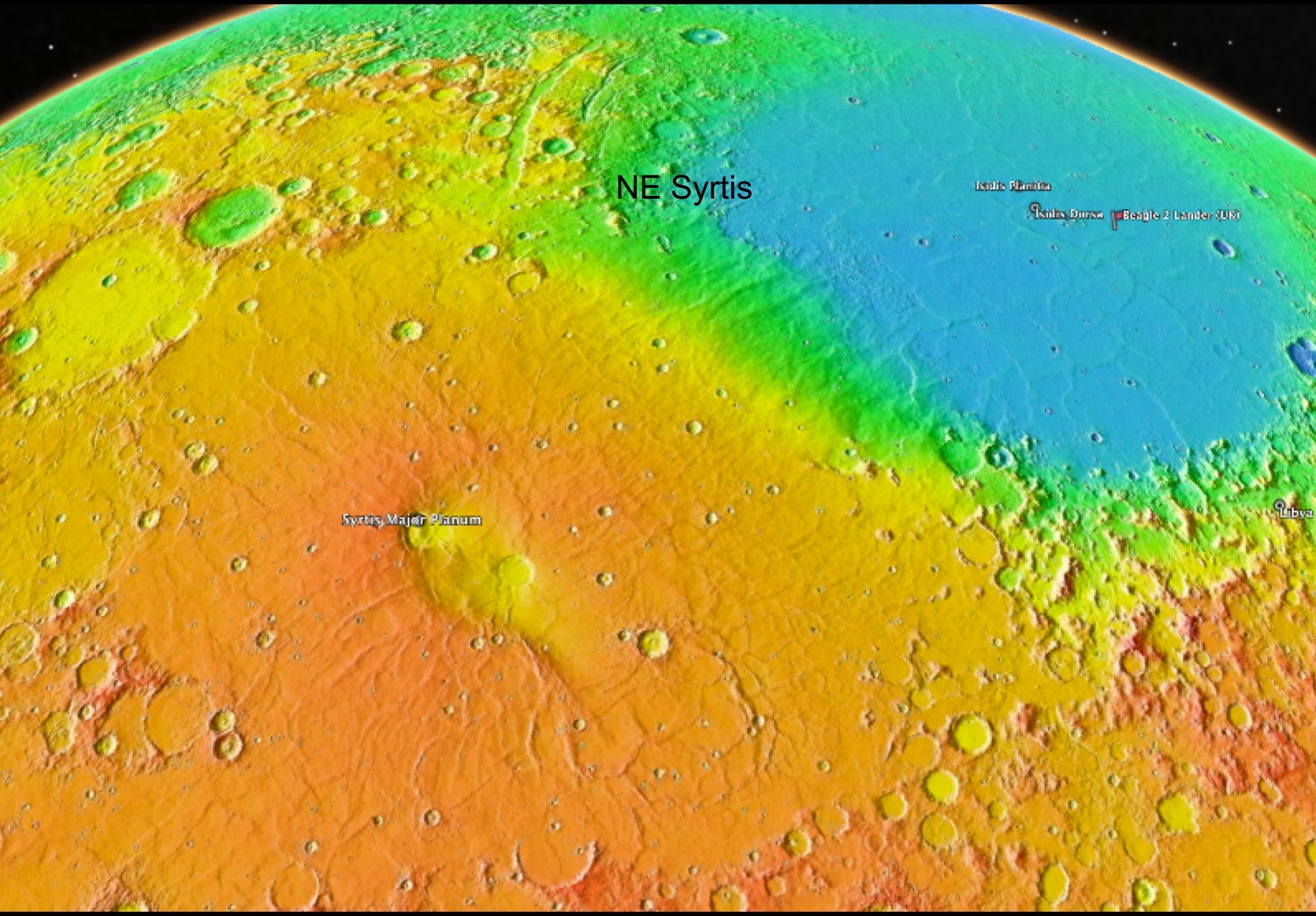
Northeast Syrtis Hydrology

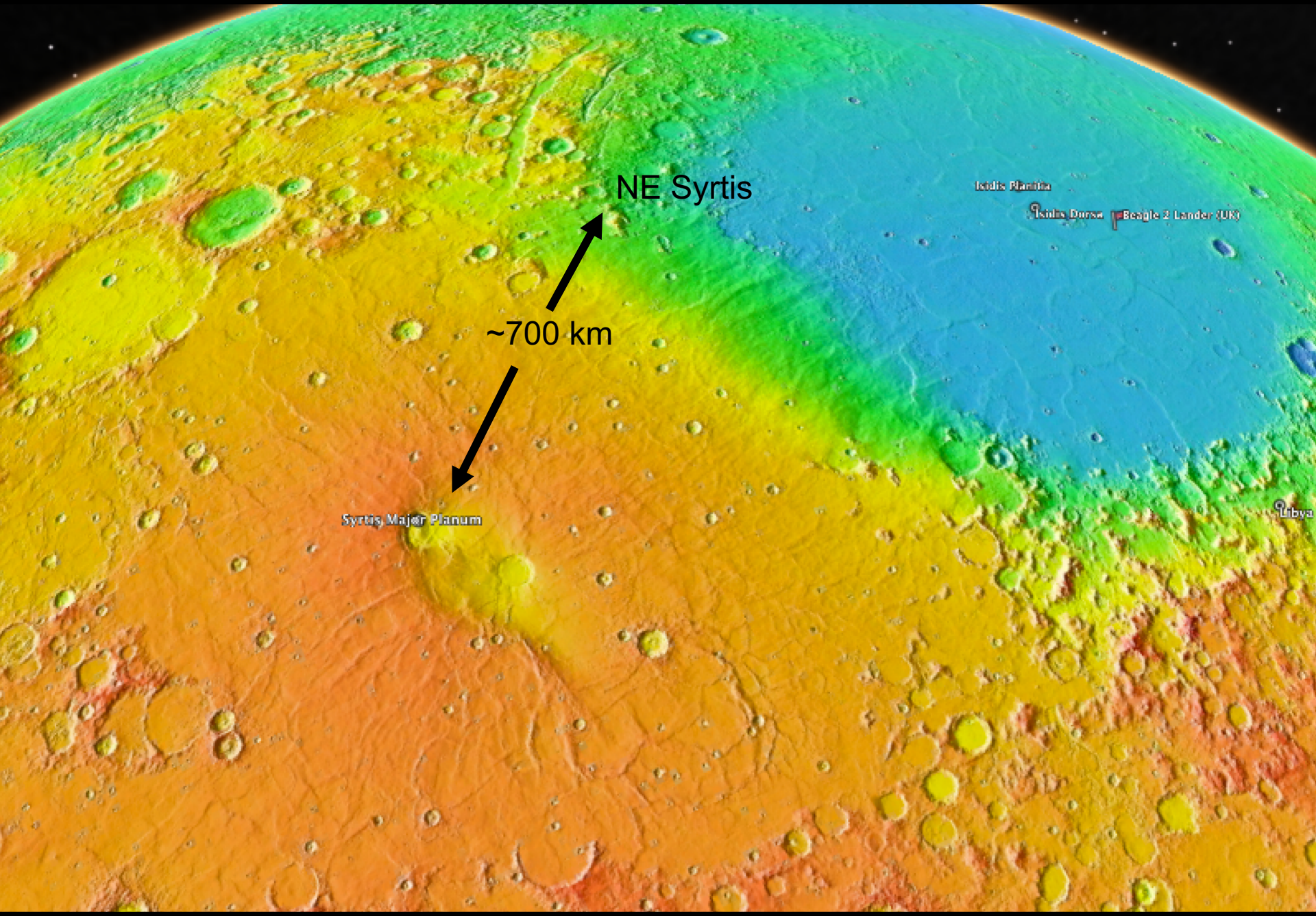


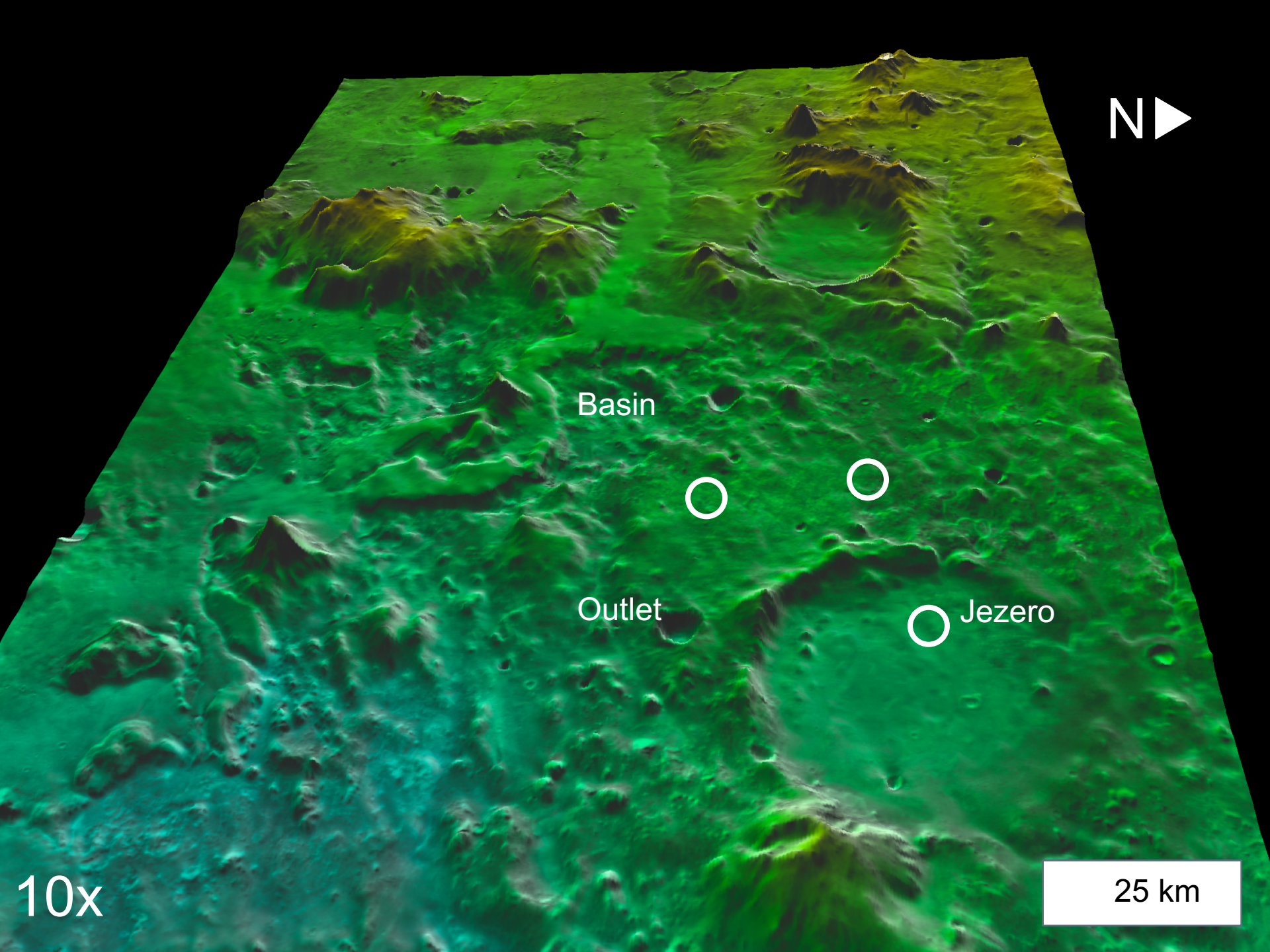
Northeast Syrtis Hydrology

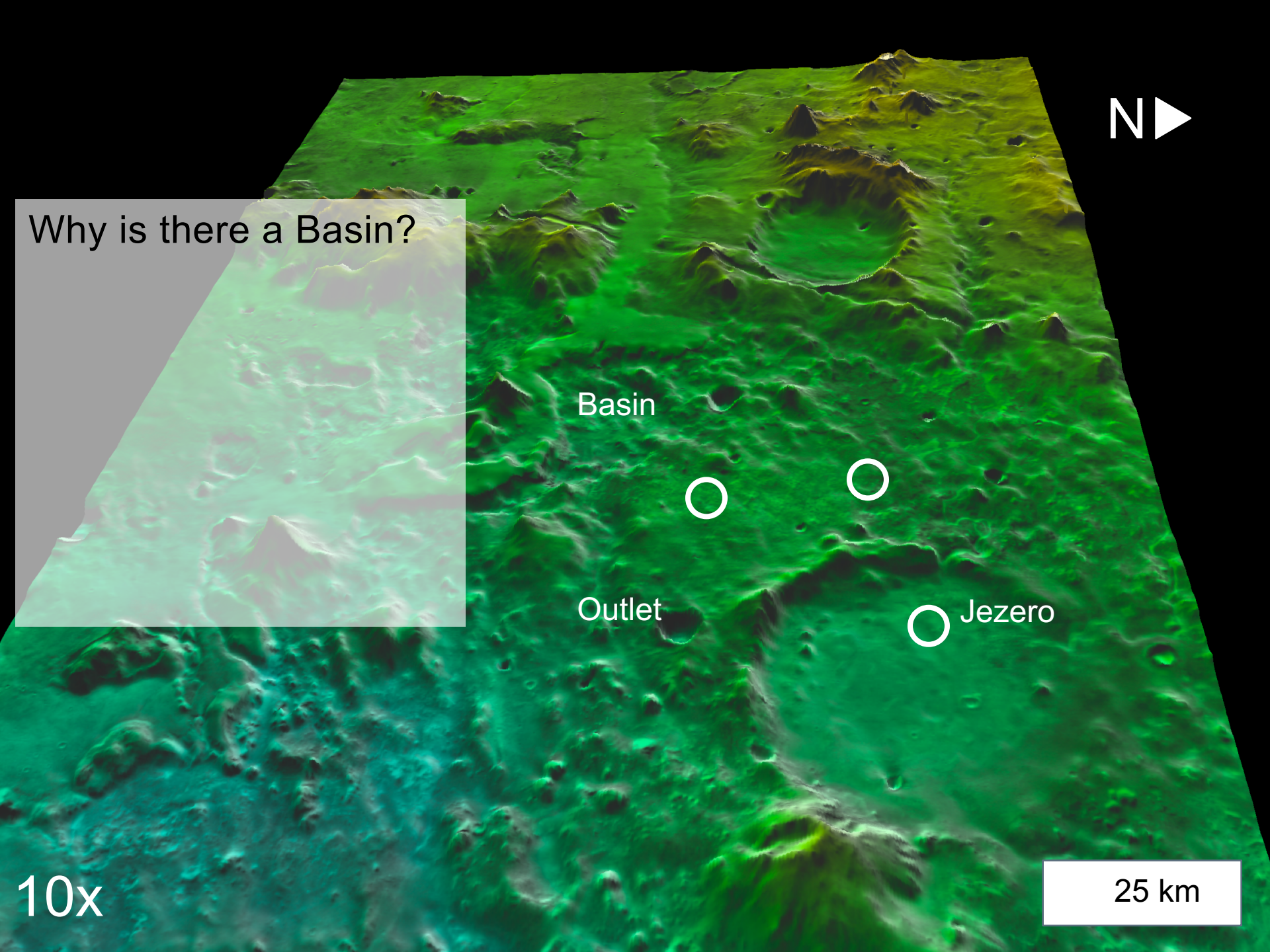


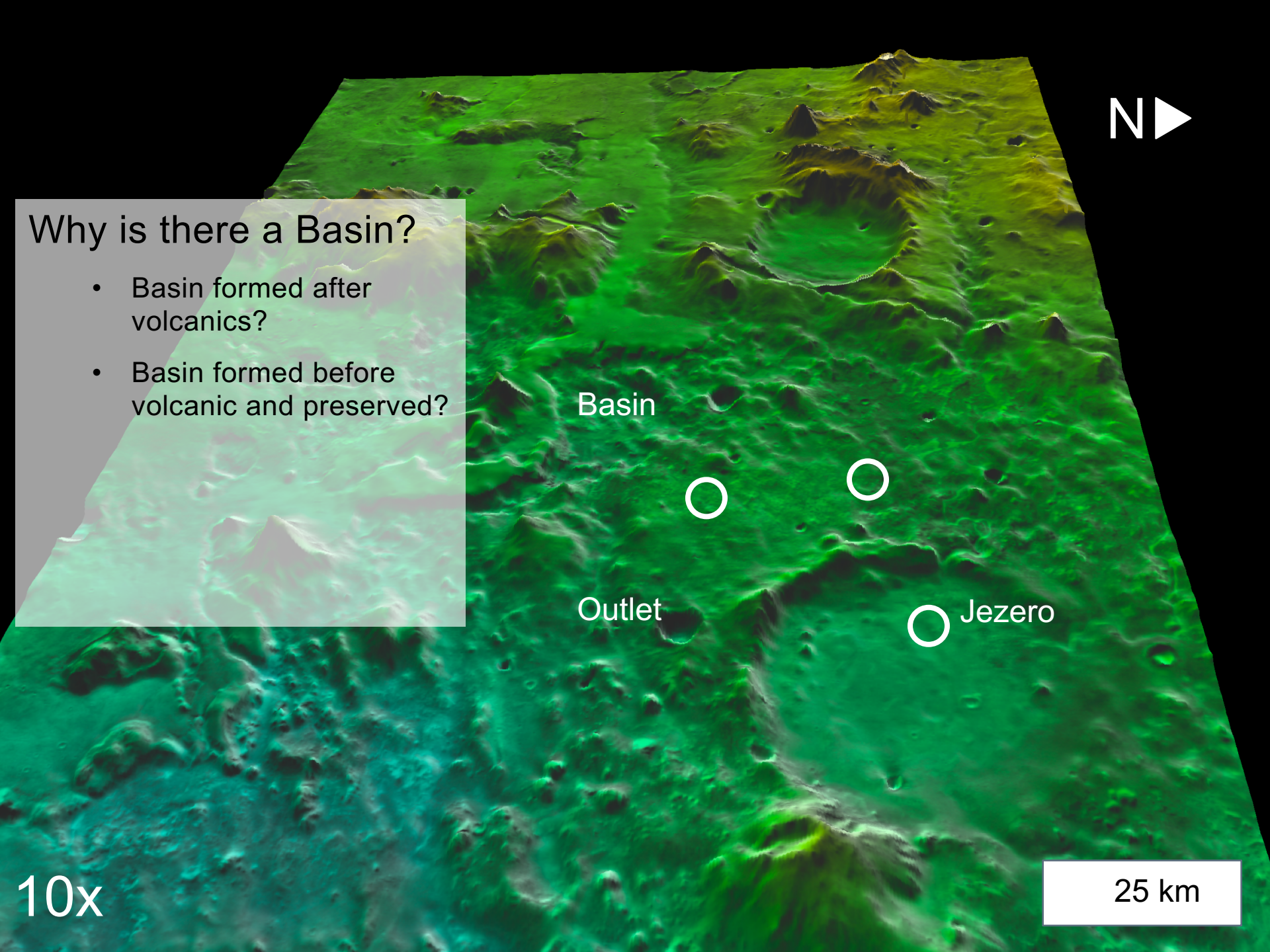

10x
N
Hesperian
Hesperian
Noachian
Noachian
Hesperian
Basin
Noachian
Outlet
Jezero
25 km
Nili Fossae Stratigraphic Column
Syrtis Lavas
Fluv./Lac. Seds
Smooth Cap
Layered Sulfates
Mafic Cap
Ol-Carb.
Noachian Basement
Aqueous Activity
not to scale
Approx. Areal Extent

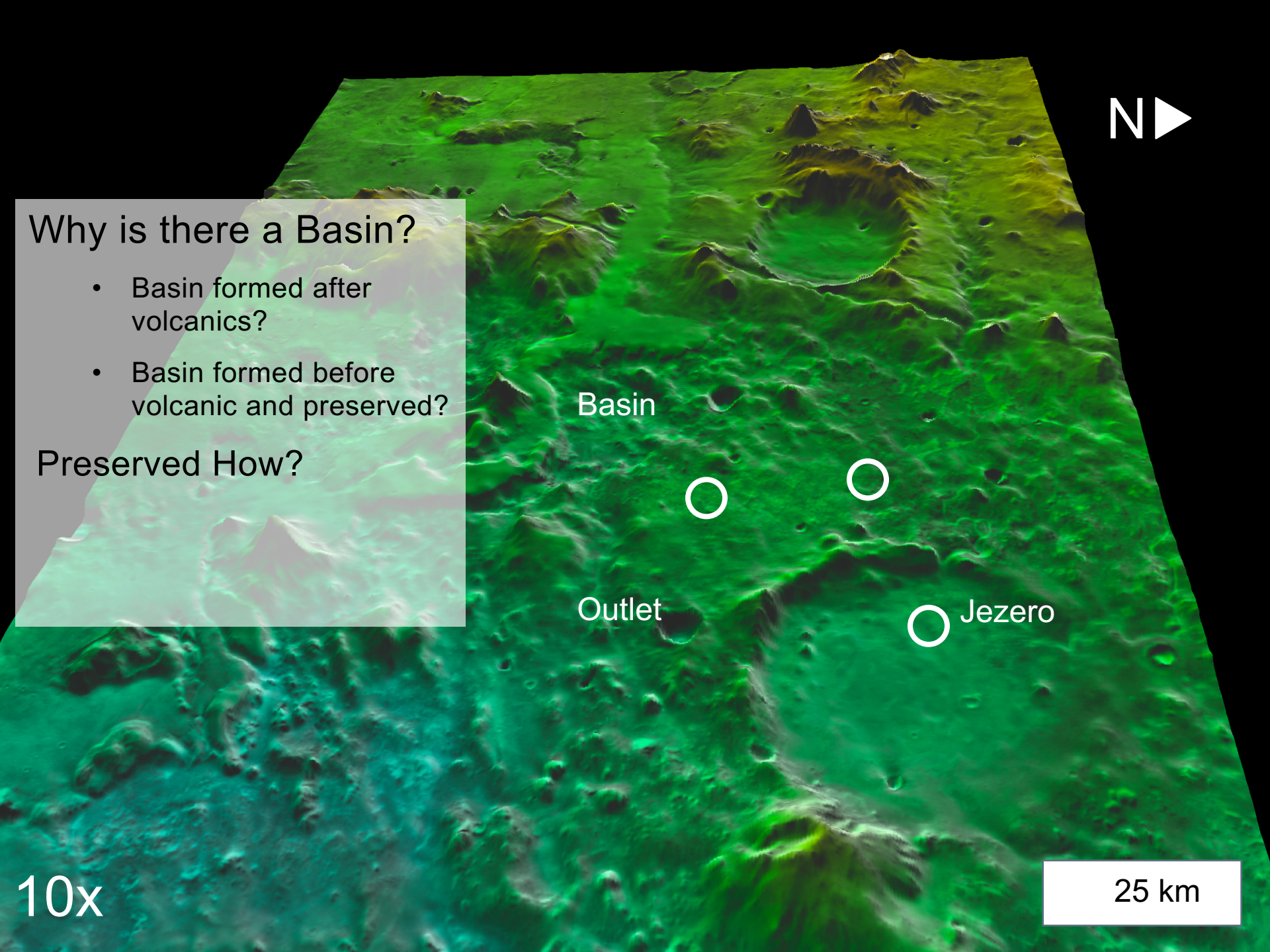

NE Syrtis
Isidis Planitia
Isidis Dorsa
Beagle 2 Lander (UK)
Syrtis Major Planum
Libya


NE Syrtis
~700 km
Isidis Planitia
Isidis Dorsa
Beagle 2 Lander (UK)
Syrtis Major Planum
Libya


N
Basin
Outlet
Jezero
10x
25 km


Why is there a Basin?
N
Basin
Outlet
Jezero
10x
25 km

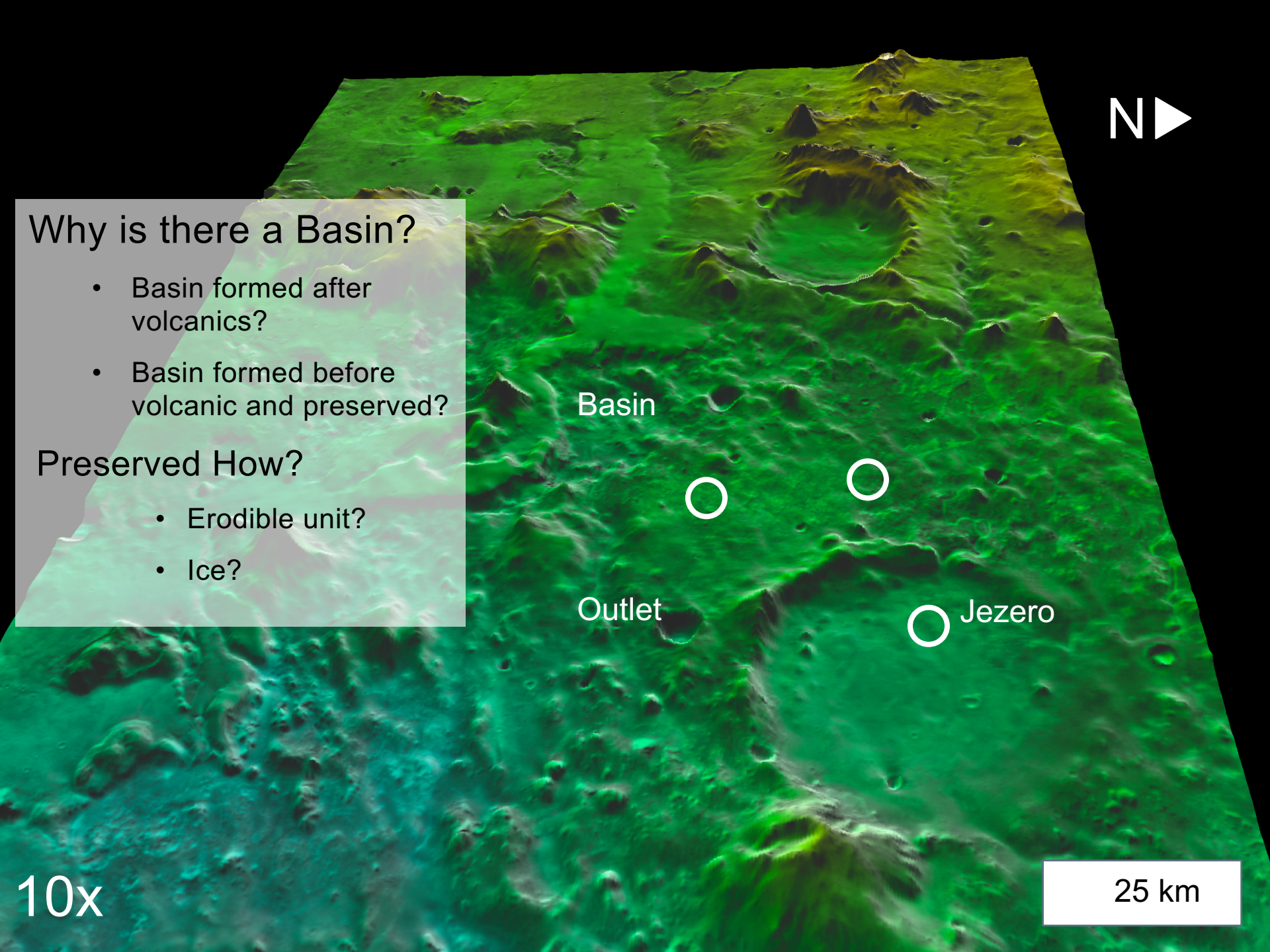

Why is there a Basin?
• Basin formed after volcanics?
• Basin formed before volcanic and preserved?
Basin
Outlet
Jezero
N
10x
25 km



Why is there a Basin?

- Basin formed after volcanics?
- Basin formed before volcanic and preserved?

Preserved How?

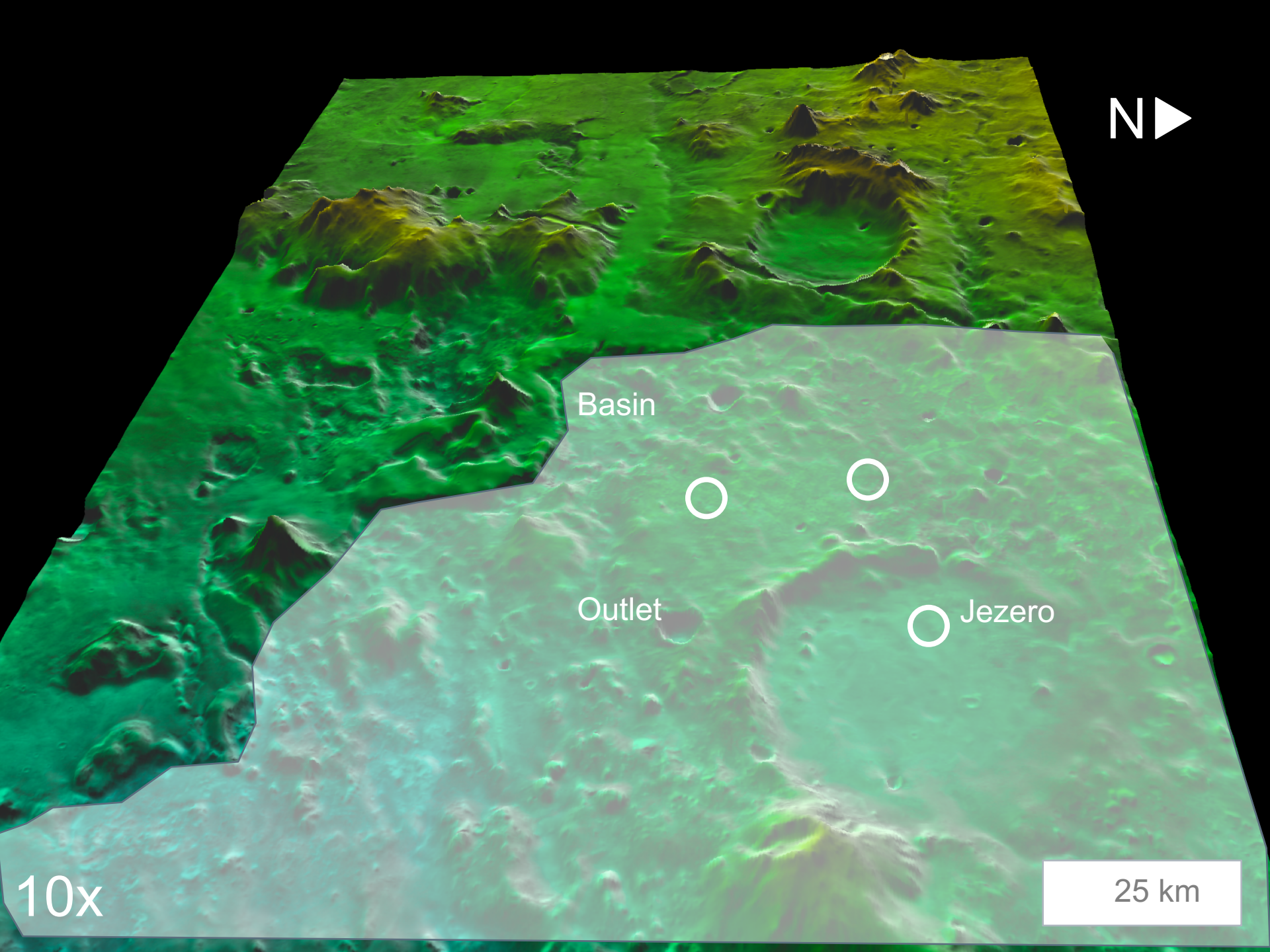


Why is there a Basin?

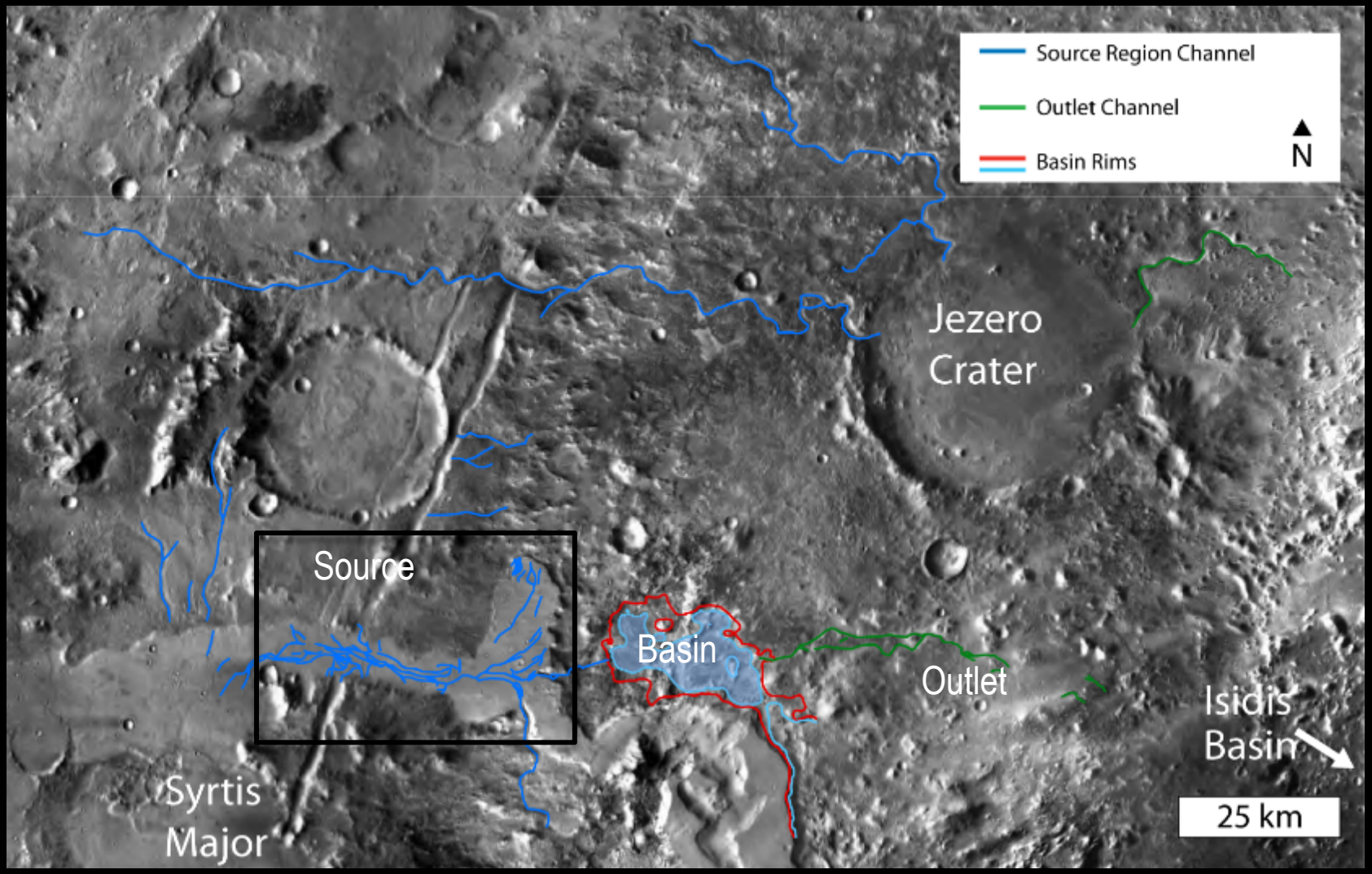
- Basin formed after volcanics?
- Basin formed before volcanic and preserved?

Preserved How?

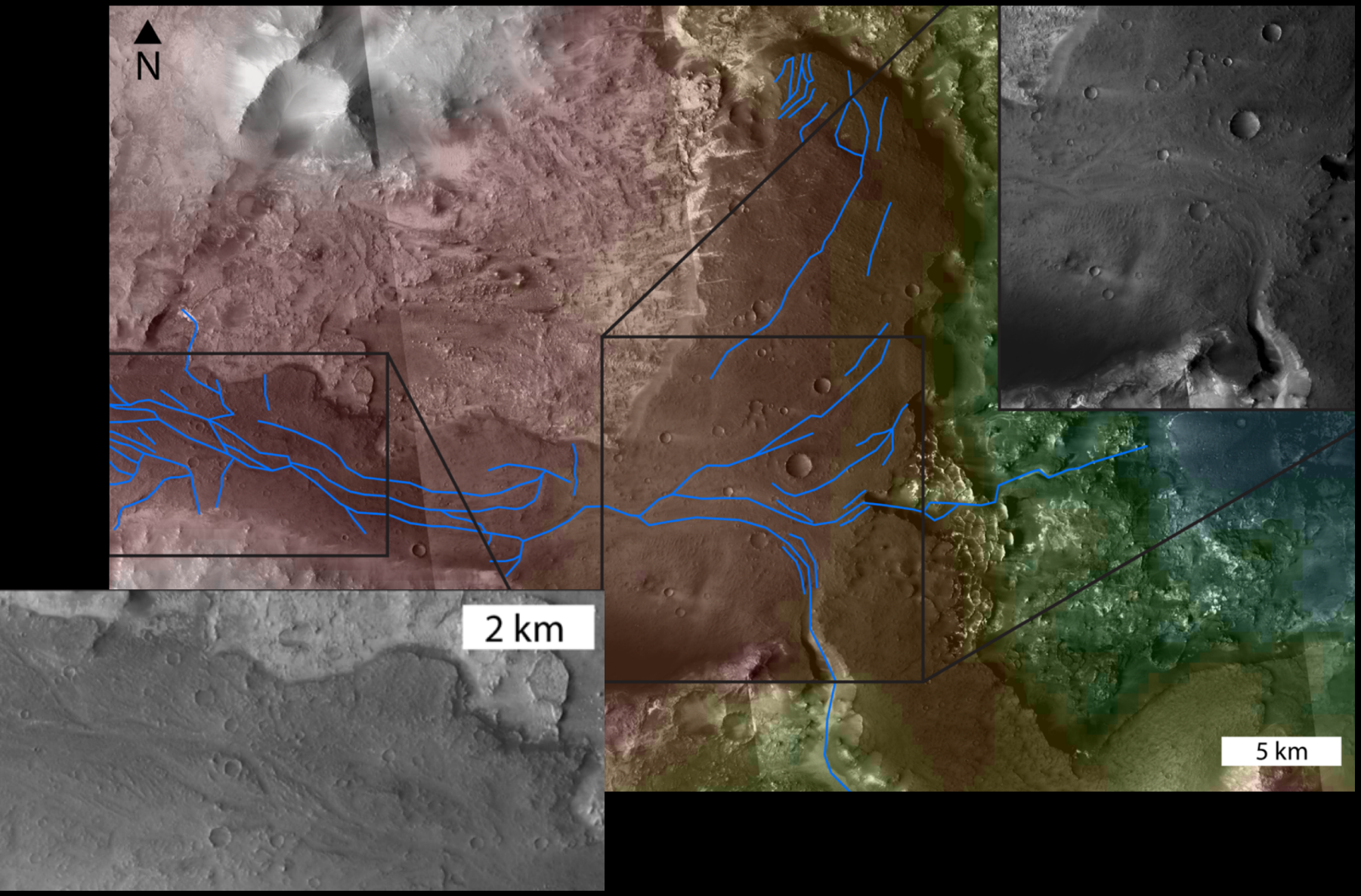
- Erodible unit?
- Ice?

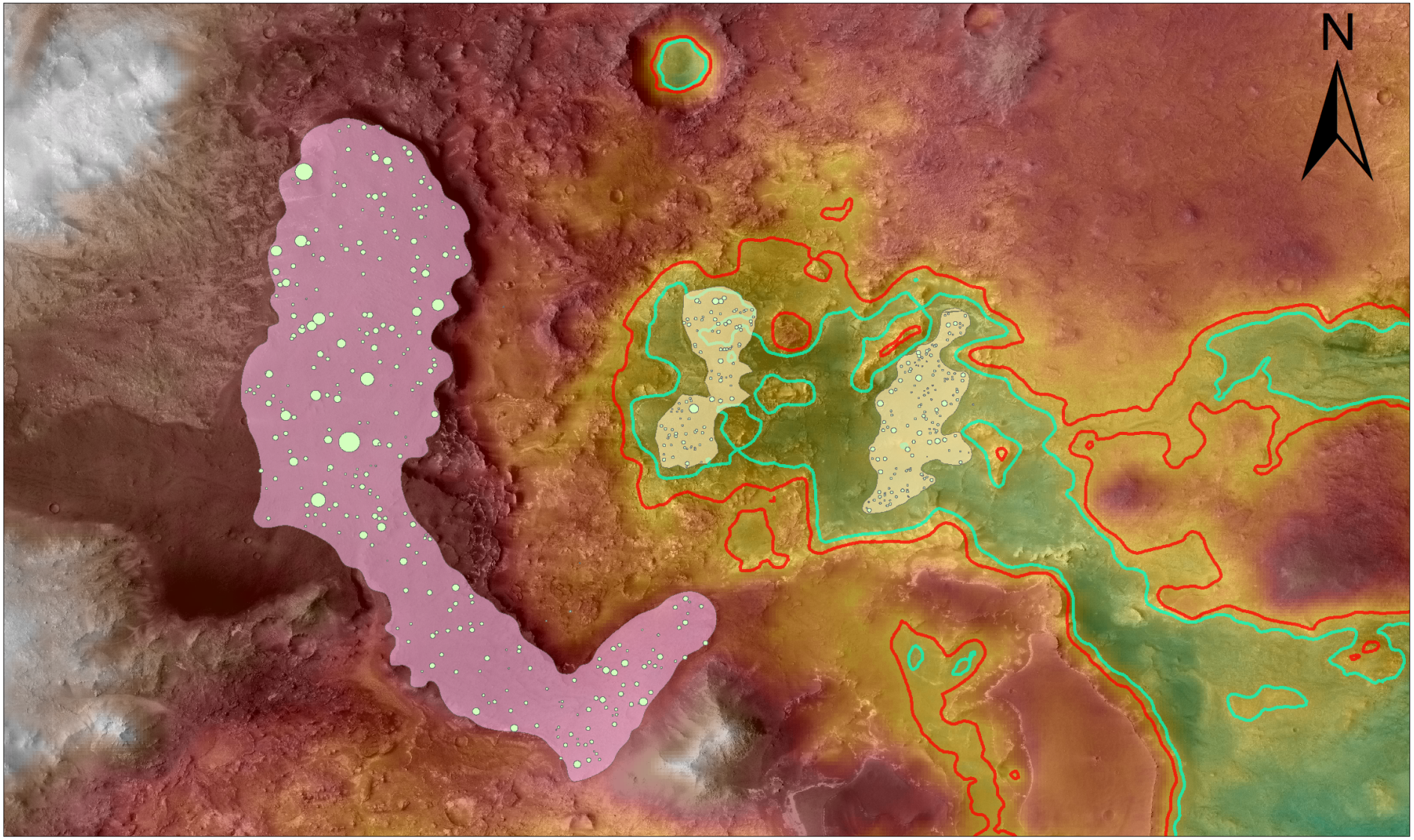

N
Basin
Outlet
Jezero
10x
25 km

Northeast Syrtis Hydrology

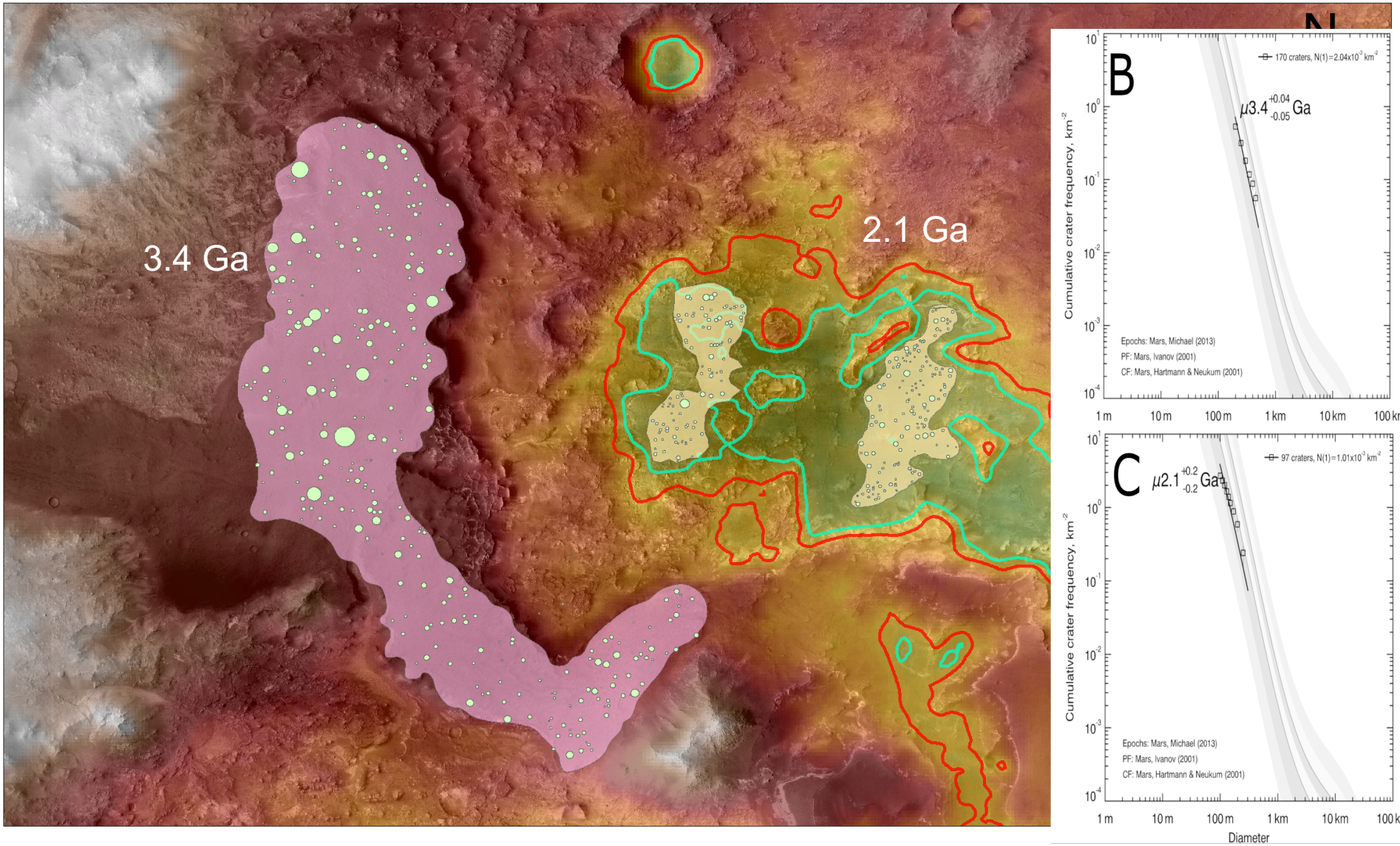


Source





Matherne et al., (In Prep), Quantin-Nataf et al., (2018)



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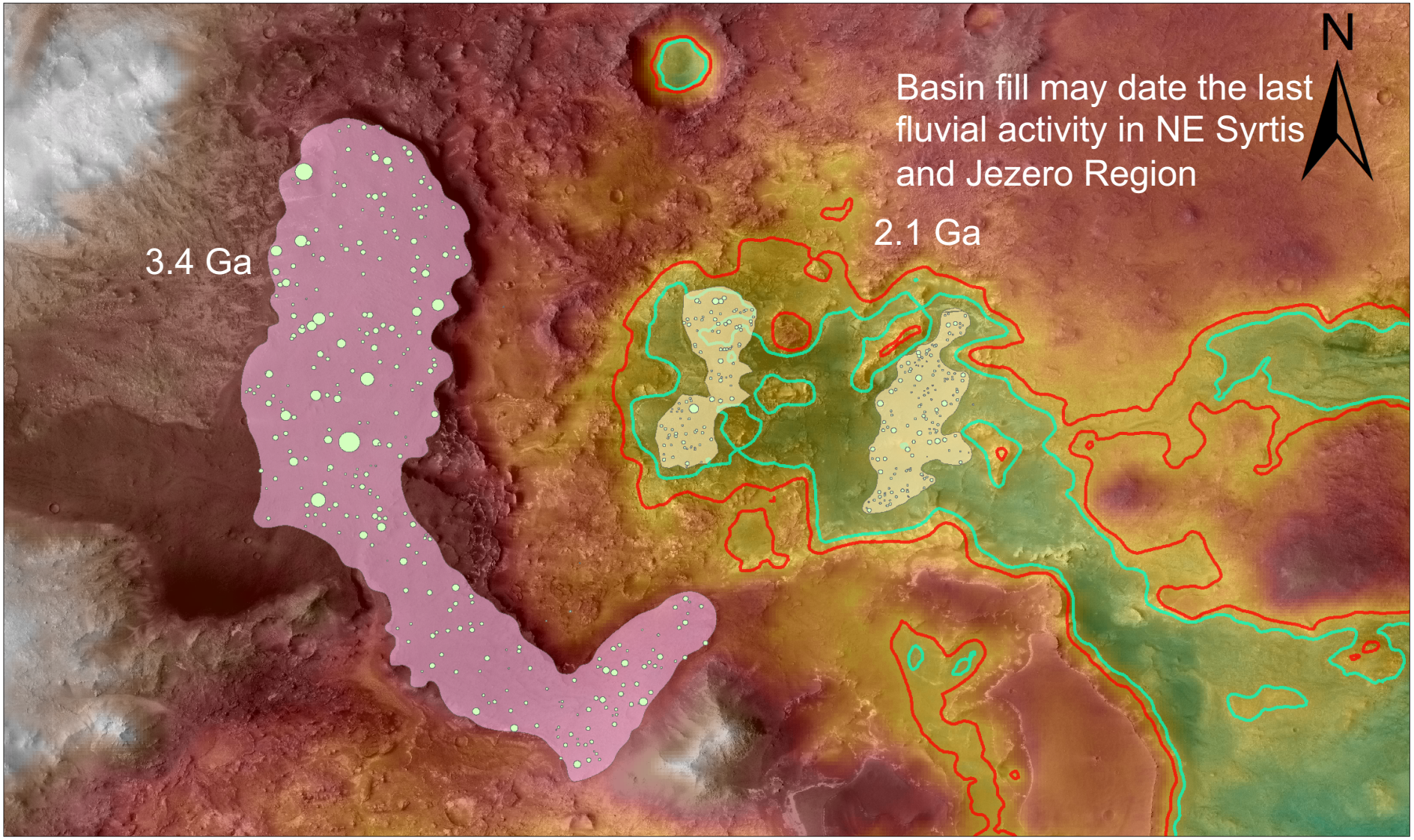

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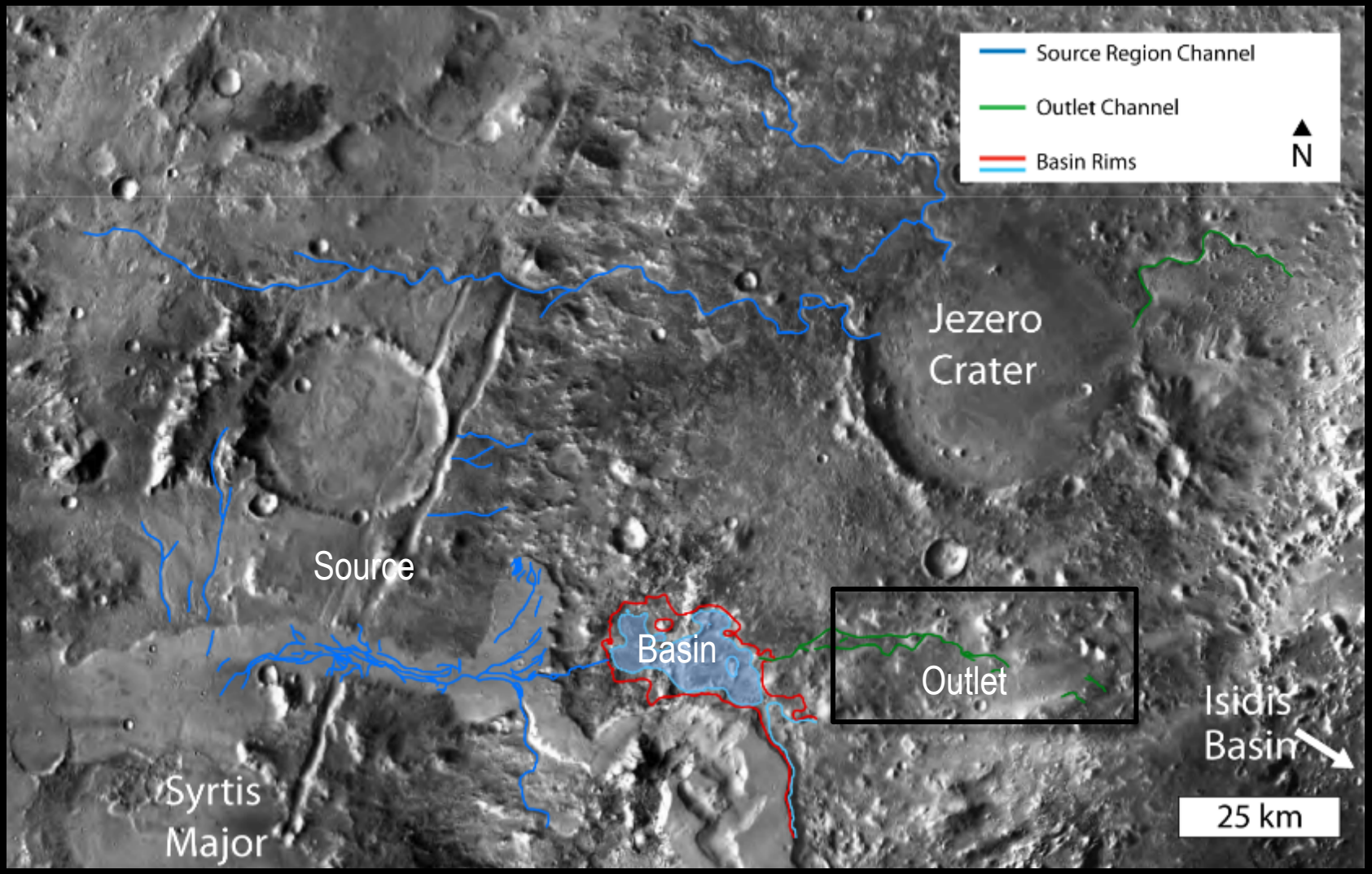
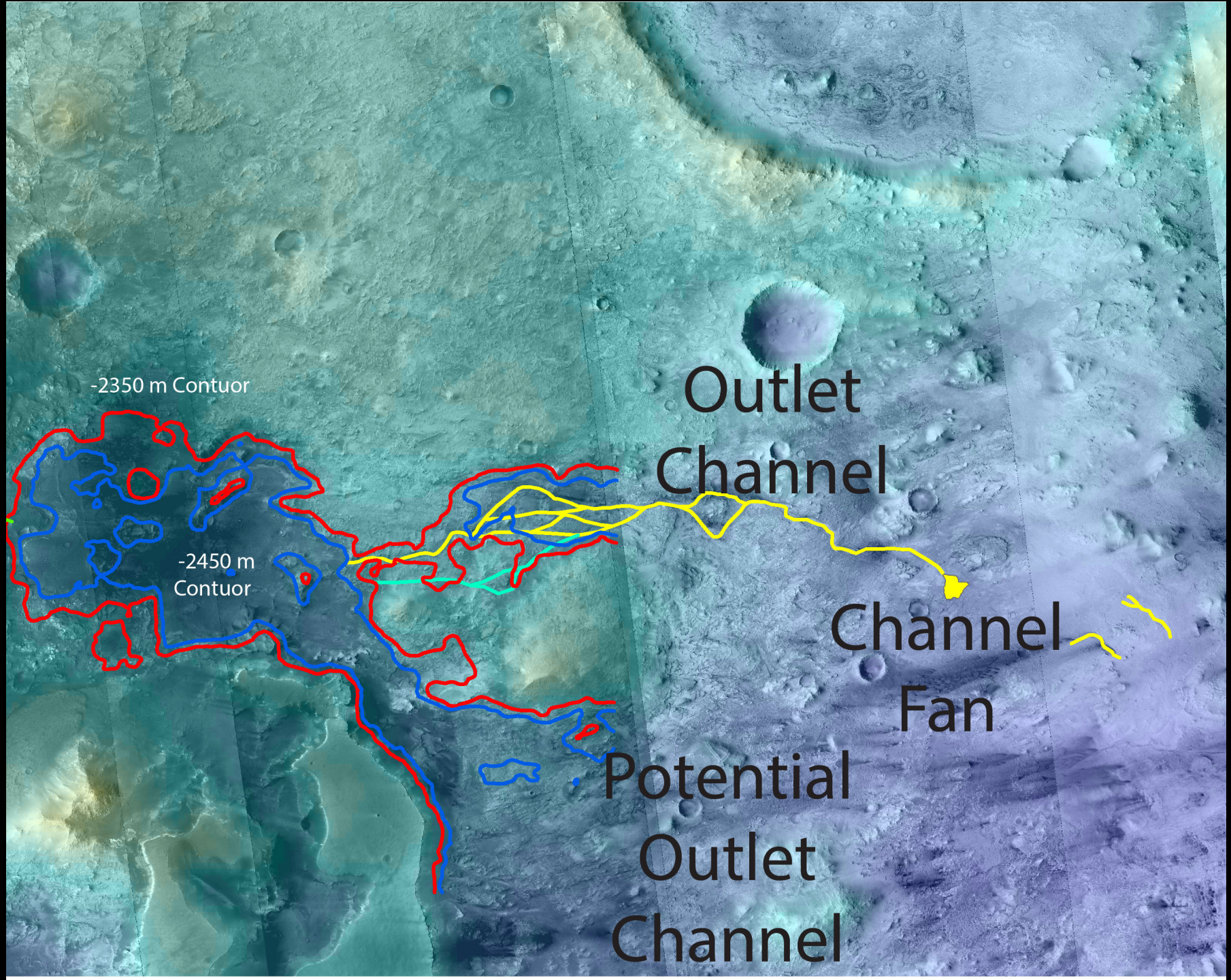
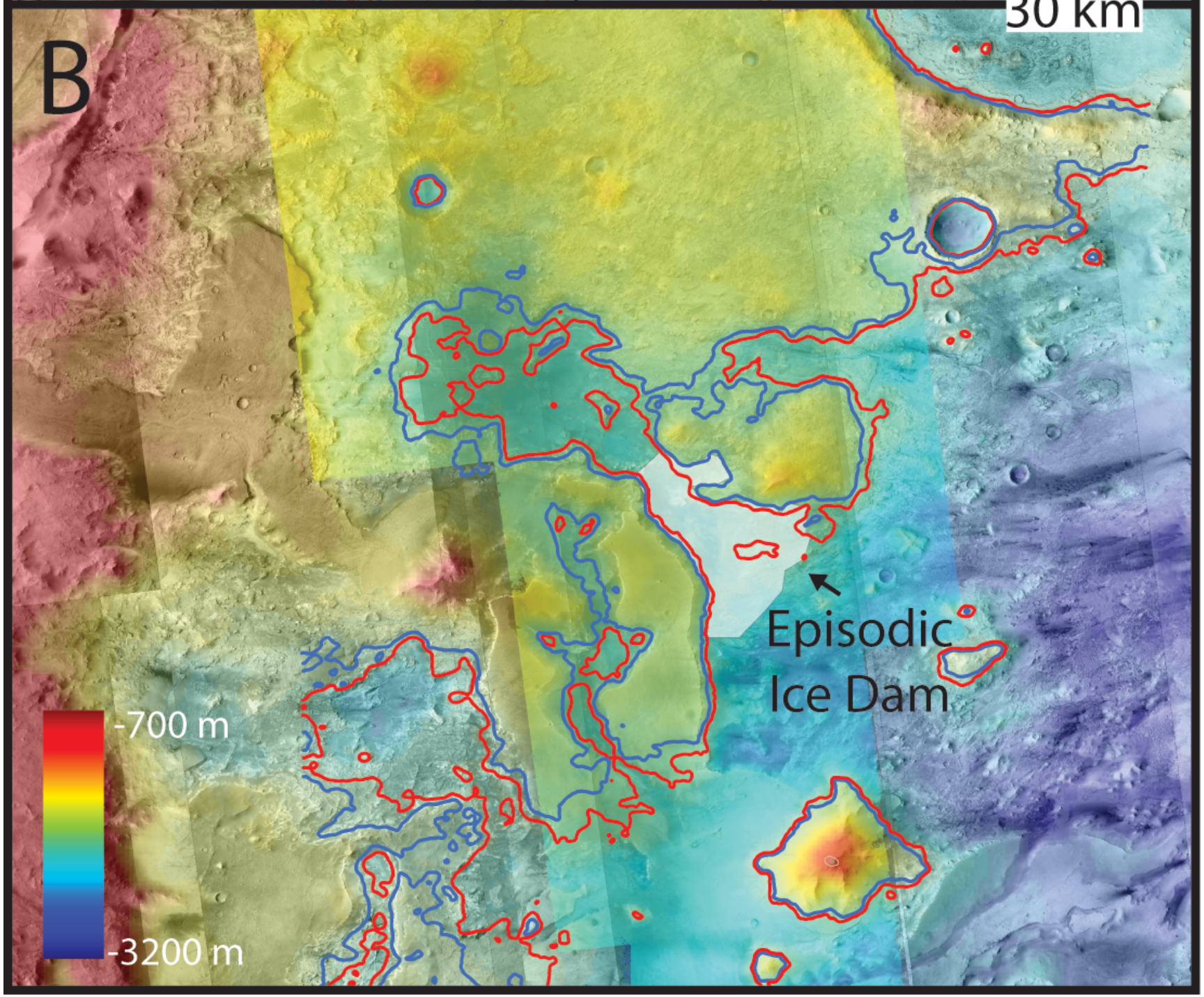
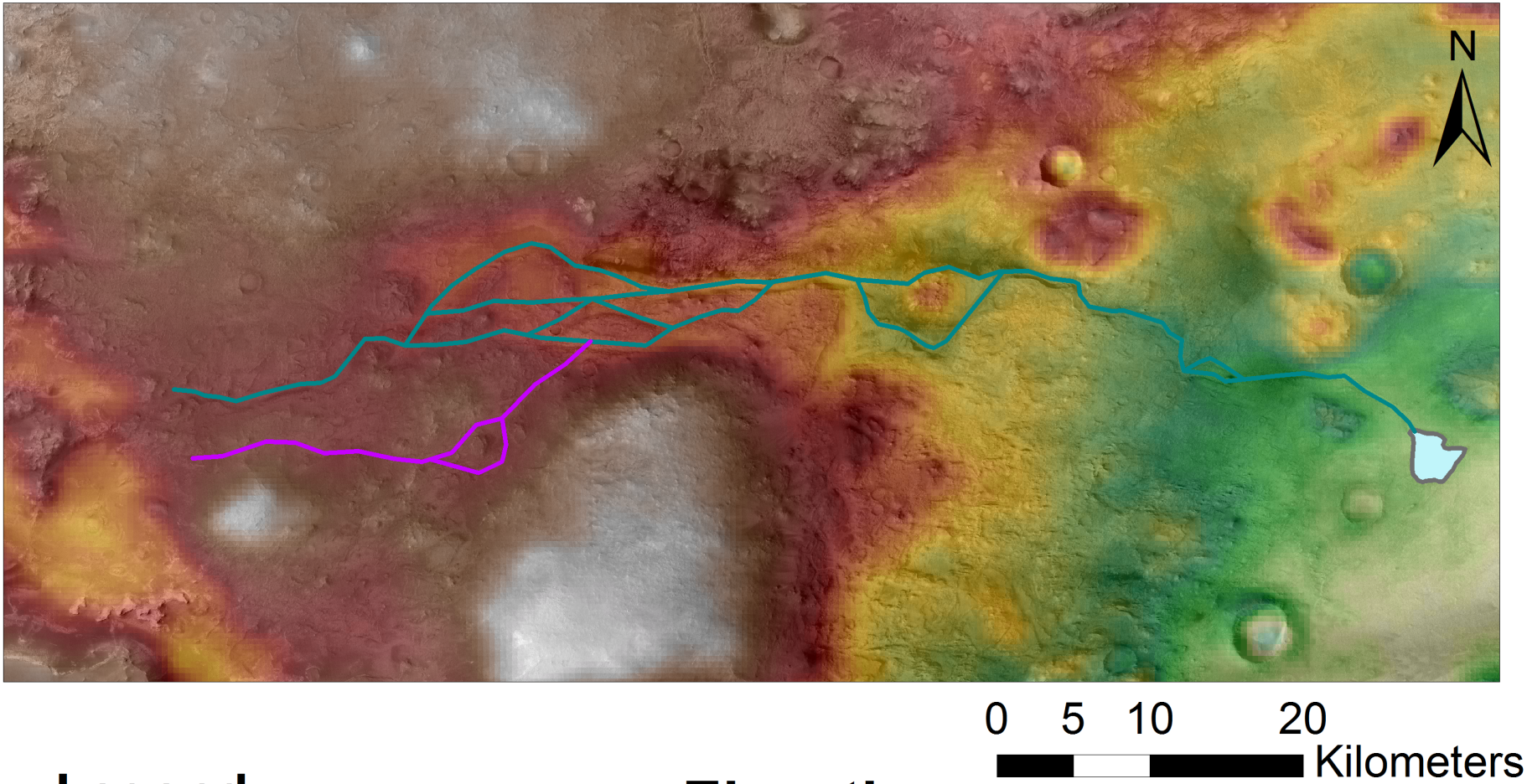
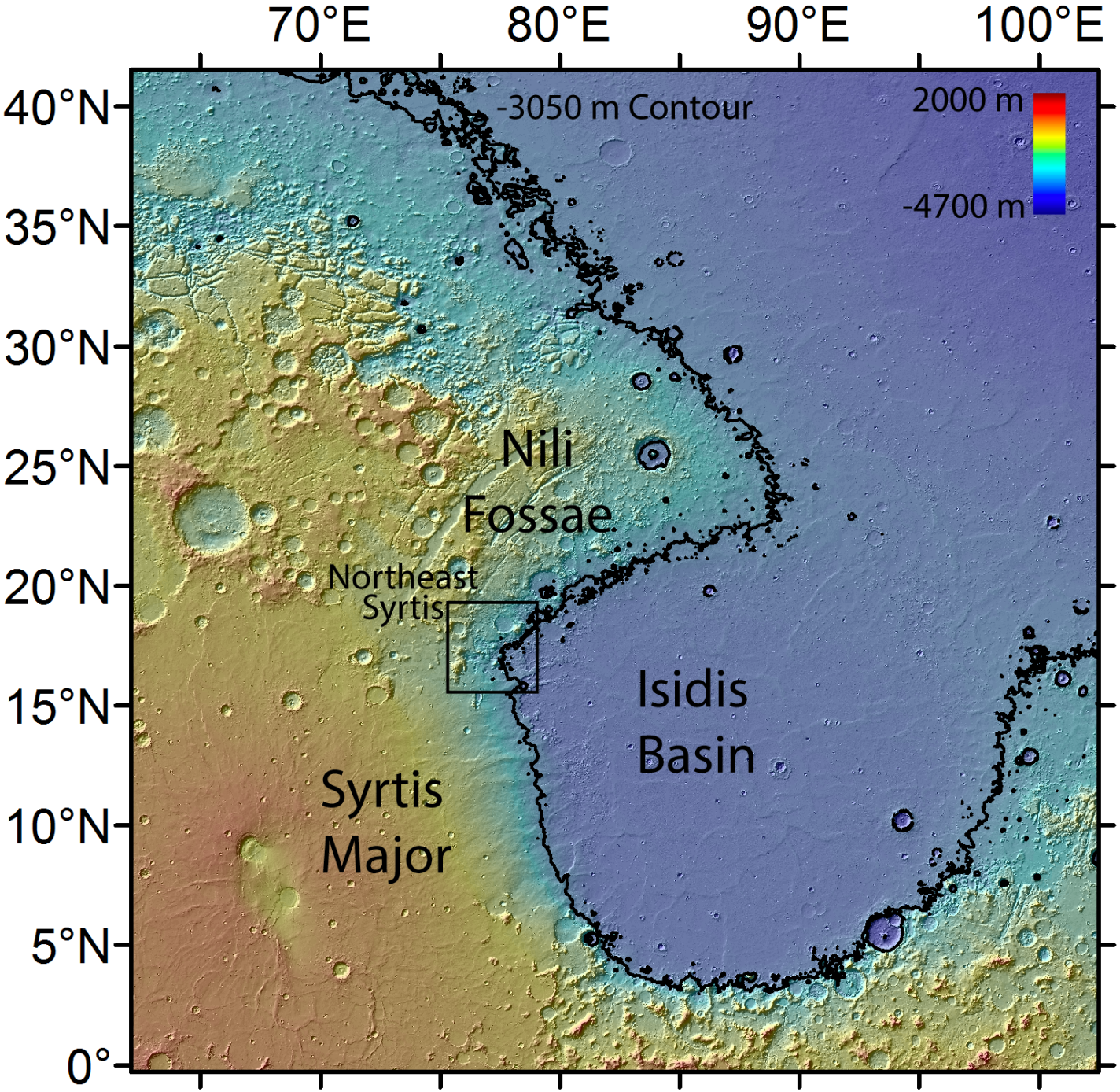
Northeast Syrtis Hydrology



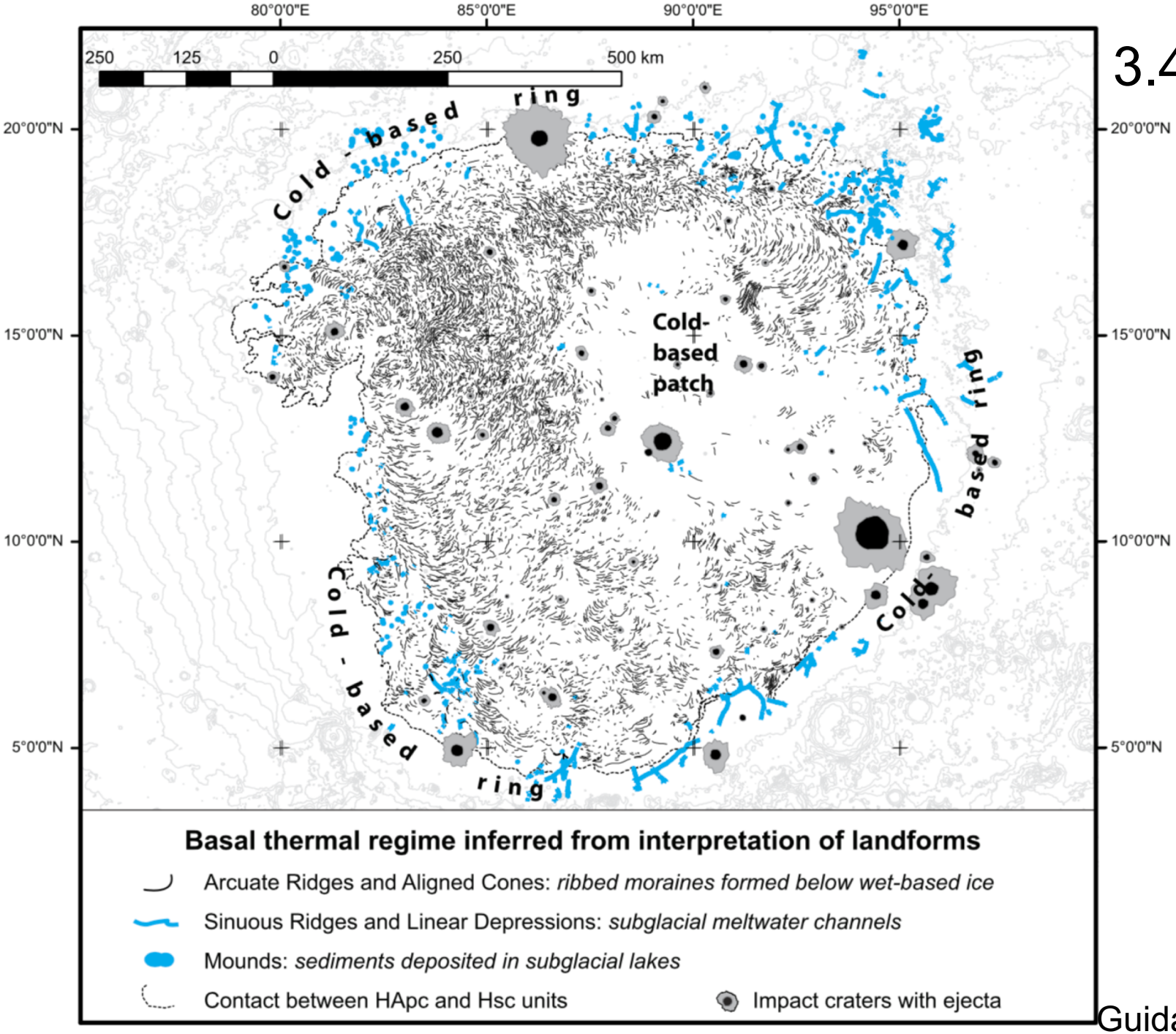

-2350 m Contuor
-2450 m
Contuor
Outlet
Channel
Channel
Fan
Potential
Outlet
Channel


B
30 km
Episodic
Ice Dam
-700 m
-3200 m


N
0 5 10 20
Kilometers
Legend
Topography Channels
Visual Outlet Channels
Fan
Elevation
High : -1700 m
Low : -3400 m

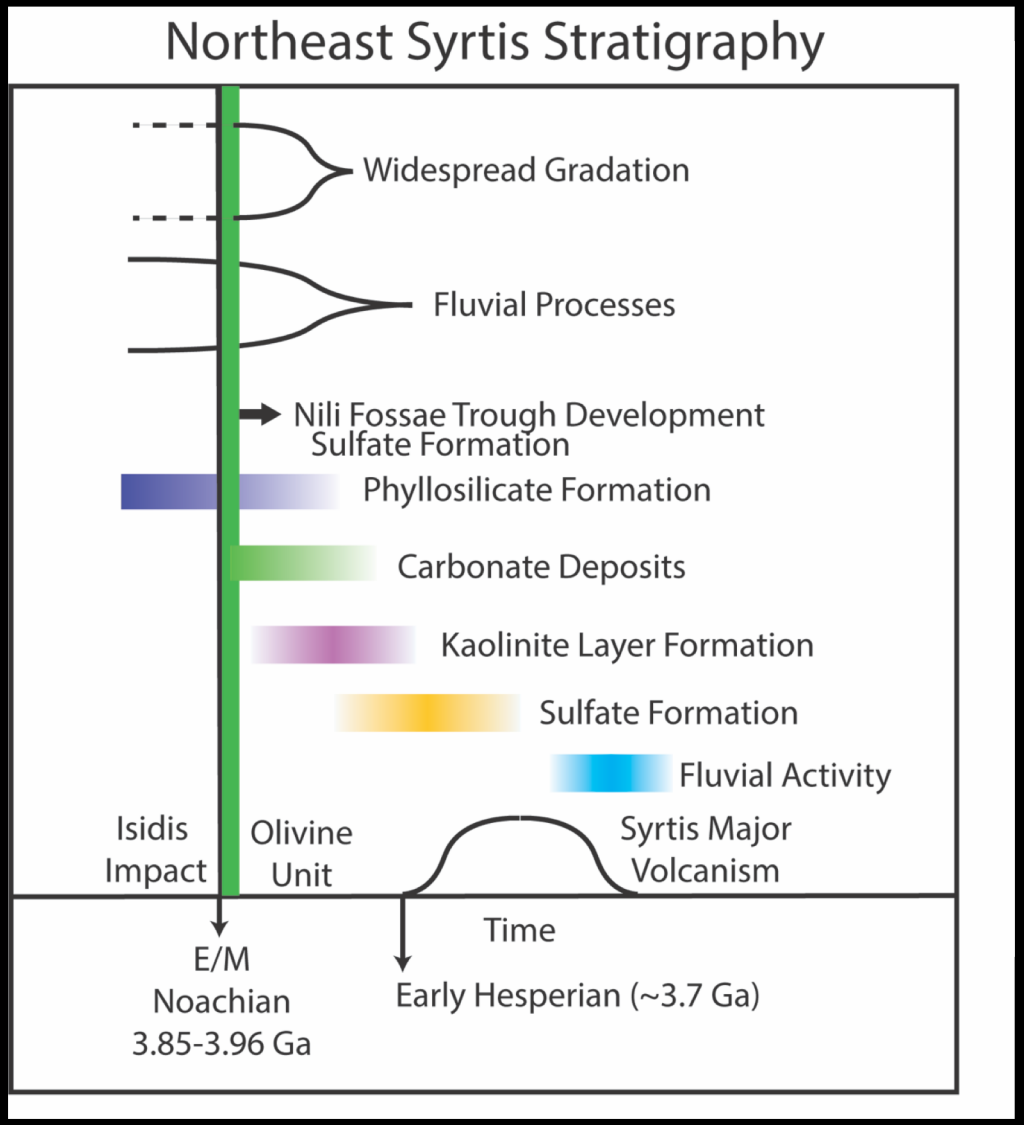

70°E
80°E
90°E
100°E
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
0°
-3050 m Contour
2000 m
-4700 m
Nili
Fossae
Northeast
Syrtis
Isidis
Basin
Syrtis
Major

3.4-2.8 Ga

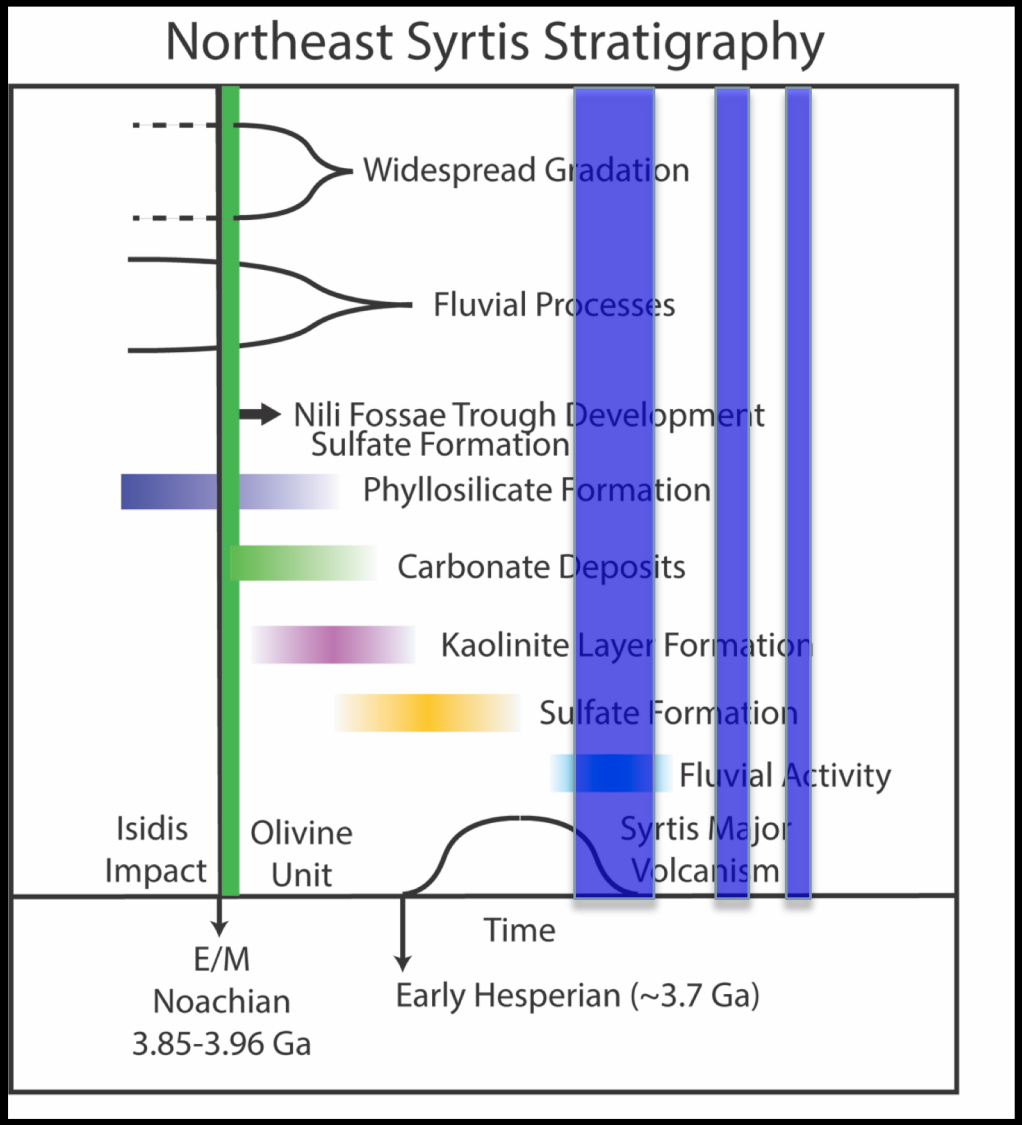


Guidat et al., 2015

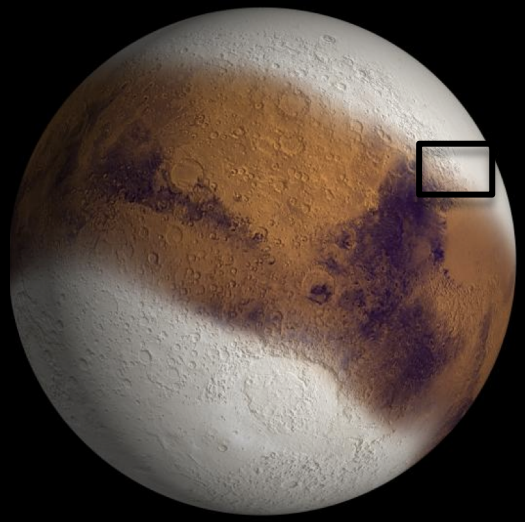
NE Syrtis Timeline



NE Syrtis Timeline

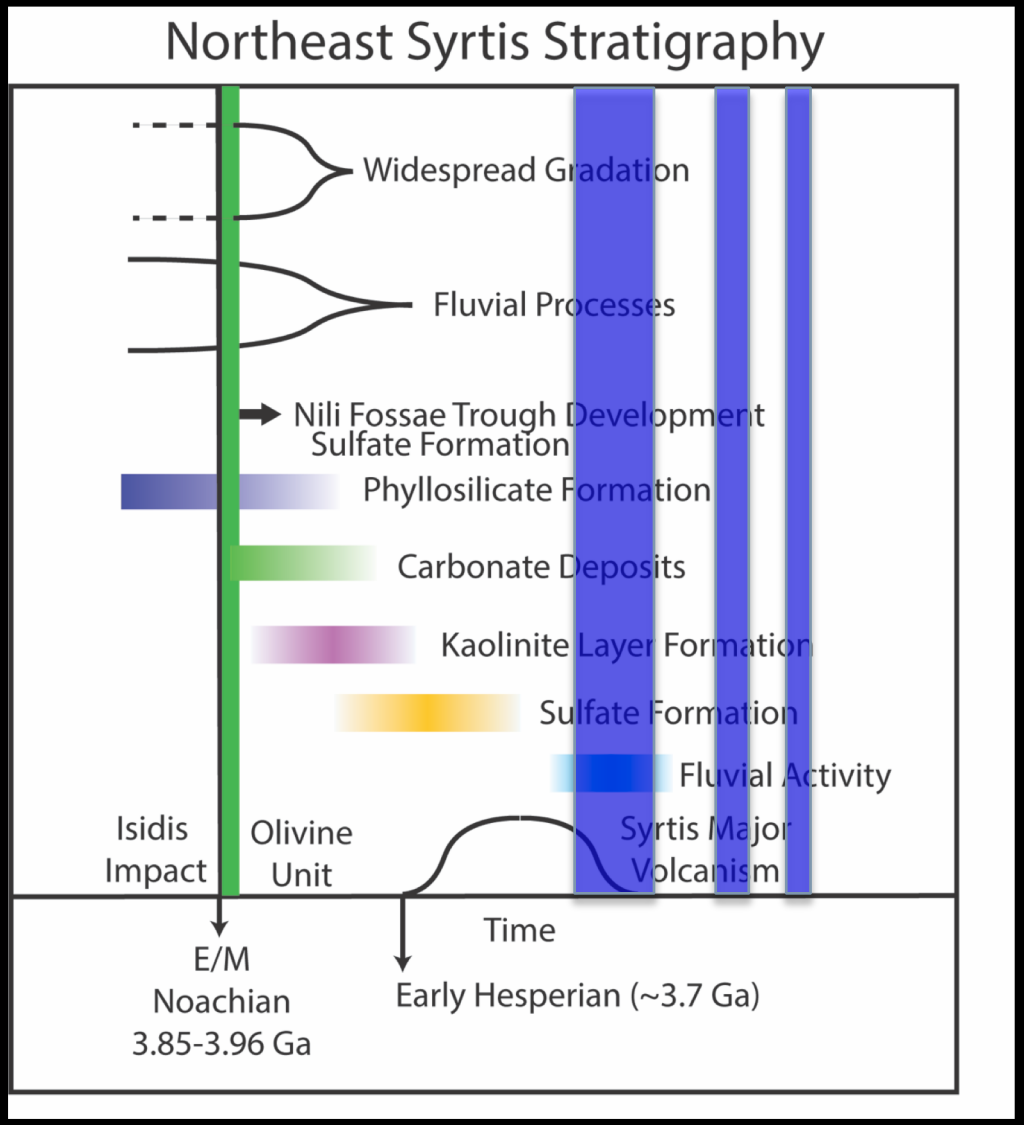


- Requires multiple glacial periods.
  - To preserve basin.
  - To enable multiple eastern outlet flows.



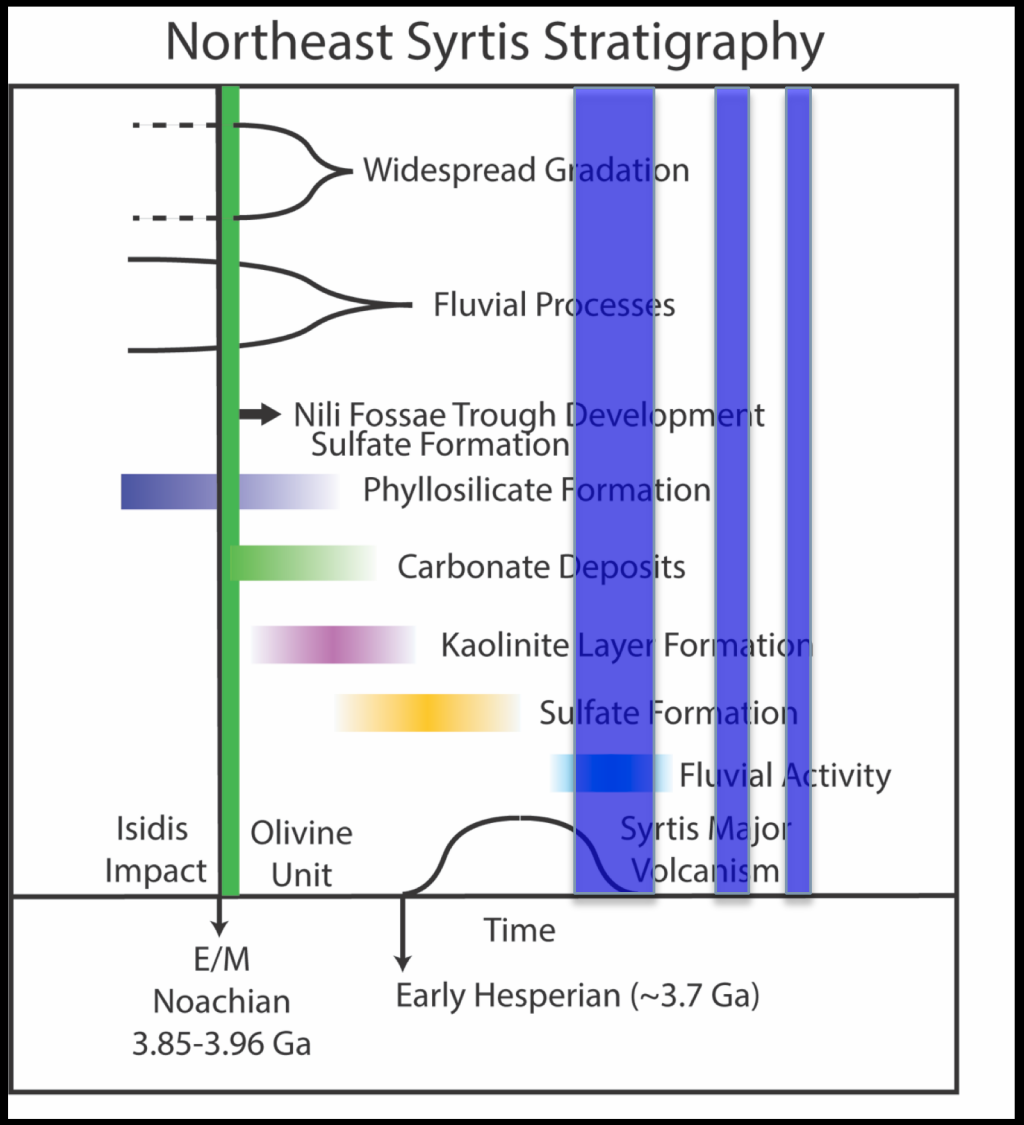
NASA/JPL/Brown University

Implications



- The NE Syrtis region was fluvially active from at least 3.4-2.1 Ga with multiple major ice units.

Implications



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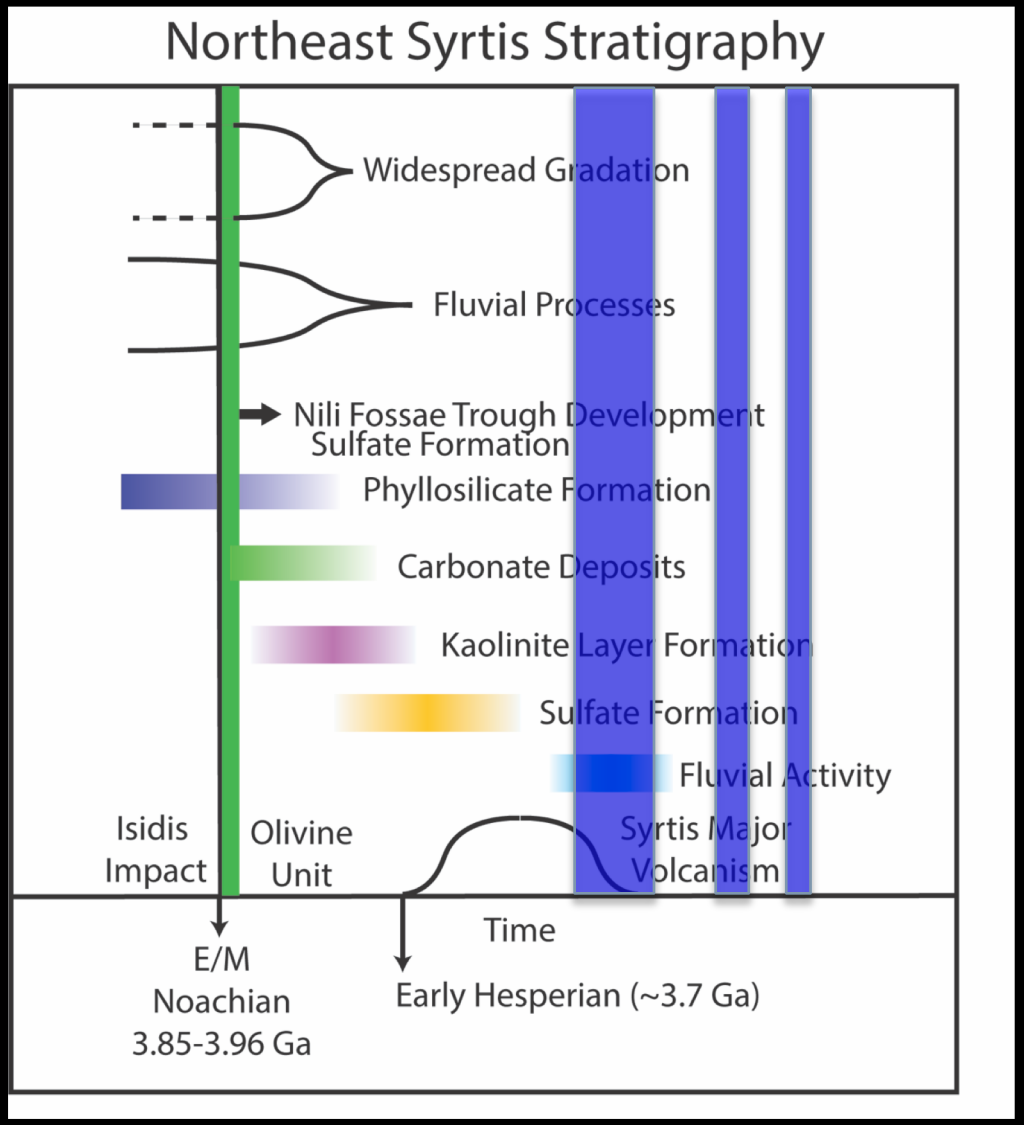
Implications



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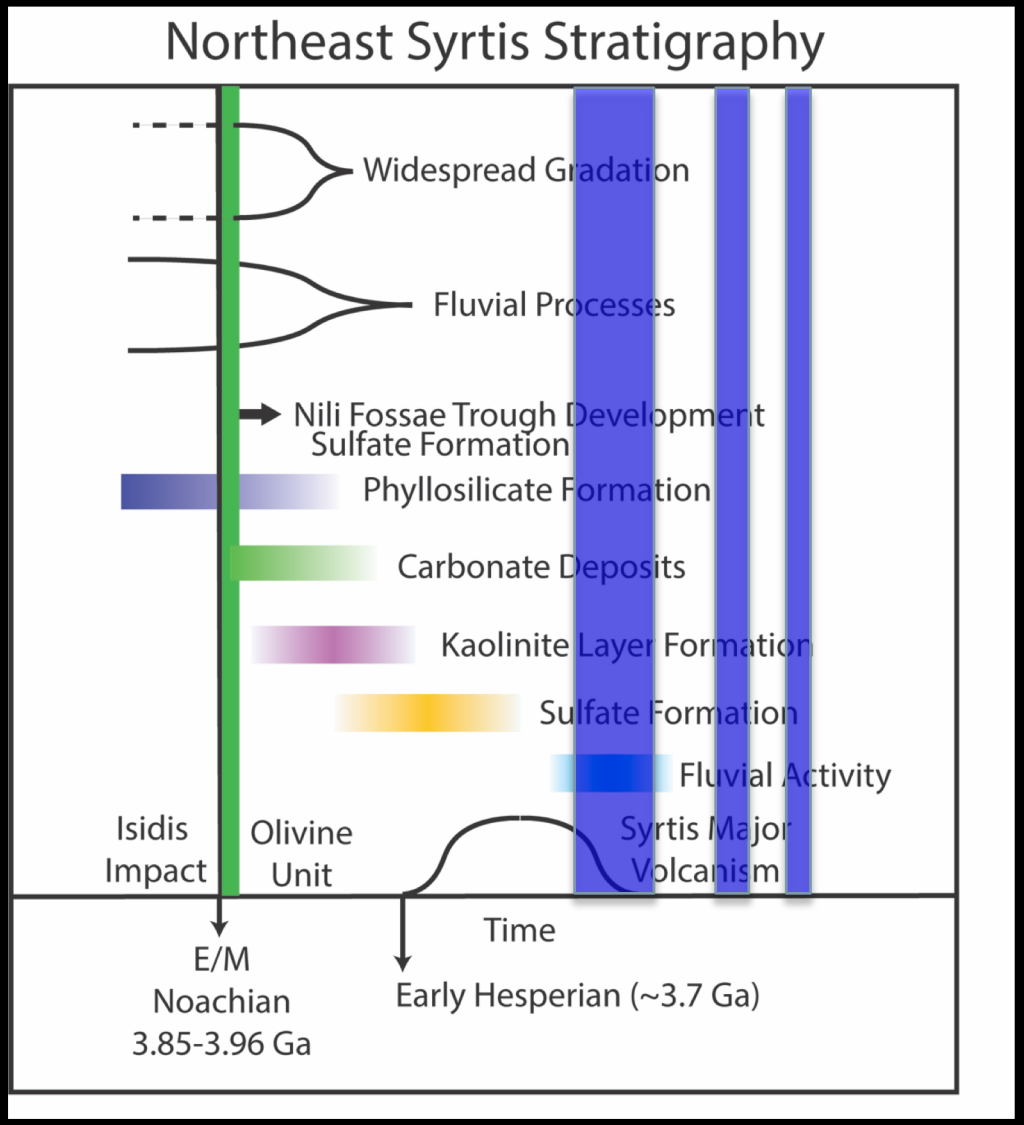

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- Ancient climate (obliquity?) can be constrained with Syrtis dating (rocks or regional ash).
- Ice may drive the nature of surface deposits and preservation.
- Dating the regional ice and fluvial activity may constrain the last deposits in Jezero.