The Mars Science Laboratory Curiosity's Gale Crater Field Site in Context

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San Diego, CA

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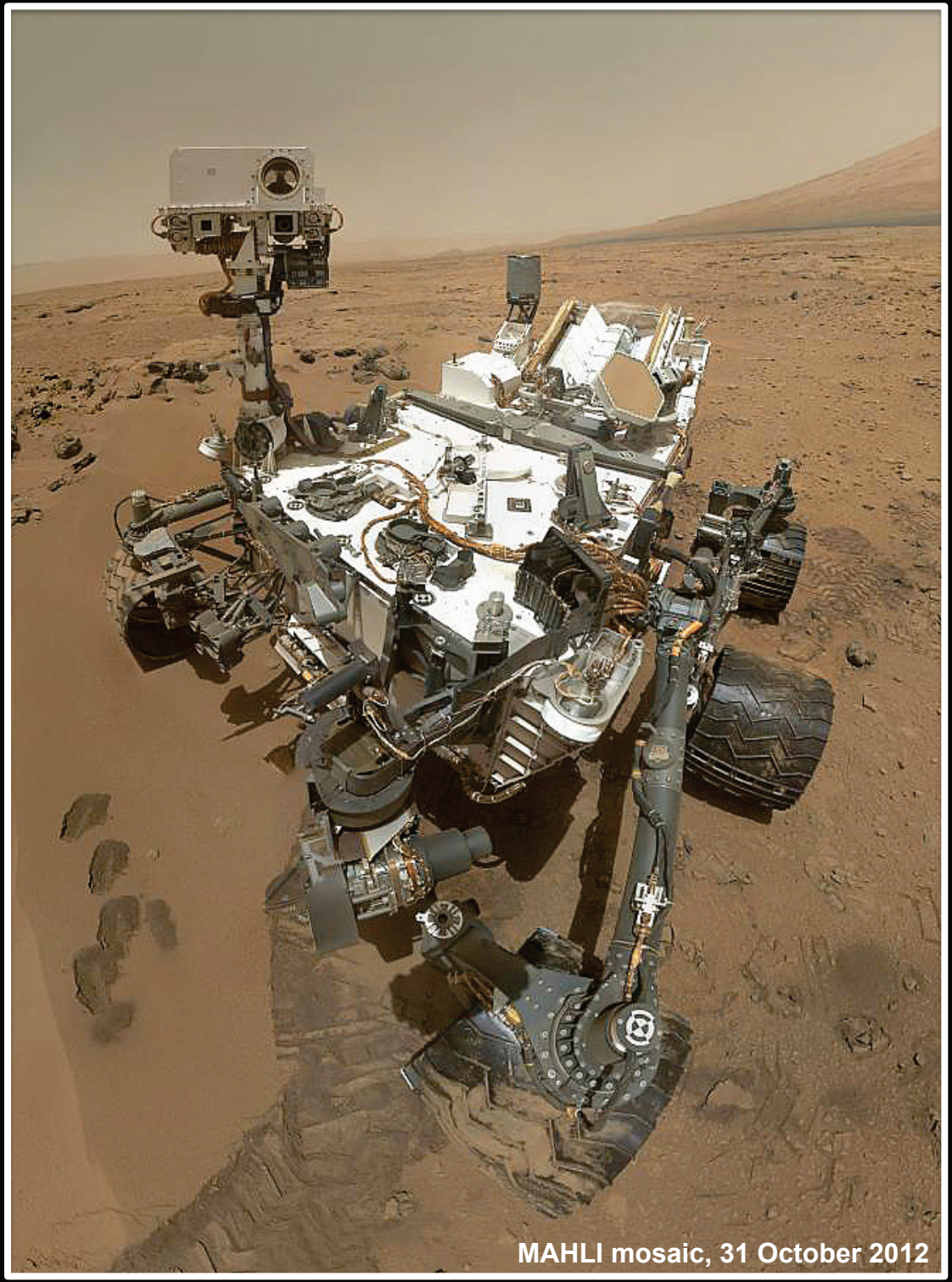
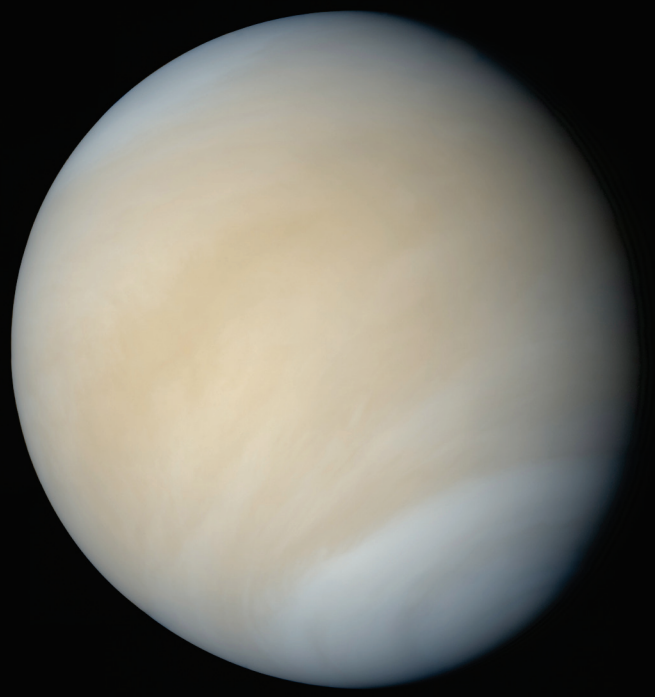


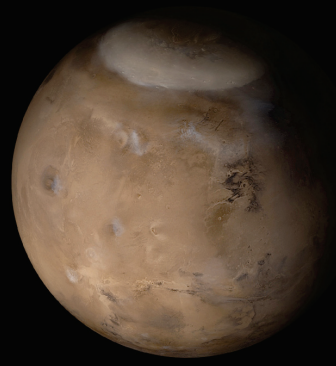
MAHLI mosaic, 31 October 2012

Mars is the only terrestrial planet with an atmosphere that appears to have preserved an extensive geologic record of its earliest history.



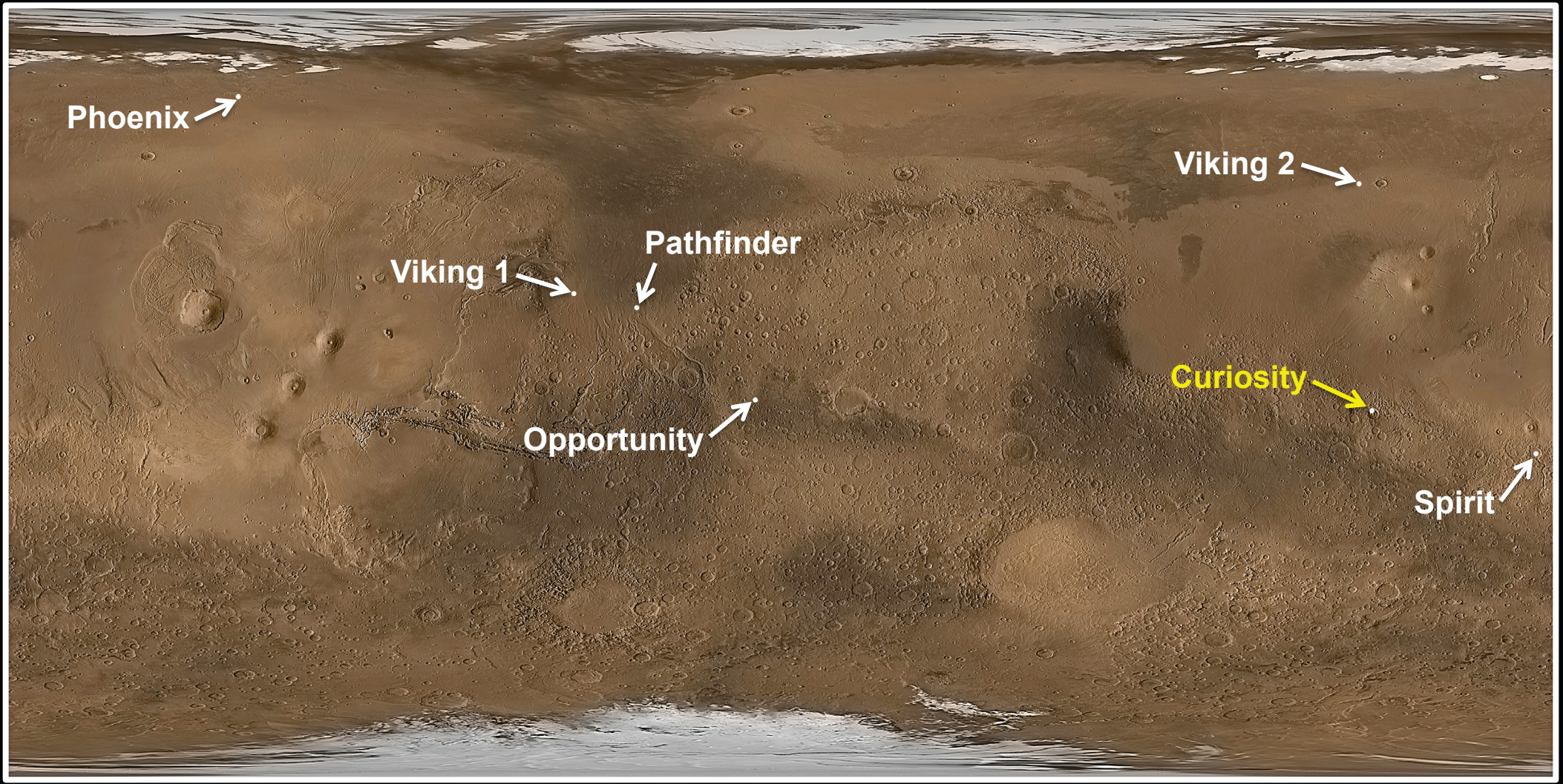
NASA Mariner 10 image of Venus processed by Mattias Malmer.

January 2012 view of Earth; NASA/NOAA/ GSFC/Suomi NPP/VIIRS/Norman Kuring



Mars, May 2002, NASA/JPL_Caltech/MSSS

Mars Robotic Exploration Field Sites

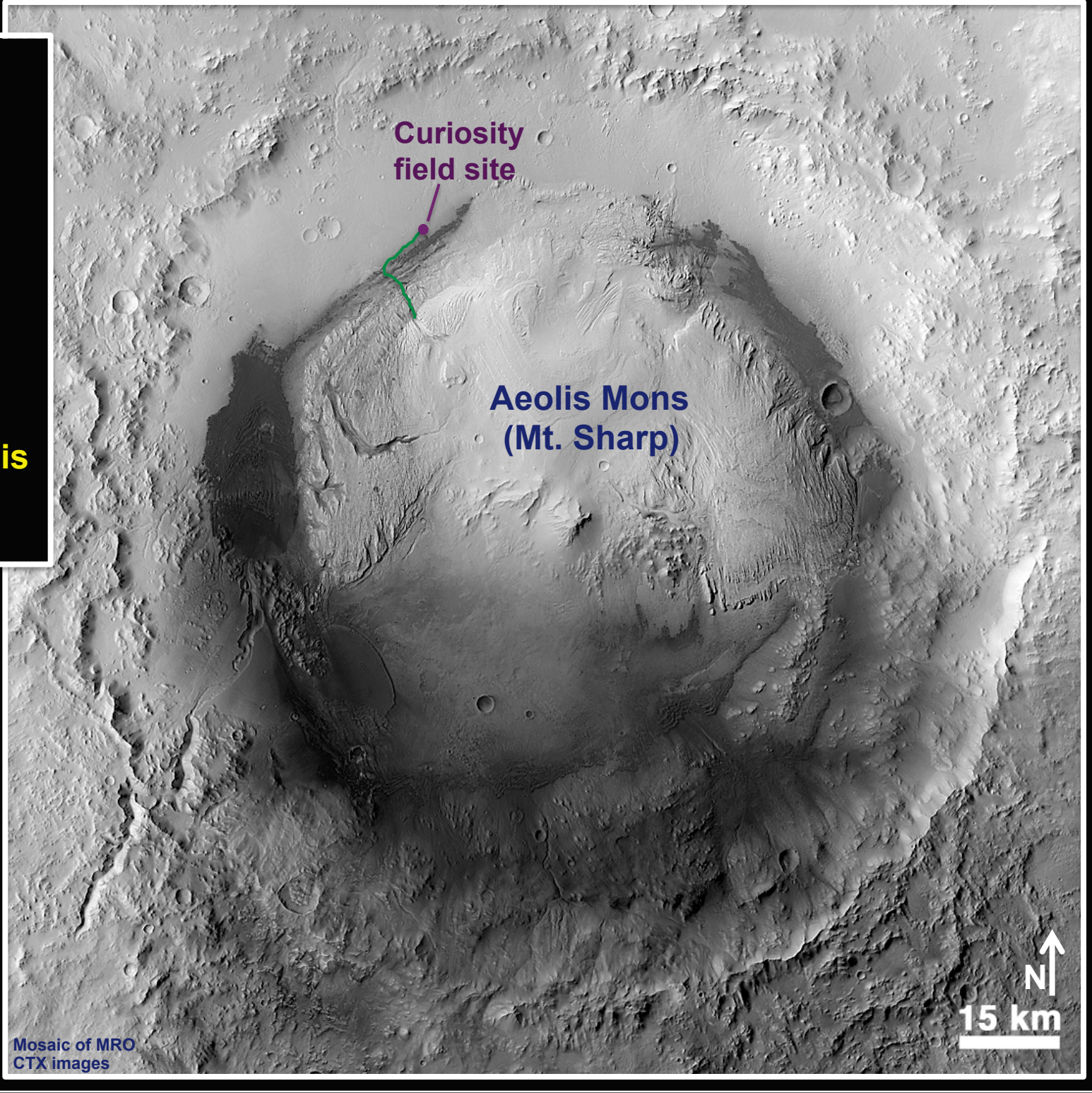


90°N to 90°S, 180°W to 180°W, centered on 0°

MSSS/MGS MOC & MOLA product

Gale Crater

- 5.4°S, 222.3°W
- 155 km diameter
- Mt. Sharp is about 5 km high
- Field site elevation is near –4.5 km



Gale Crater

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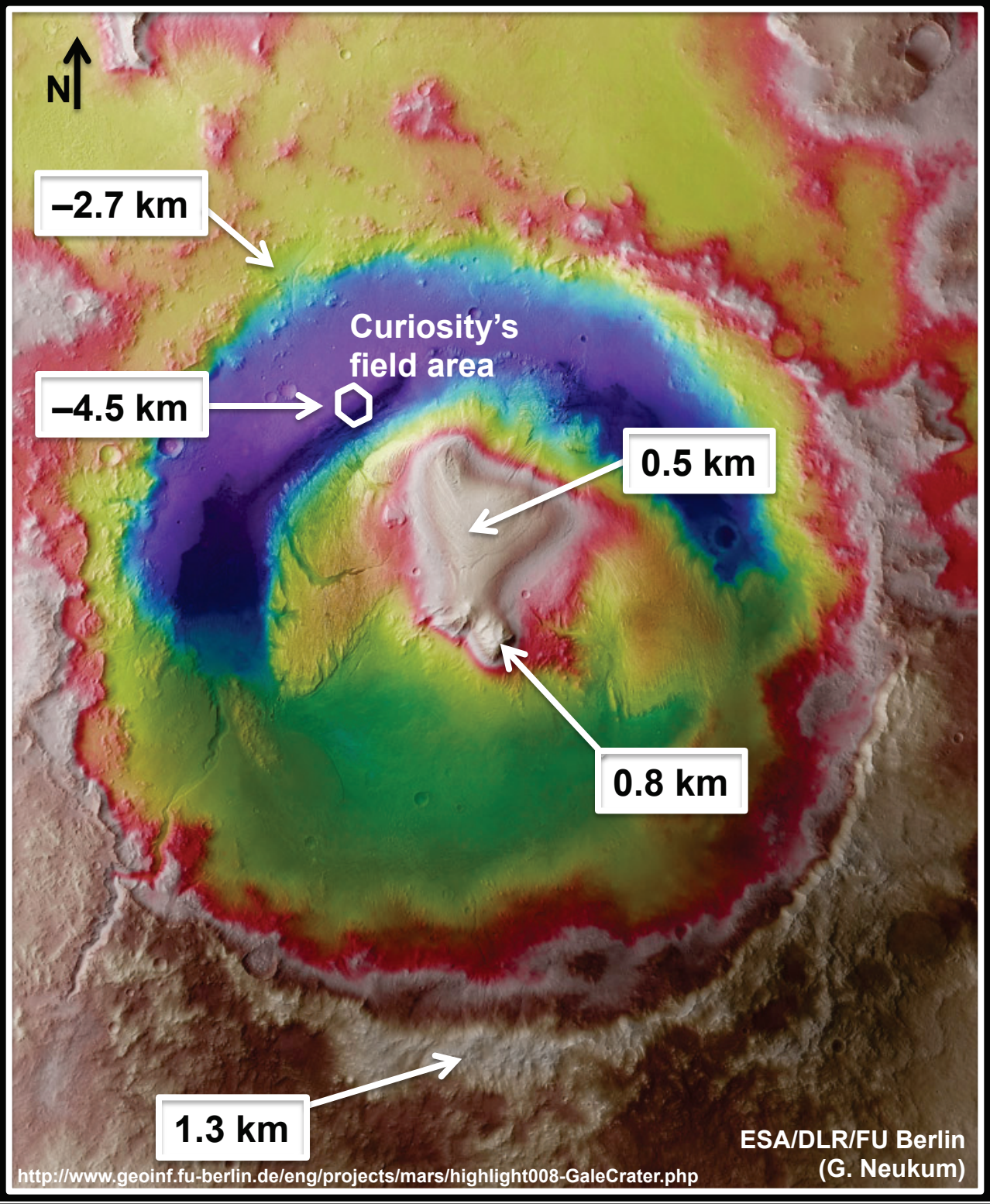
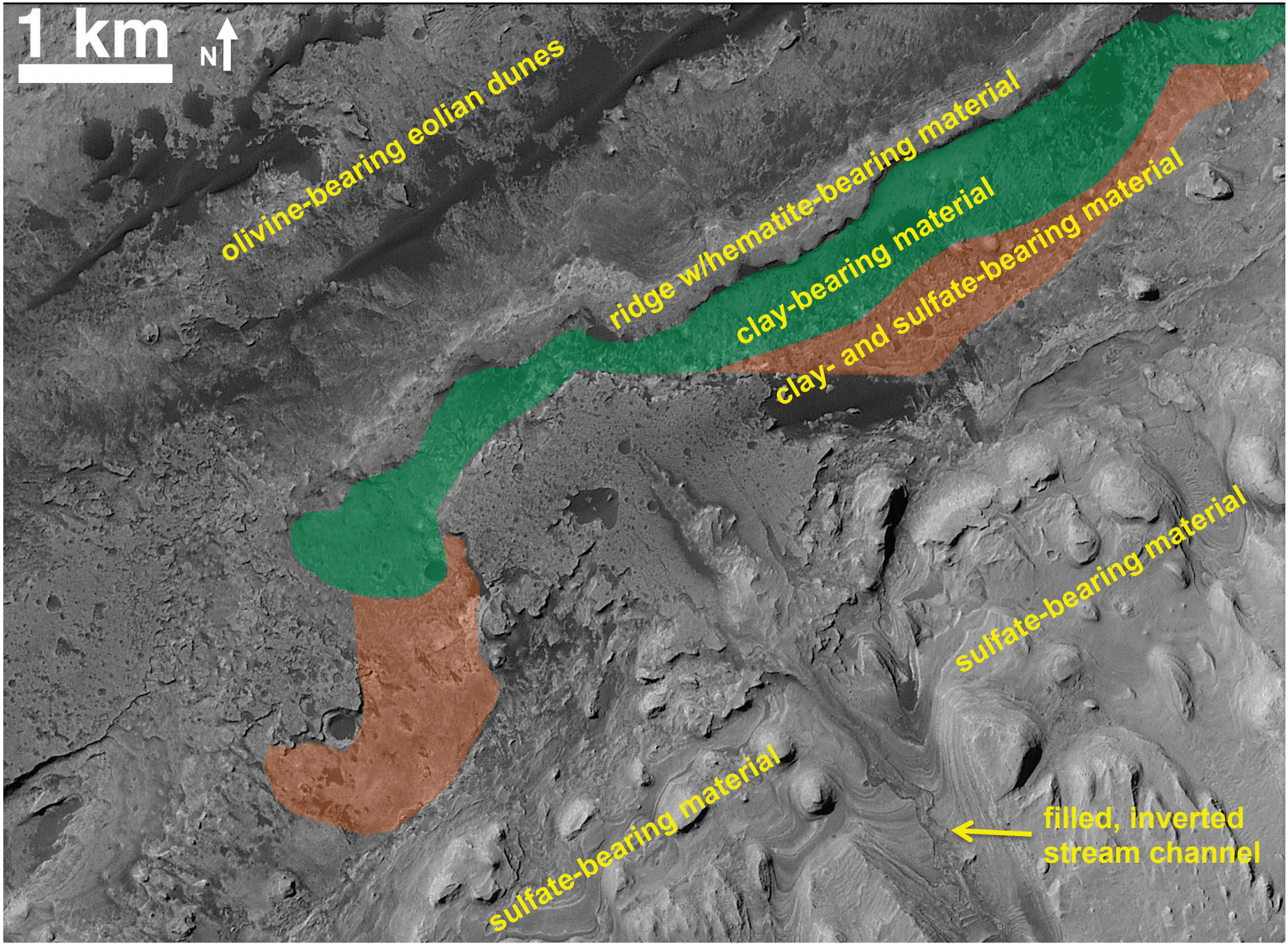
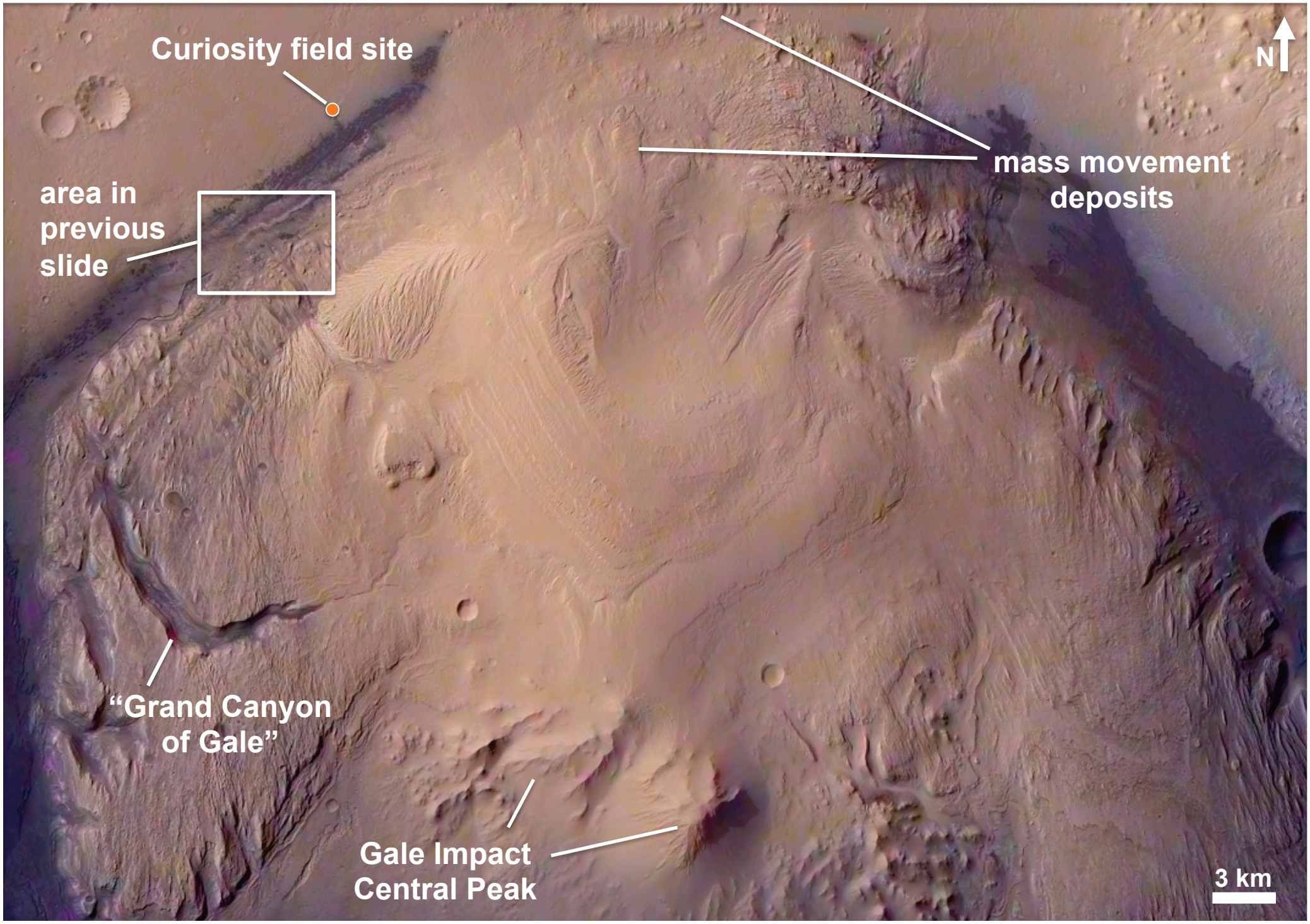


Gale Topographic Map

Derived from Mars Express HRSC data by G. Neukum *et al.*, released to public in October 2011.

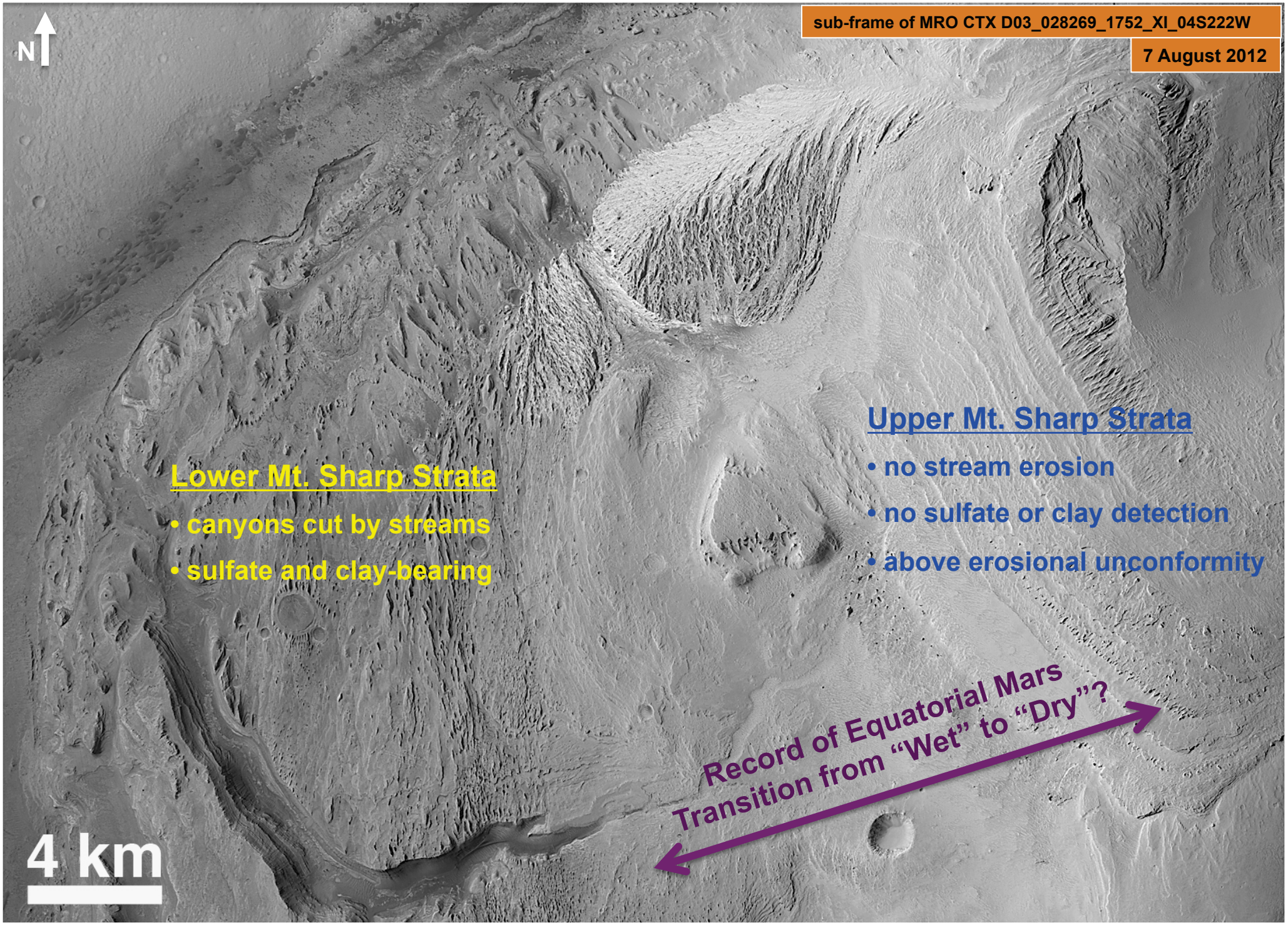

1 km
N
olivine-bearing eolian dunes
ridge w/hematite-bearing material
clay-bearing material
clay- and sulfate-bearing material
sulfate-bearing material
sulfate-bearing material
filled, inverted
stream channel

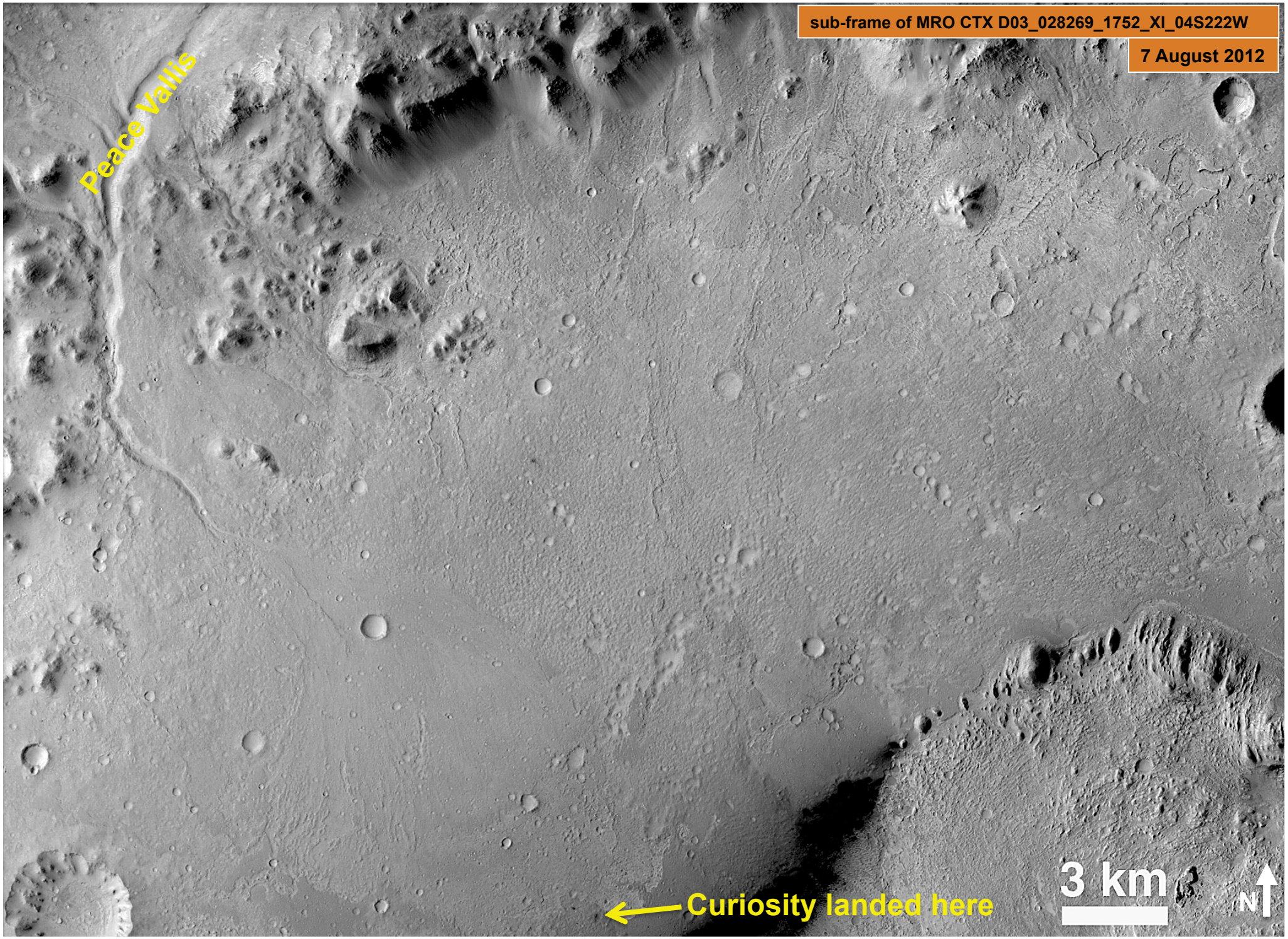


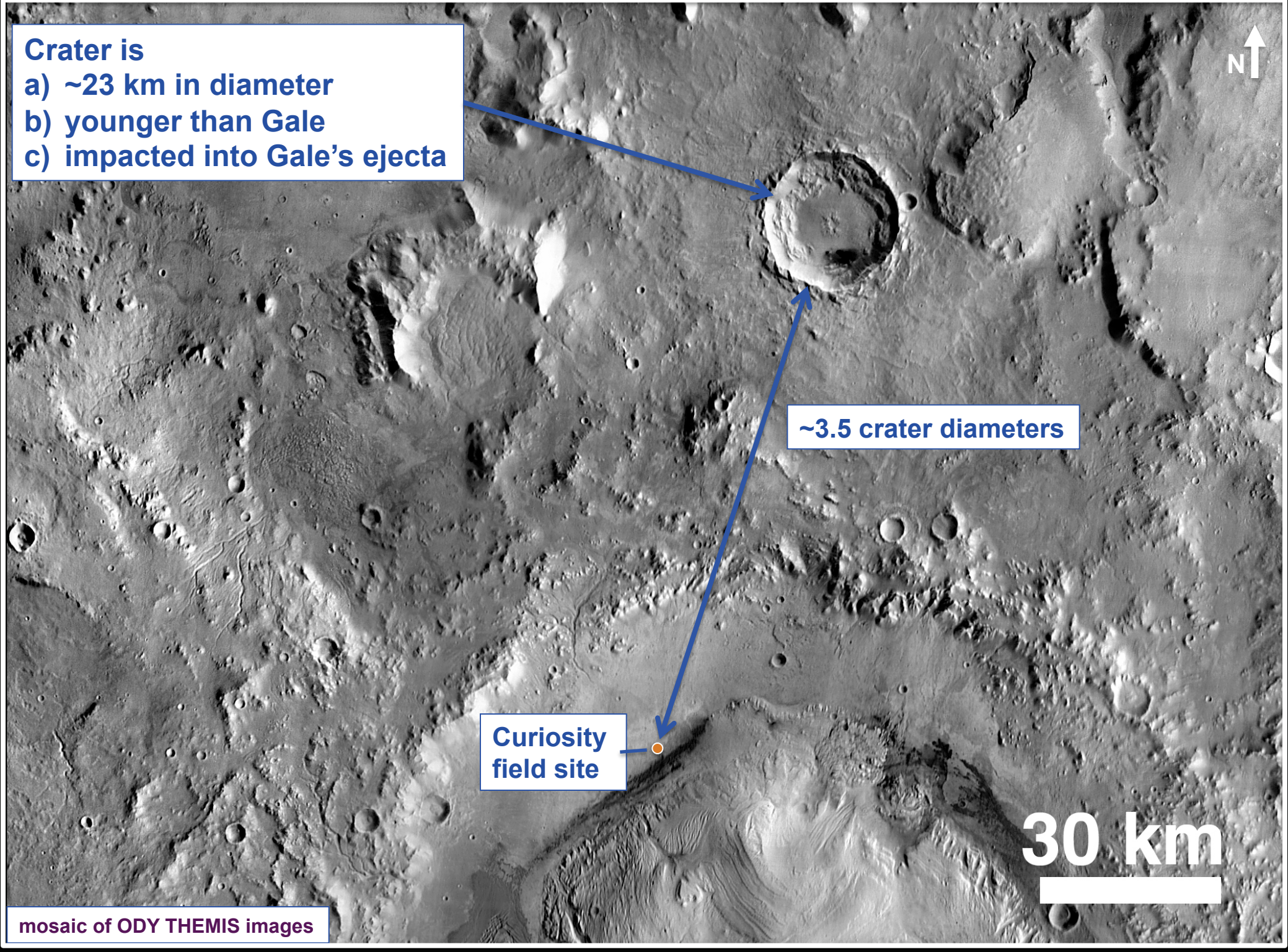
Gale – 4.8°S, 222.7°W

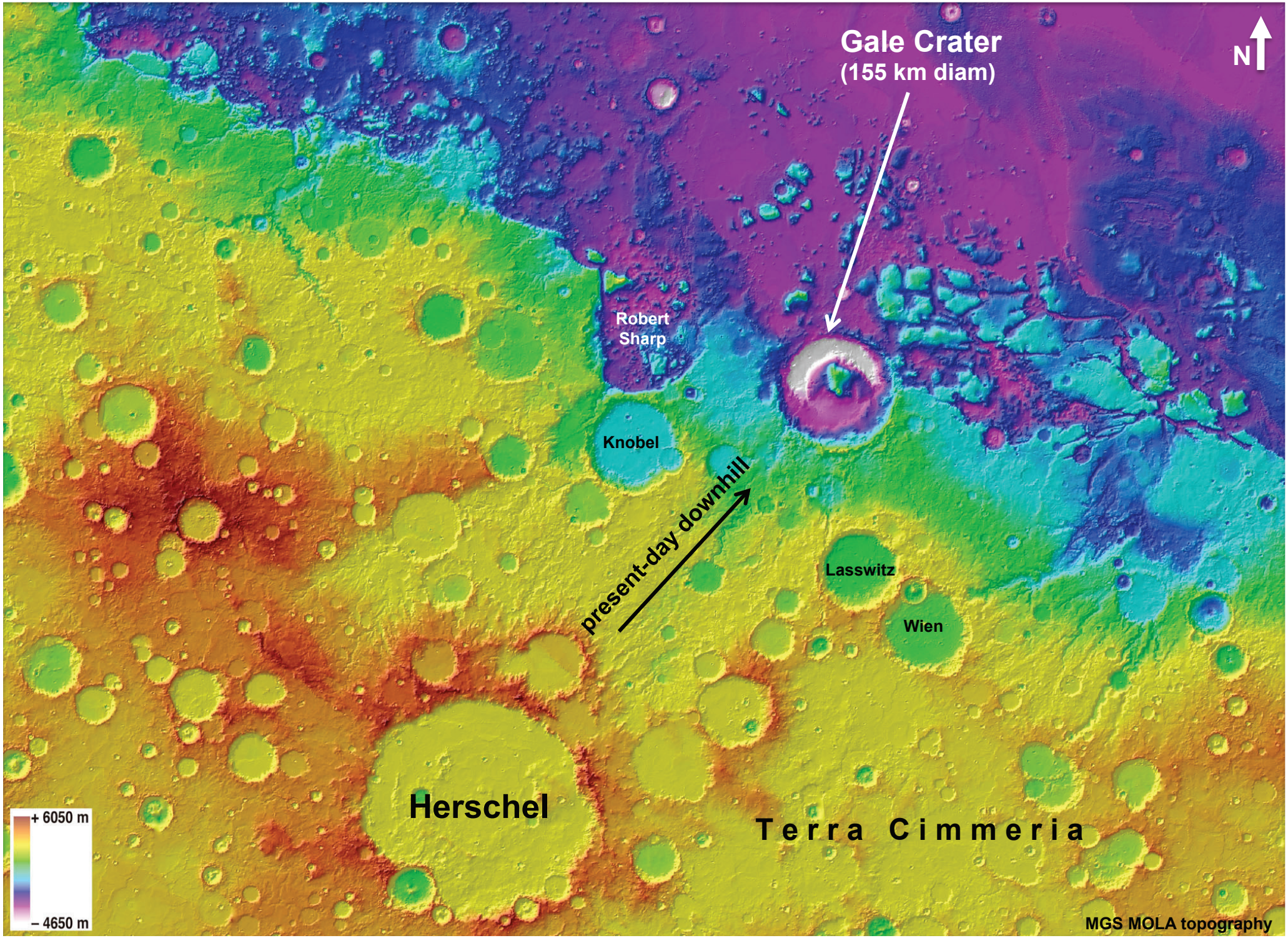
MRO MARCI + CTX, MSSS

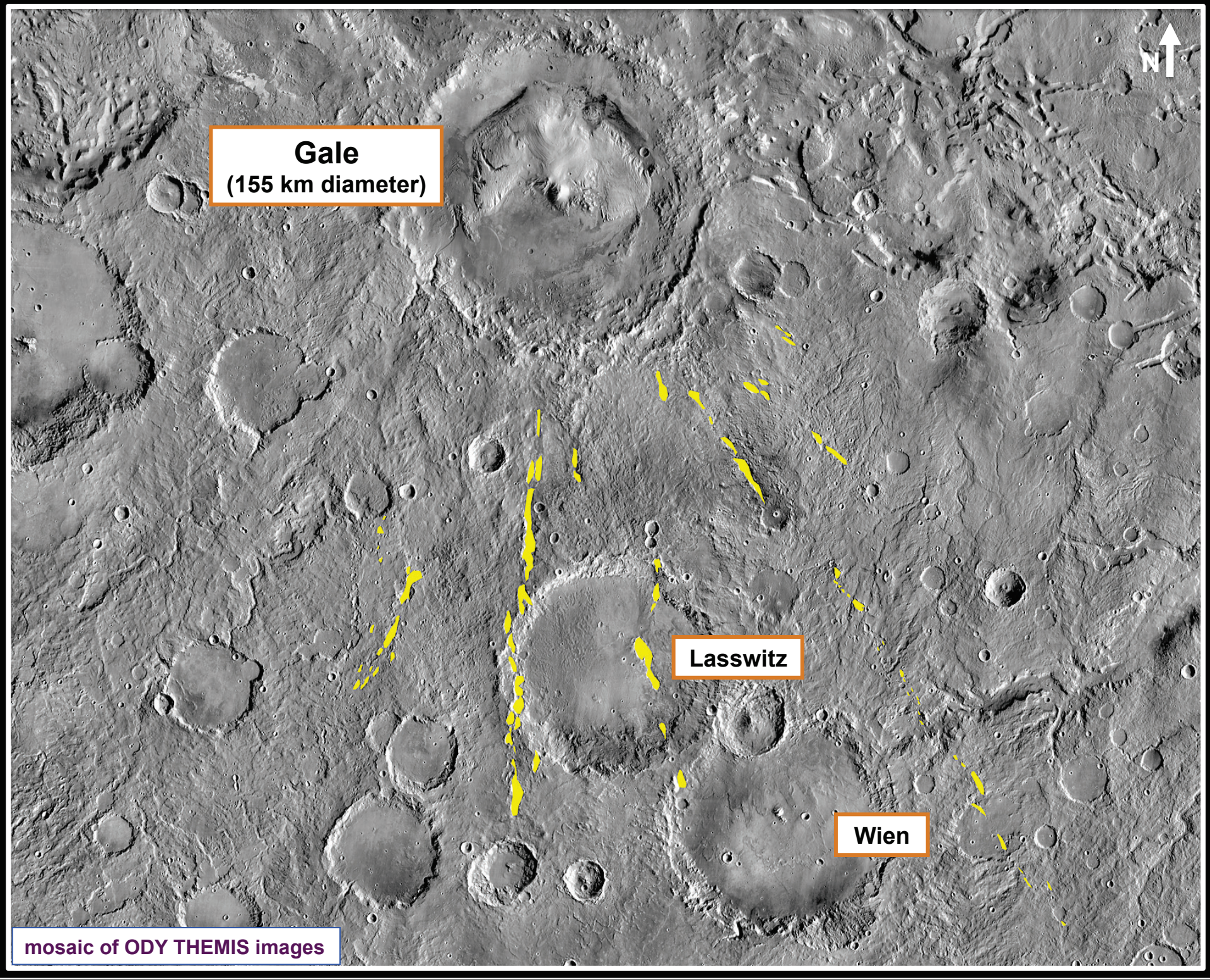
MRO HiRISE ESP_019988_1750
N
250 m


sub-frame of MRO CTX D03_028269_1752_XI_04S222W
7 August 2012
N
Lower Mt. Sharp Strata
• canyons cut by streams
• sulfate and clay-bearing
Upper Mt. Sharp Strata
• no stream erosion
• no sulfate or clay detection
• above erosional unconformity
Record of Equatorial Mars
Transition from "Wet" to "Dry"?
4 km

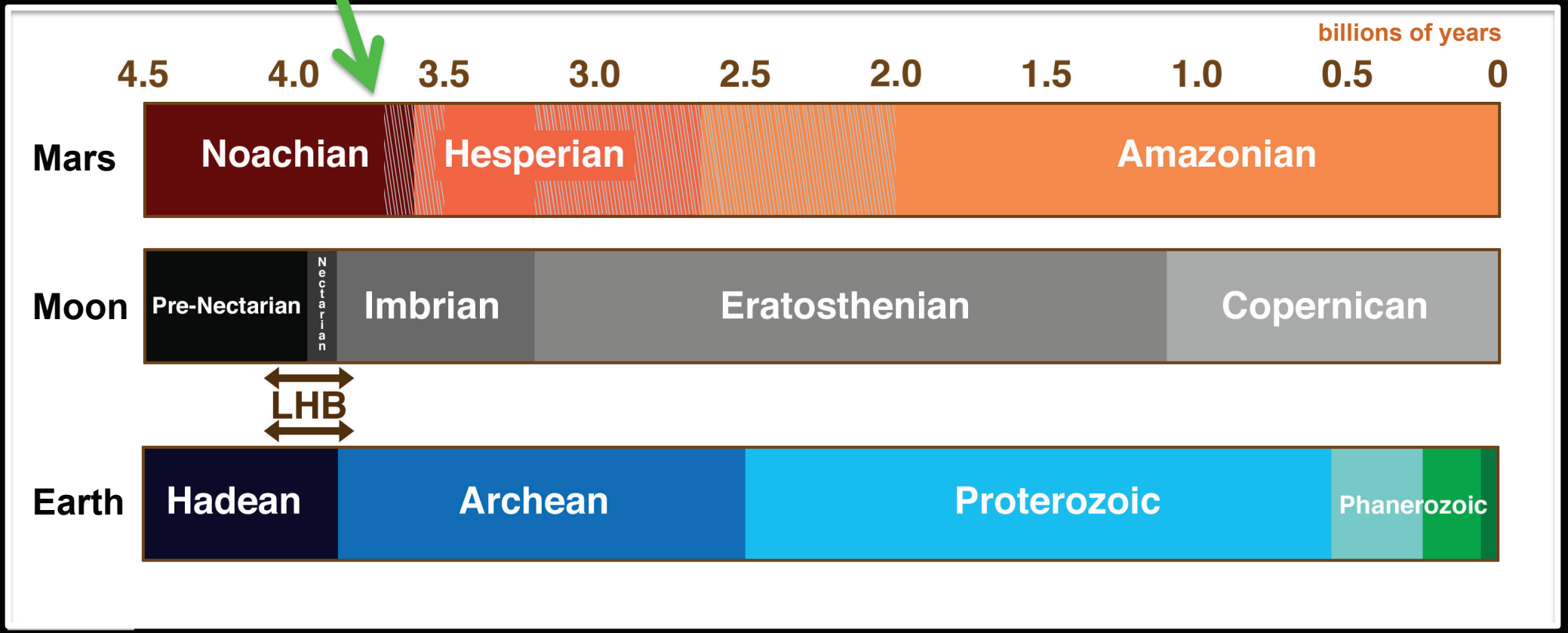

sub-frame of MRO CTX D03_028269_1752_XI_04S222W
7 August 2012
Peace Vallis
Curiosity landed here
3 km
N

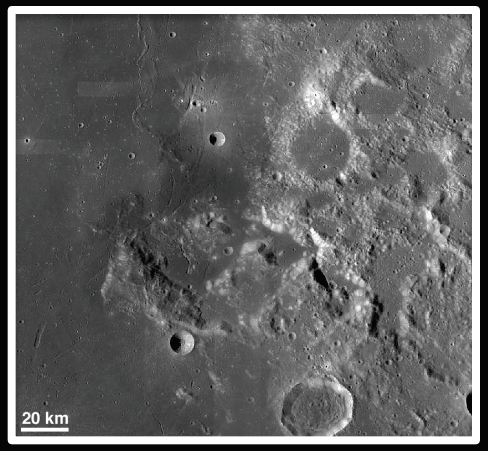

Crater is
a) ~23 km in diameter
b) younger than Gale
c) impacted into Gale's ejecta
N
~3.5 crater diameters
Curiosity field site
30 km
mosaic of ODY THEMIS images

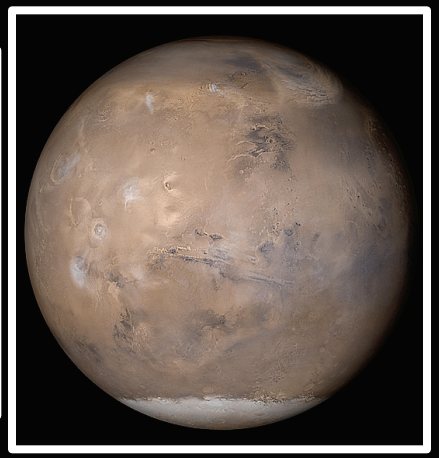

Gale Crater
(155 km diam)
N
Robert
Sharp
Knobel
present-day downhill
Lasswitz
Wien
Herschel
Terra Cimmeria
+ 6050 m
– 4650 m
MGS MOLA topography

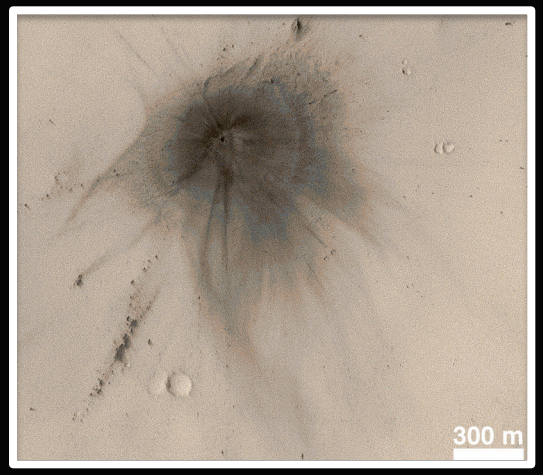

Gale
(155 km diameter)
N
Lasswitz
Wien
mosaic of ODY THEMIS images

Thomson et al. (2011) suggest Gale & Mt. Sharp formed 3.8–3.6 Ga (doi:10.1016/j.icarus.2011.05.002)

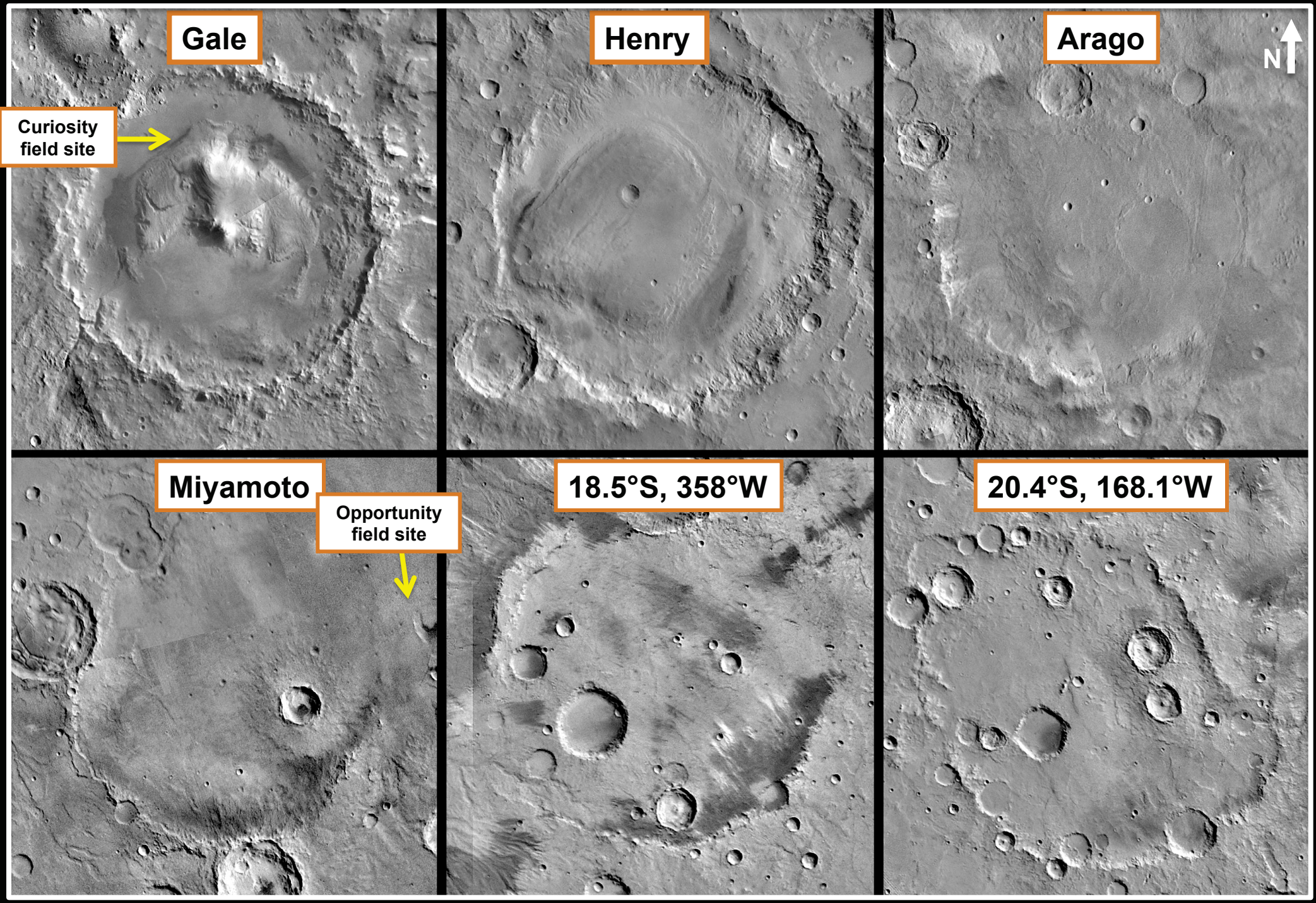






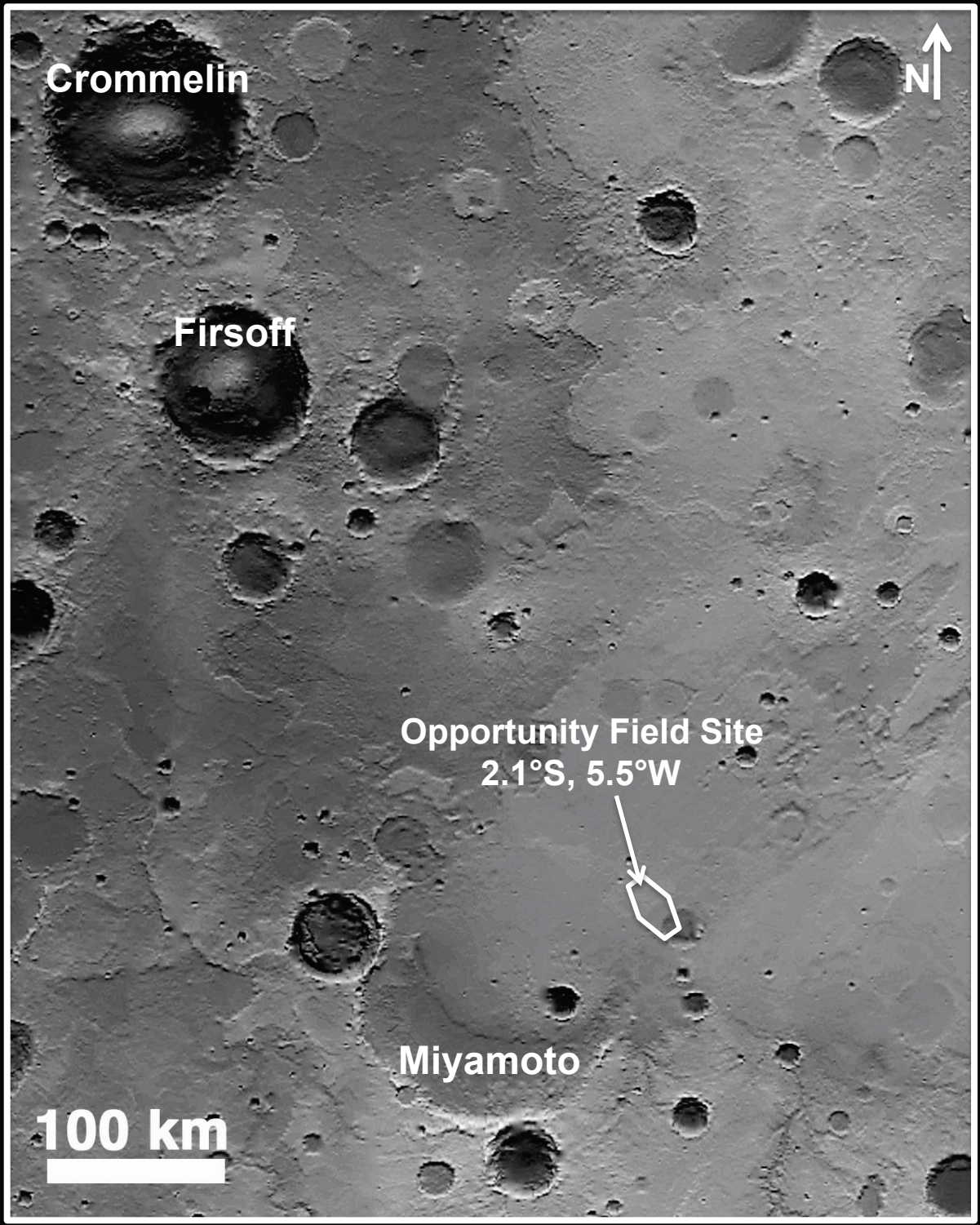


Moon cratering record → Moon rock age → orbital dynamics/Mars rate → modern Mars rate → Crater Retention Age Per Surface Unit Area



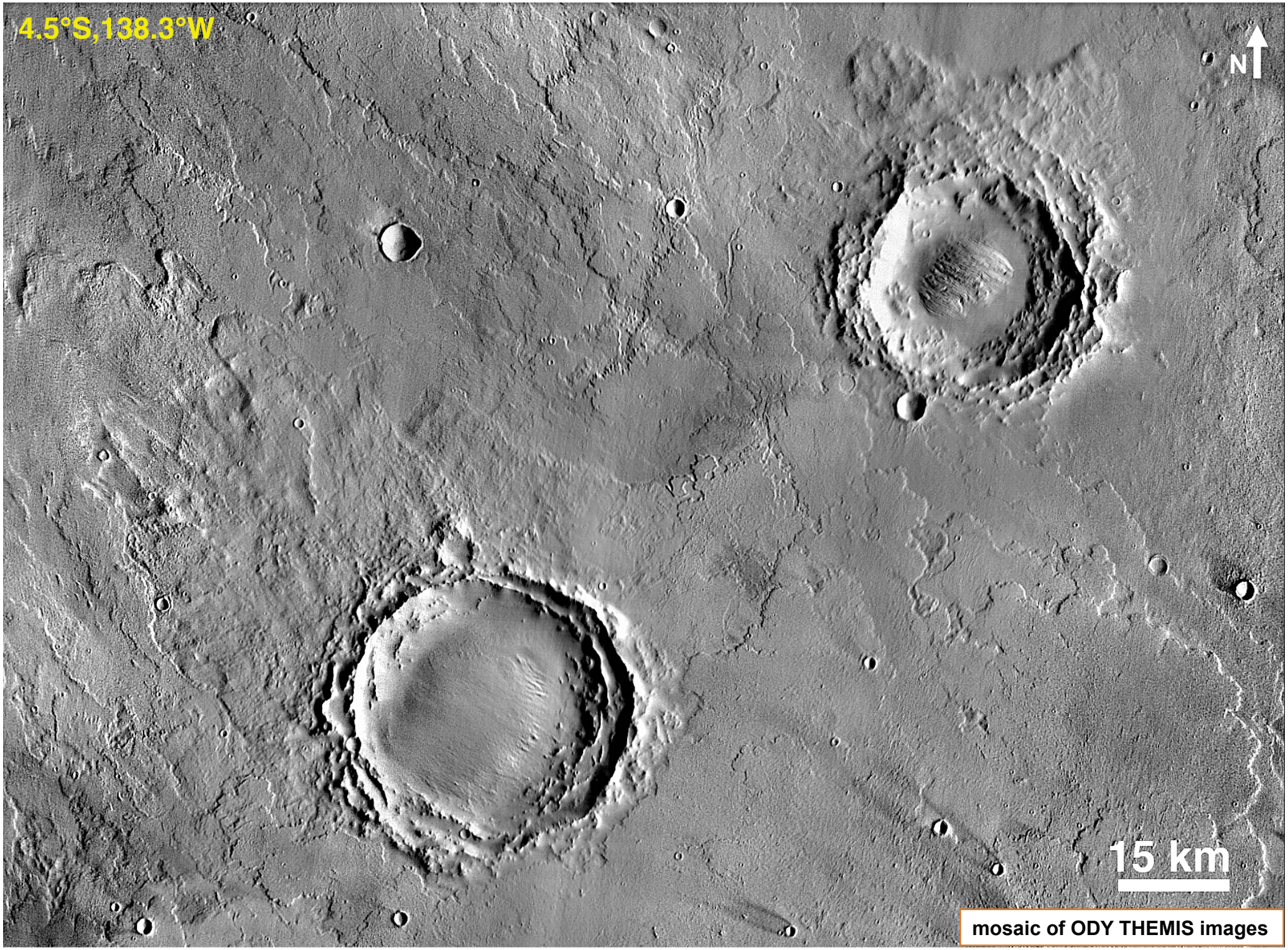
all craters ~155 km in diameter

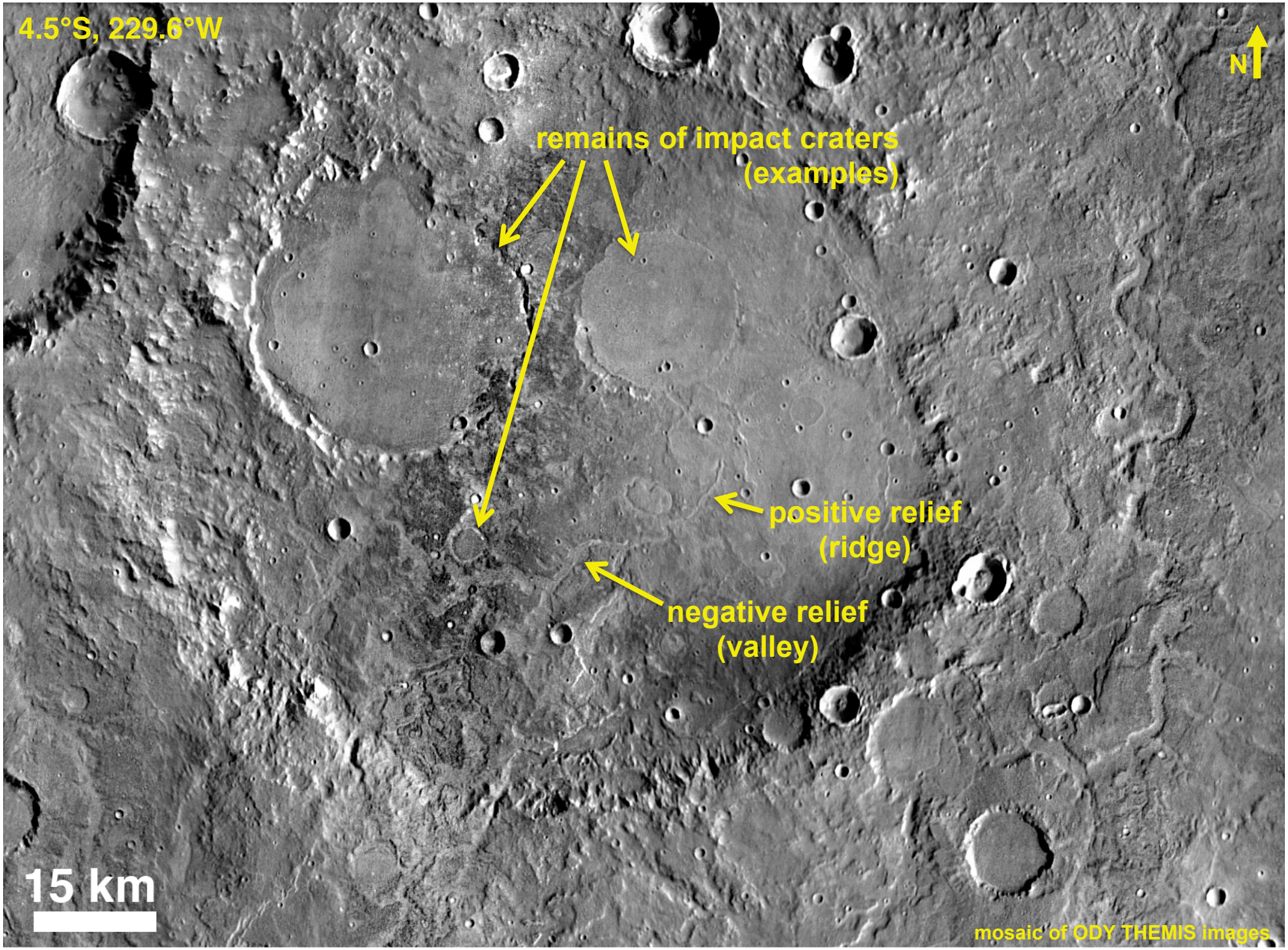
USGS mosaics of Viking orbiter images

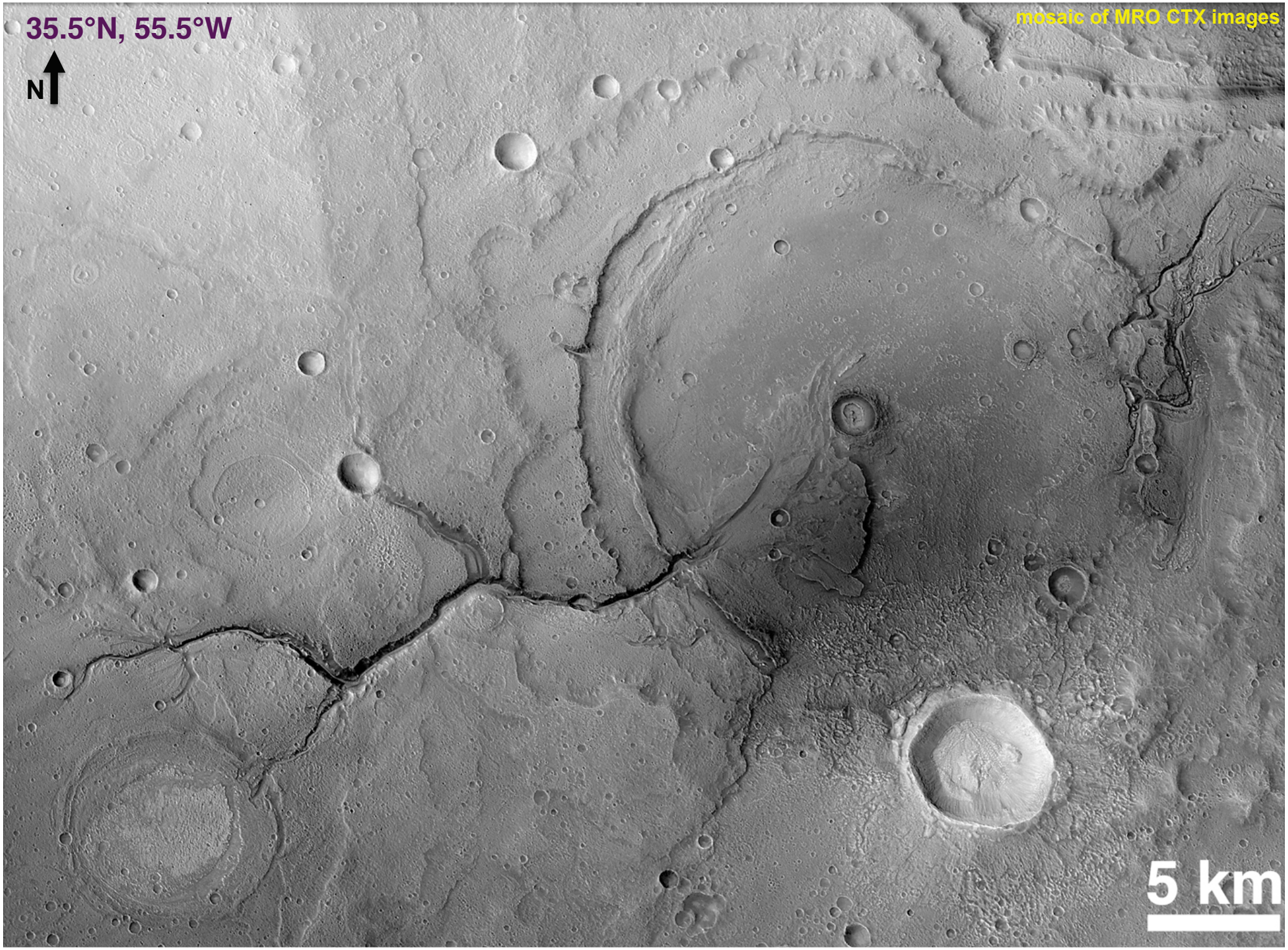


shaded relief from MGS MOLA topographic product

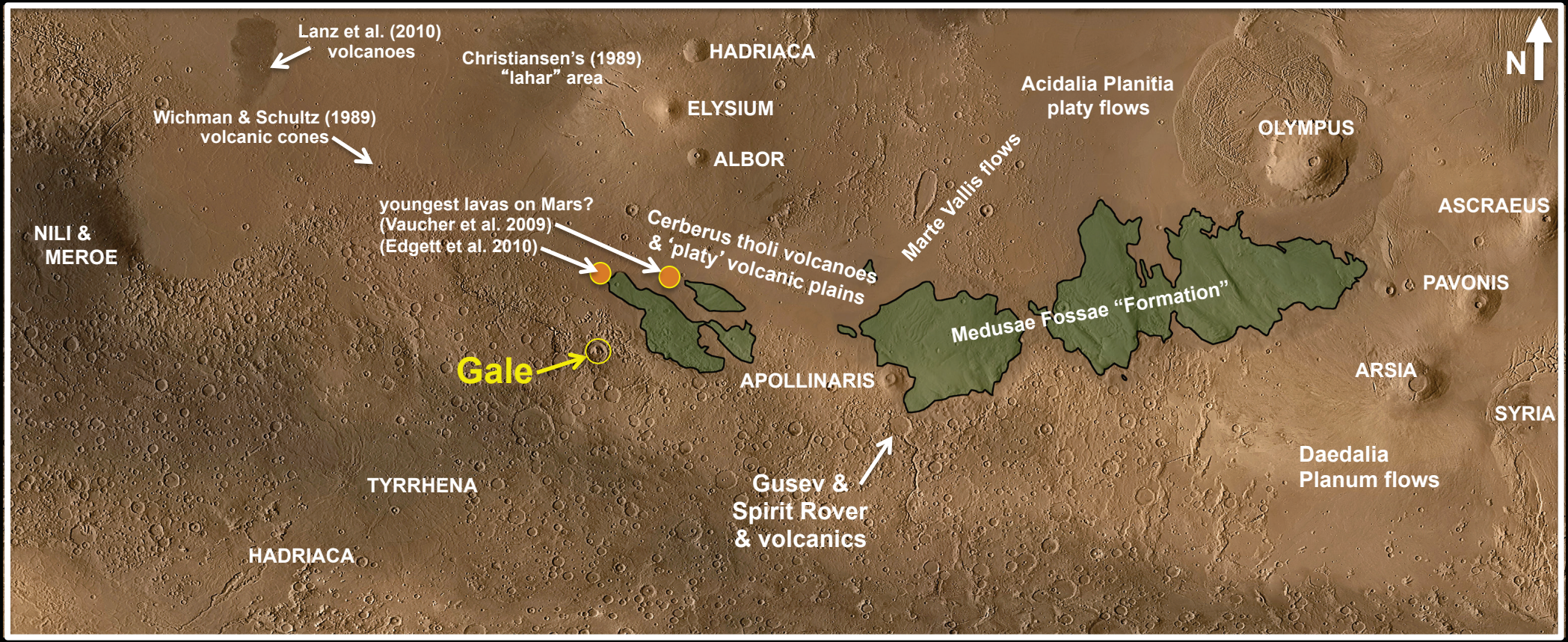
Opportunity Pancam Mosaic near “Erebus”


4.5°S,138.3°W
N
15 km
mosaic of ODY THEMIS images


4.5°S, 229.6°W
N
remains of impact craters
(examples)
positive relief
(ridge)
negative relief
(valley)
15 km
mosaic of ODY THEMIS images

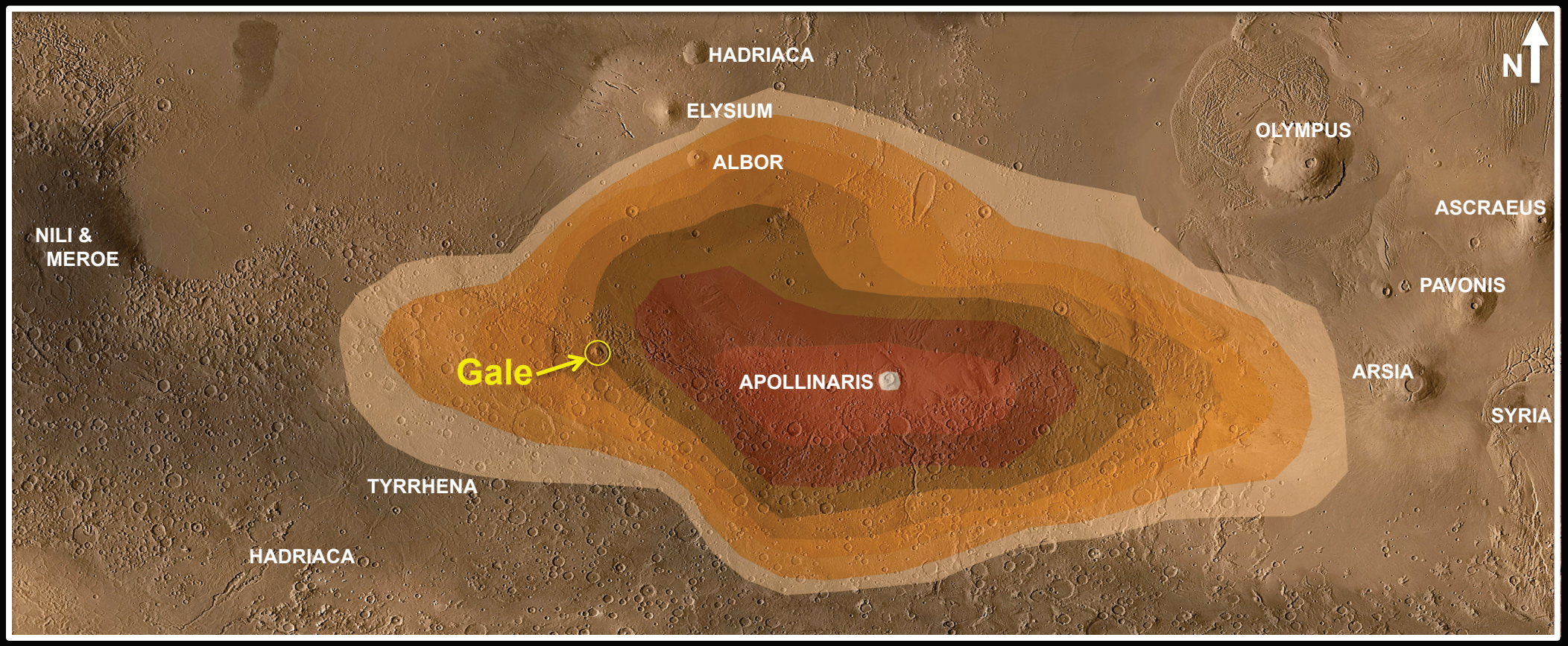

35.5°N, 55.5°W
N
mosaic of MRO CTX images
5 km

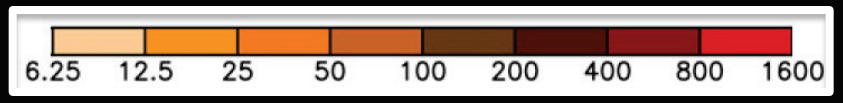
Gale and Volcanic Features



MGS MOC wide angle red mosaic + MOLA topo as shaded relief, by MSSS

Gale and *Simulated* Apollinaris Tephra Deposition

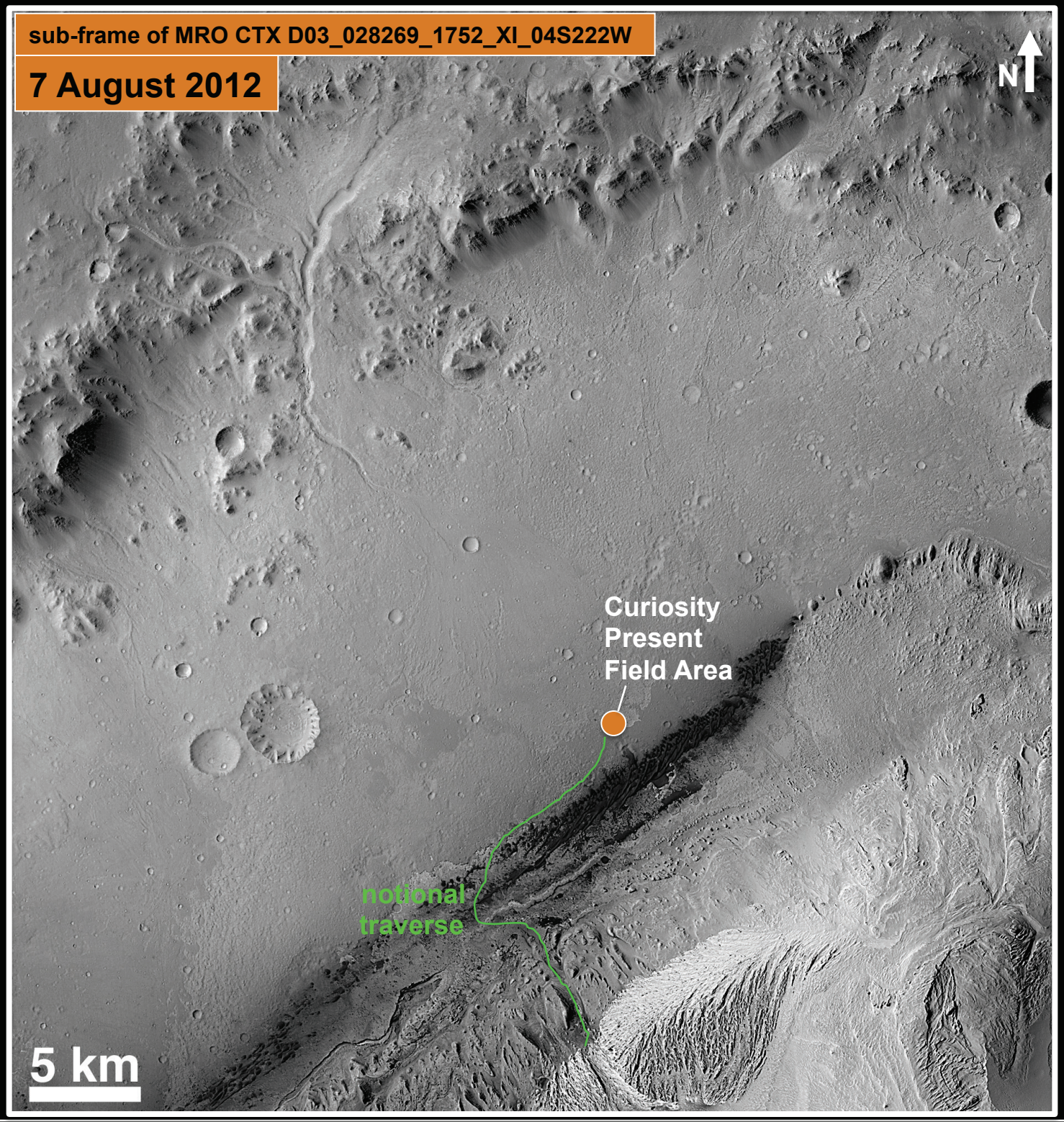




Thickness in meters, assuming 700 kg/m^3 density

- **Autumn case, 19 km high plume, 35 µm clasts**
- **See Figure 5 of Kerber *et al.* (2011)**

Tephra deposition simulation from:
Kerber *et al.* (2011) The dispersal of pyroclasts from Apollinaris Patera, Mars: Implications for the origin of the Medusae Fossae Formation, *Icarus 216*, 212–220. doi:10.1016/j.icarus.2011.07.035


sub-frame of MRO CTX D03_028269_1752_XI_04S222W
7 August 2012
N
Curiosity
Present
Field Area
notional
traverse
5 km