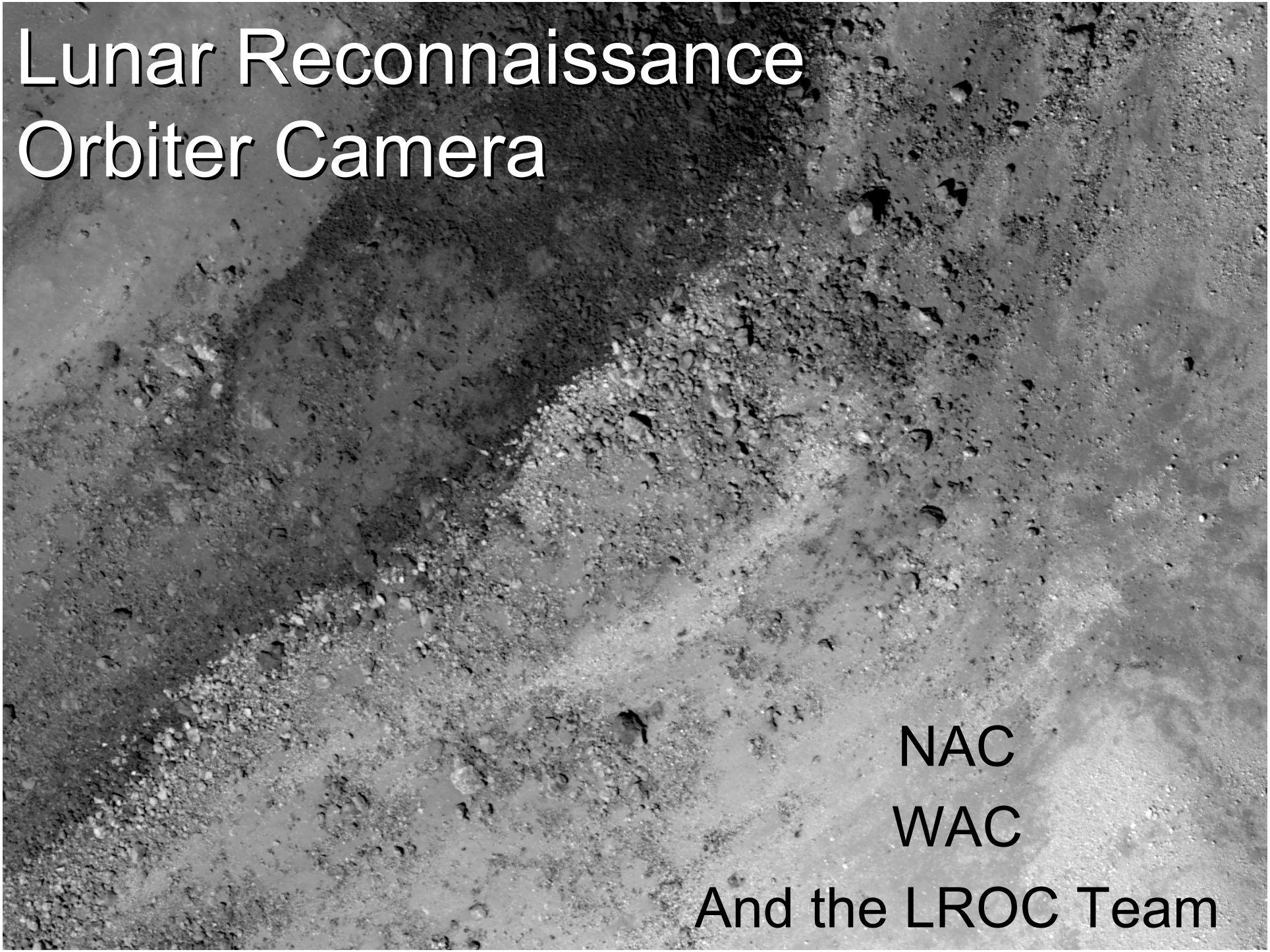
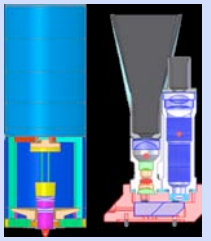
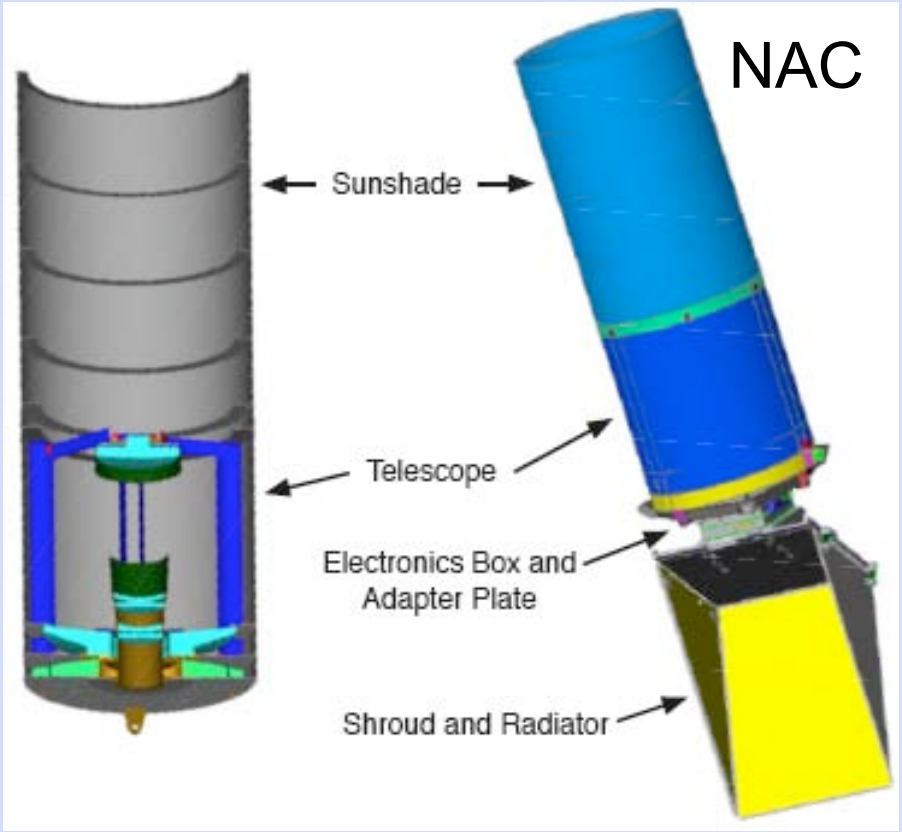

Lunar Reconnaissance
Orbiter Camera
NAC
WAC
And the LROC Team

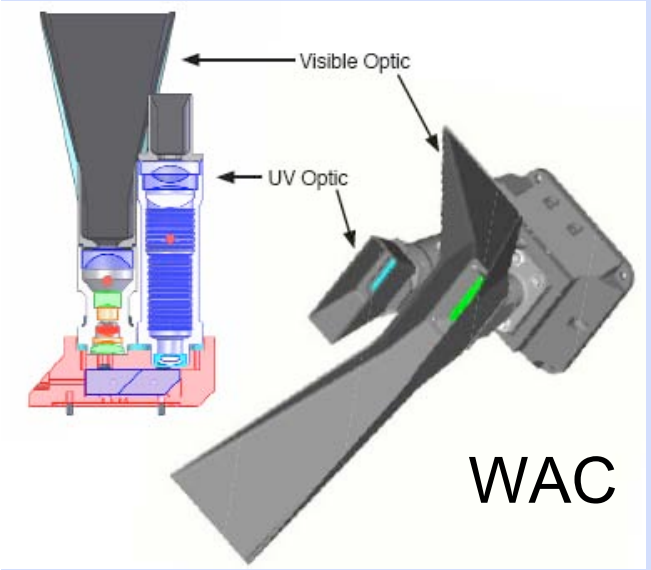
LROC Instrument Overview



- Two Narrow Angle Cameras (NACs) provide 0.5 to 1.0 pixel scale with combined FOV 5-km. *Three off nadir views per day, up to 350 images per day.*
- Wide Angle Camera (WAC), 75 to 100 m pixel scale global 7-band color (320 to 690 nm)

Big small images!

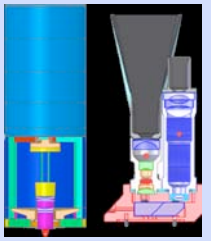




Malin Space Science Systems

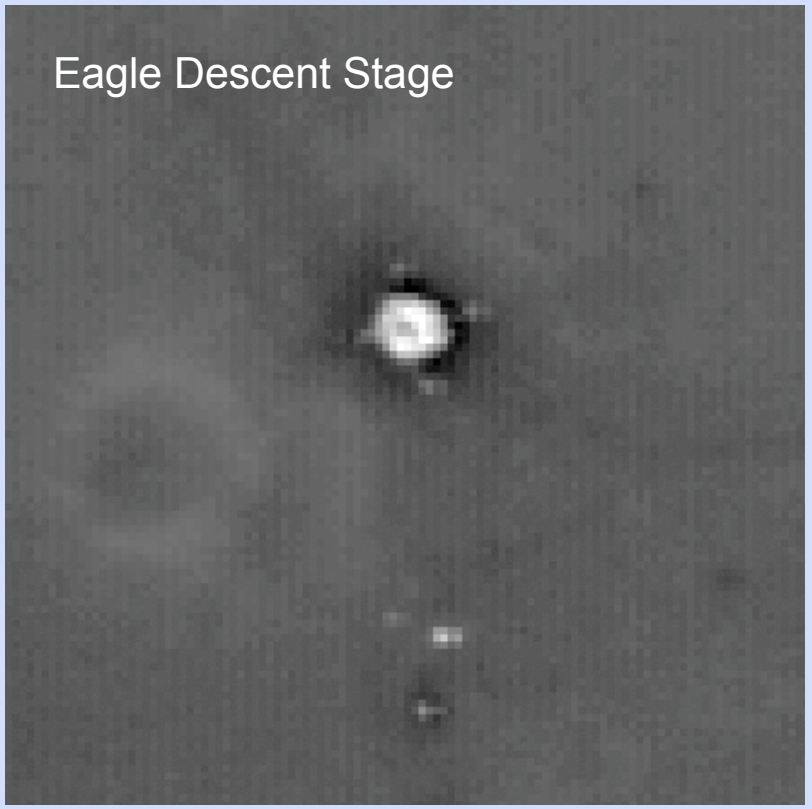
ASU Arizona State University

LROC Status Nominal
16 July 2010



- 350 Gbits image data per day!
- NAC: 165,575 images
  - 142,505 inc < 90°
  - 25,729 inc <45°
- WAC: Images post Sept 20
  - 79,850 <90° incidence
  - 59,909 <90° post Sept 20

- *SMD Mission plus extended mission, NACs could map whole Moon at 0.5 to 2 m/p*



Enlargement of Apollo 11 landing site stretched to enhance details of the lunar module descent stage and EASEP (bottom)

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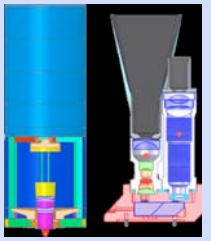
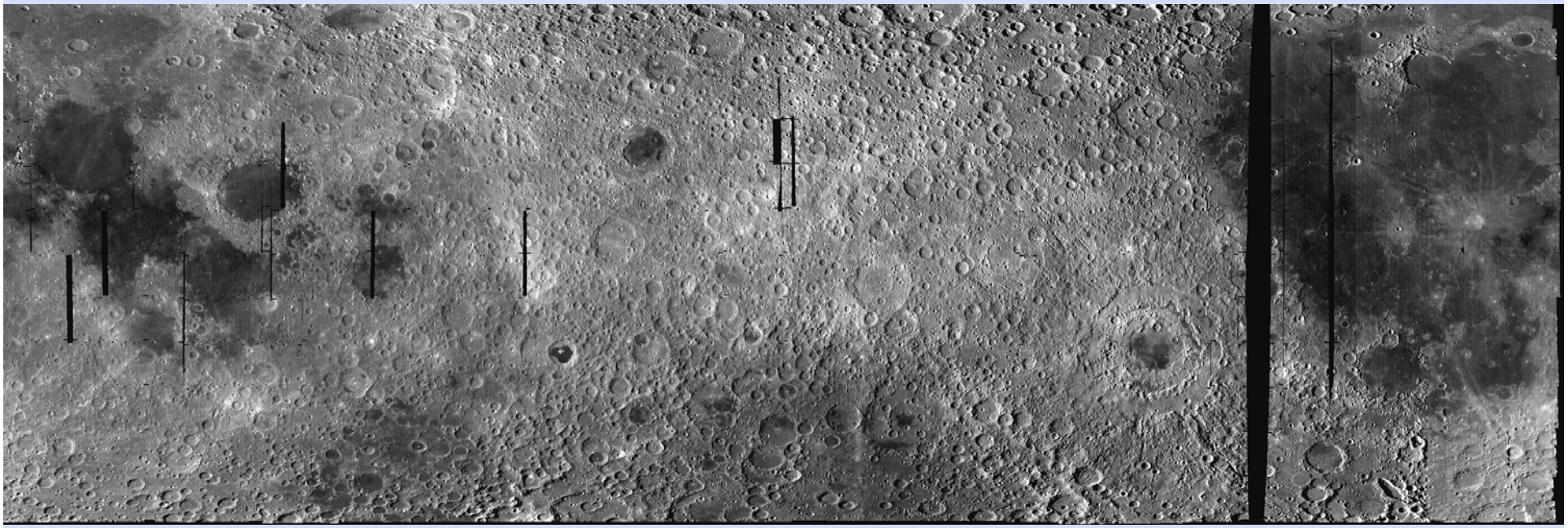


WAC Maps Moon Every Month 7-Colors

Building up a multi-phase map of the Moon!



January equatorial (60°S to 60°N) mosaic

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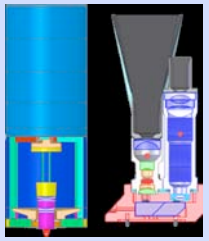
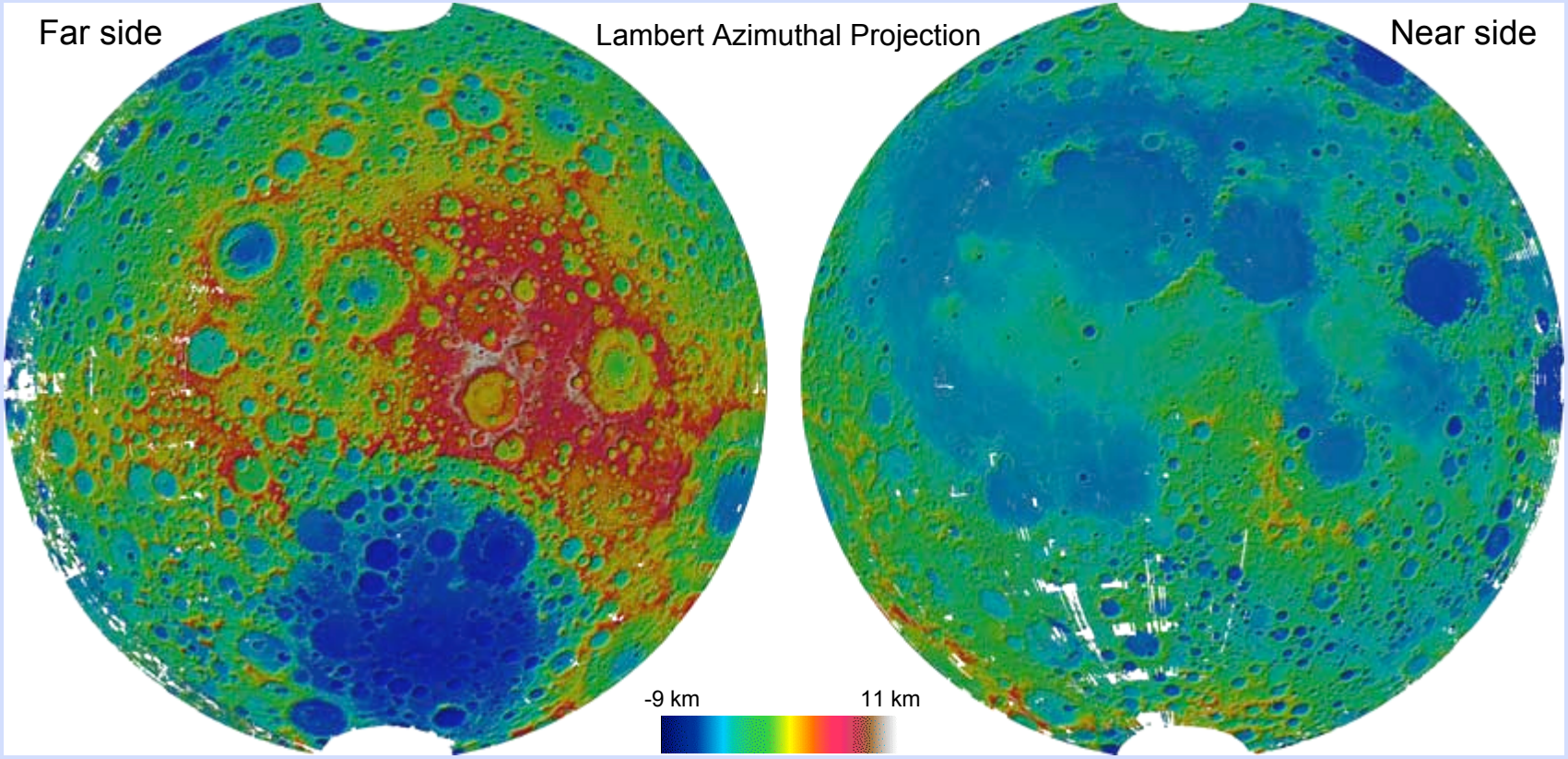
WAC Global Observations: Stereo

Lunar topography model @ 250 m lateral grid



WAC DTM processing by DLR/TUB
using WAC data until Dec 31, 2009 (more than 21,000 WAC stereo models)



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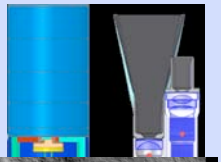
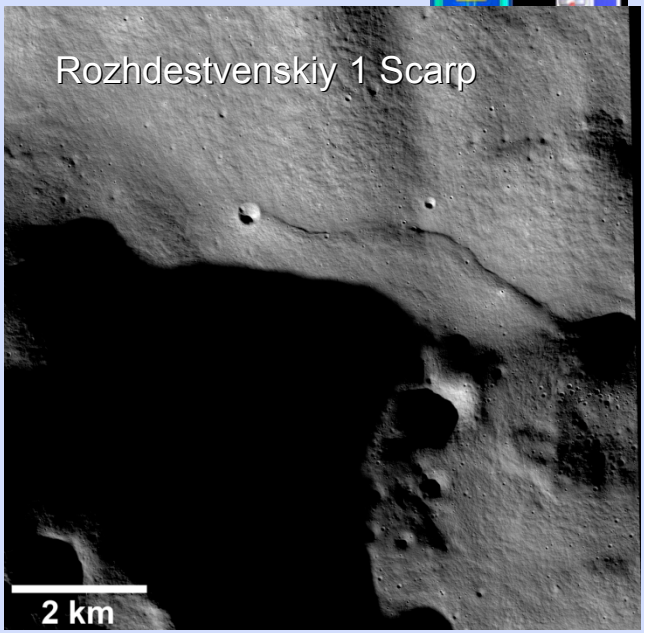
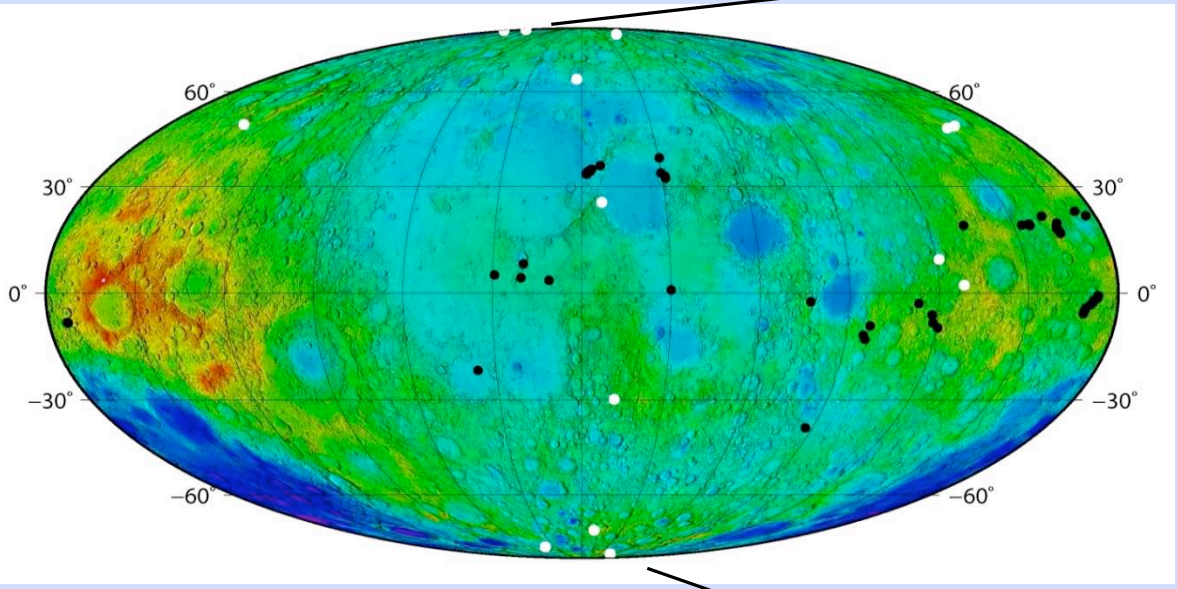
Newly Discovered Lobate Scarps



• Seven of the fourteen newly detected lunar scarps (white dots) are found at high latitudes (> ±60°). And yes - extensional features also!





• The distribution of newly detected and previously known scarps suggests that thrust faults are globally distributed.

• Important implications for the thermal history of the Moon.

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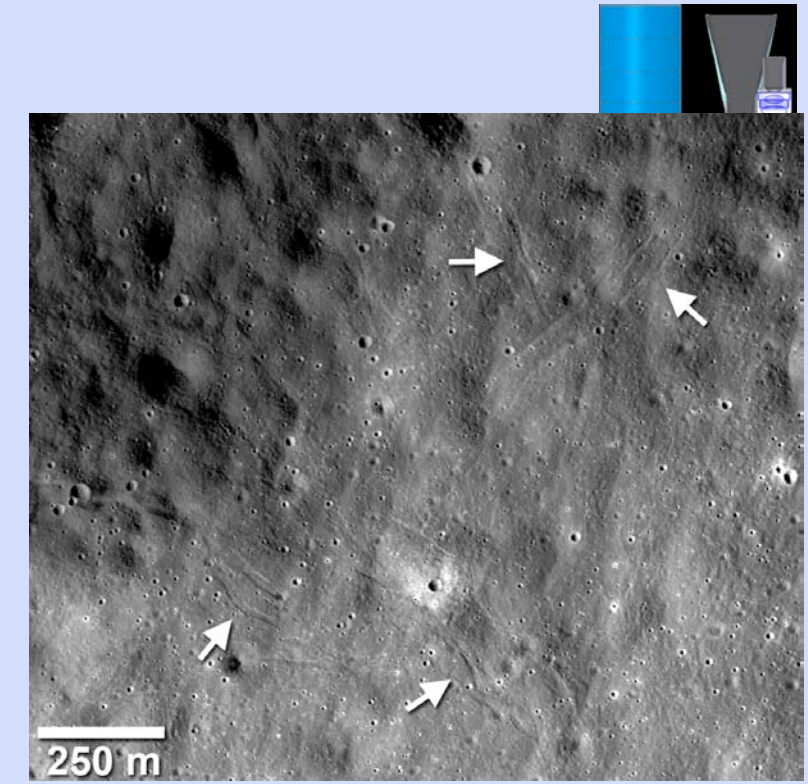
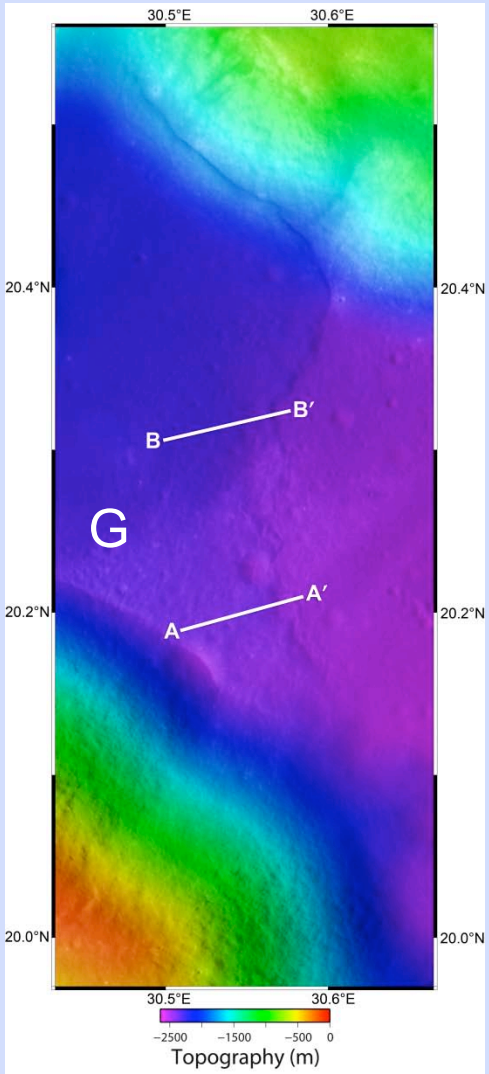
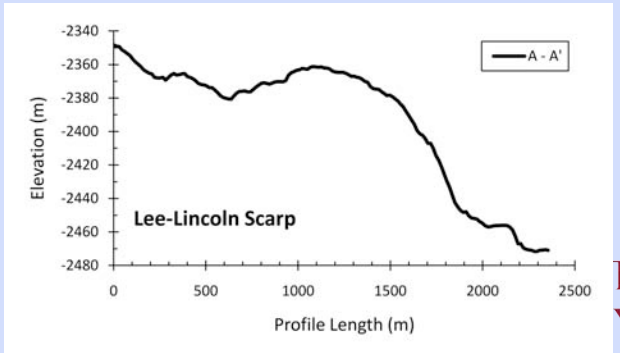
Lunar Tectonism (NAC Stereo)

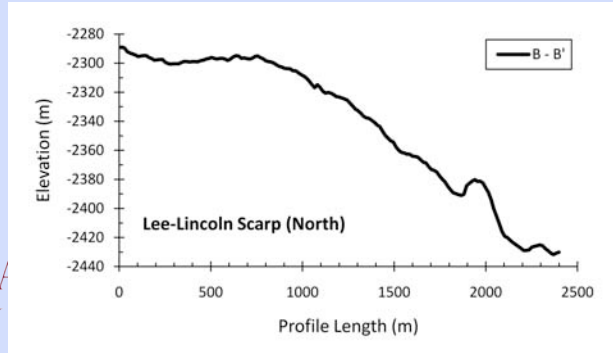




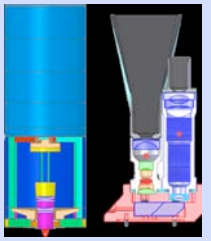
- The Lee-Lincoln scarp has an array of narrow troughs in the back-scarp area interpreted to be small-scale graben.

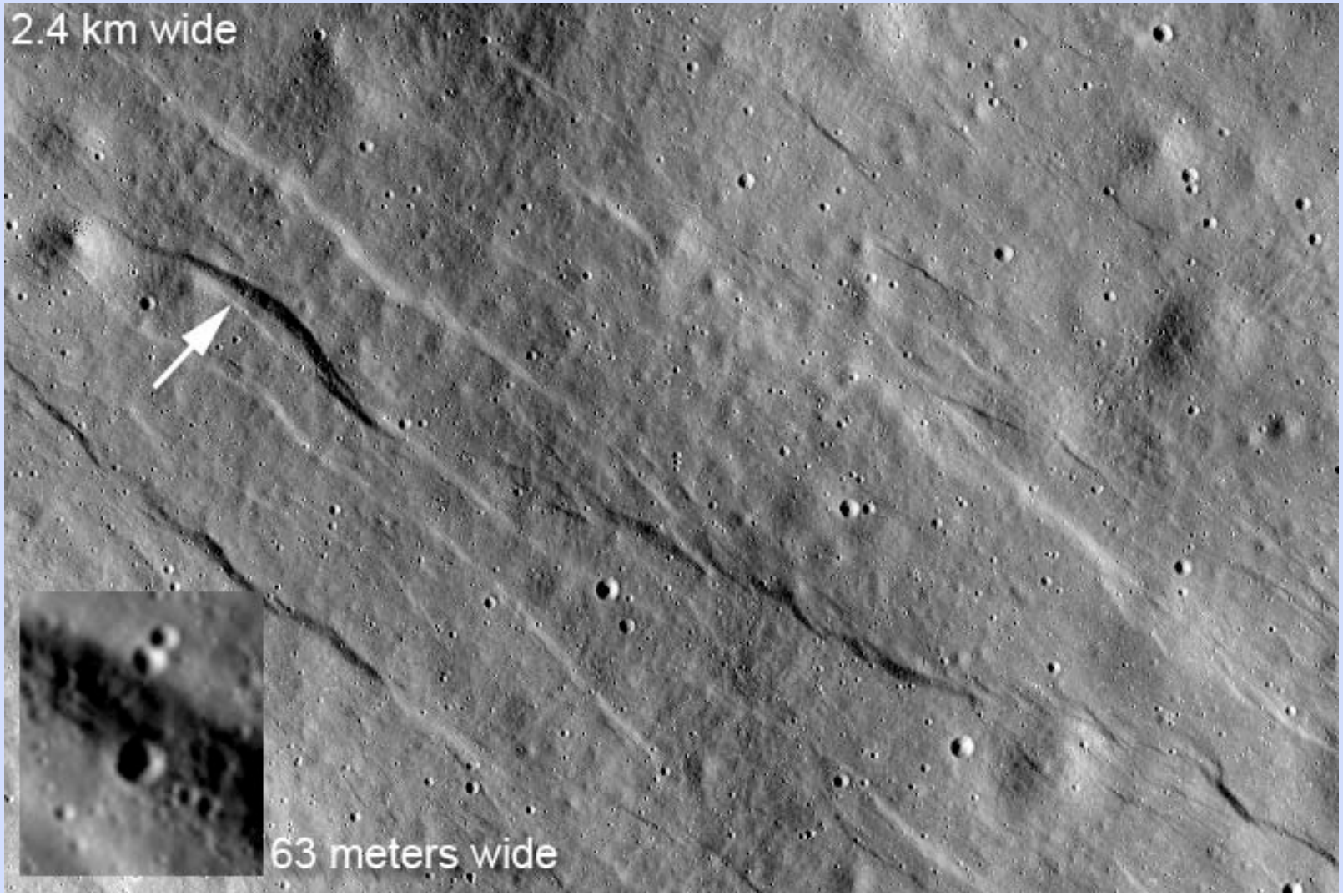
- NAC stereo-derived topography of Lee Lincoln scarp, the graben are spatially correlated with an associated rise and elevated back-scarp terrain.





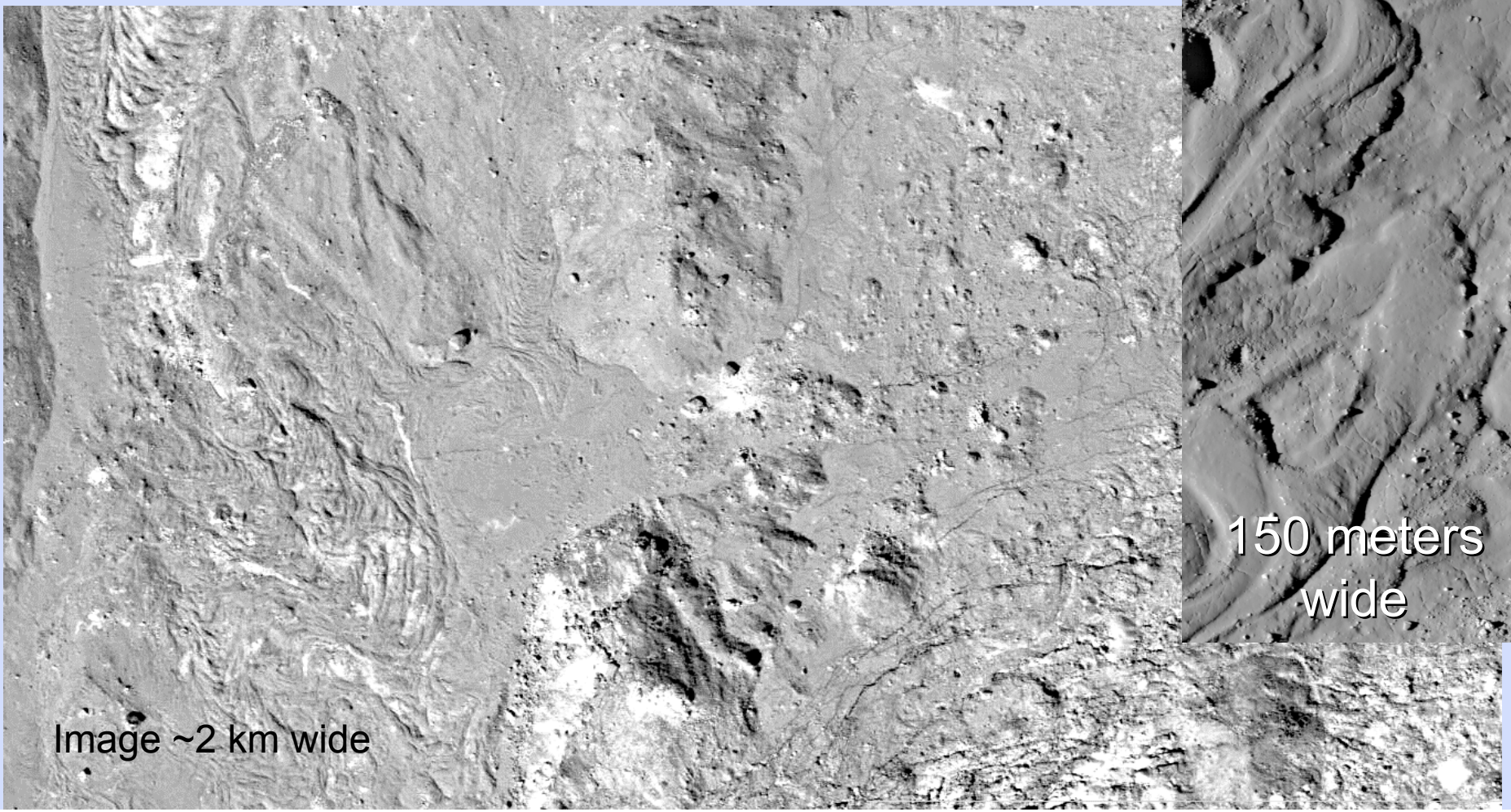
Highland Extension



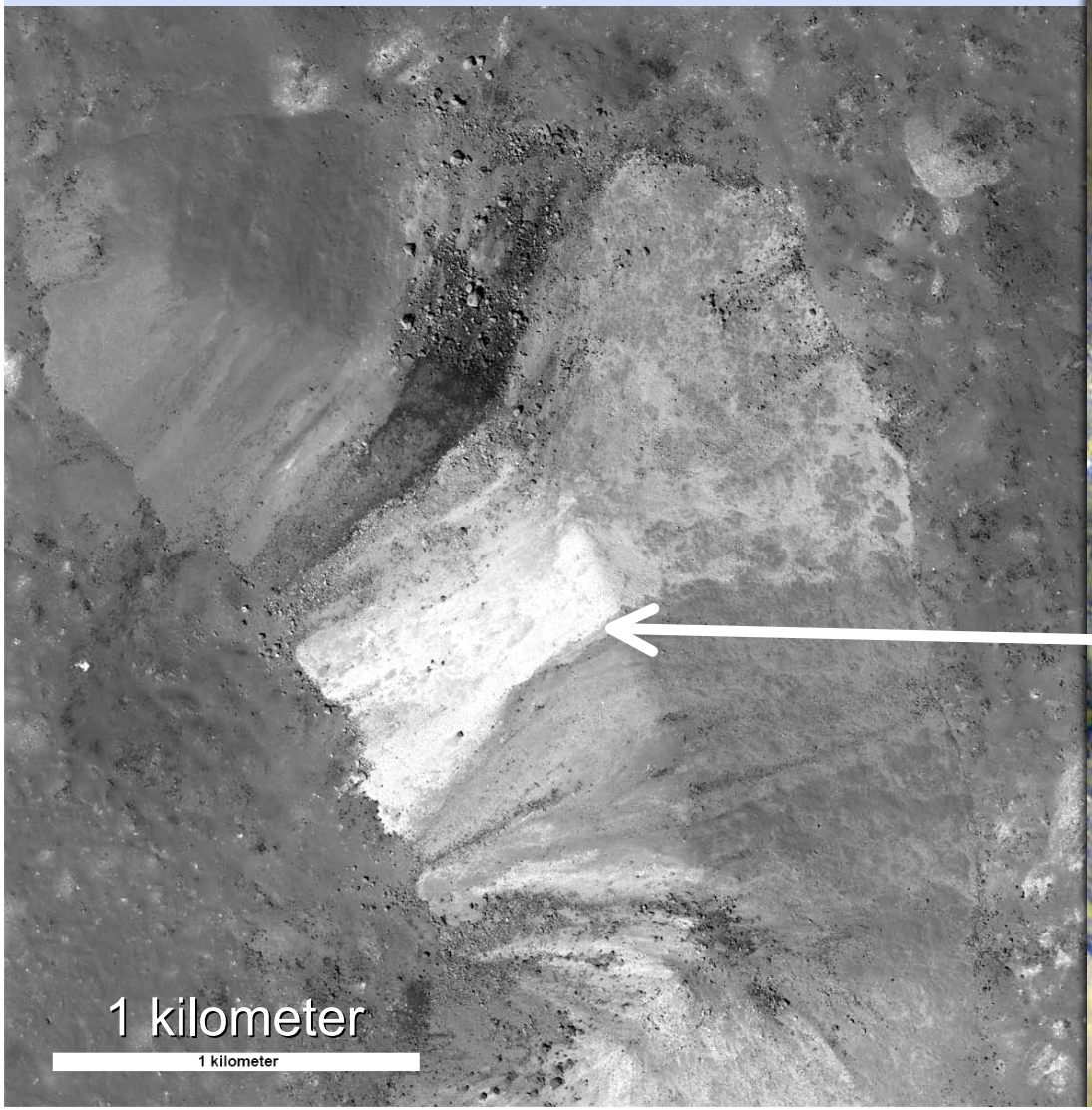


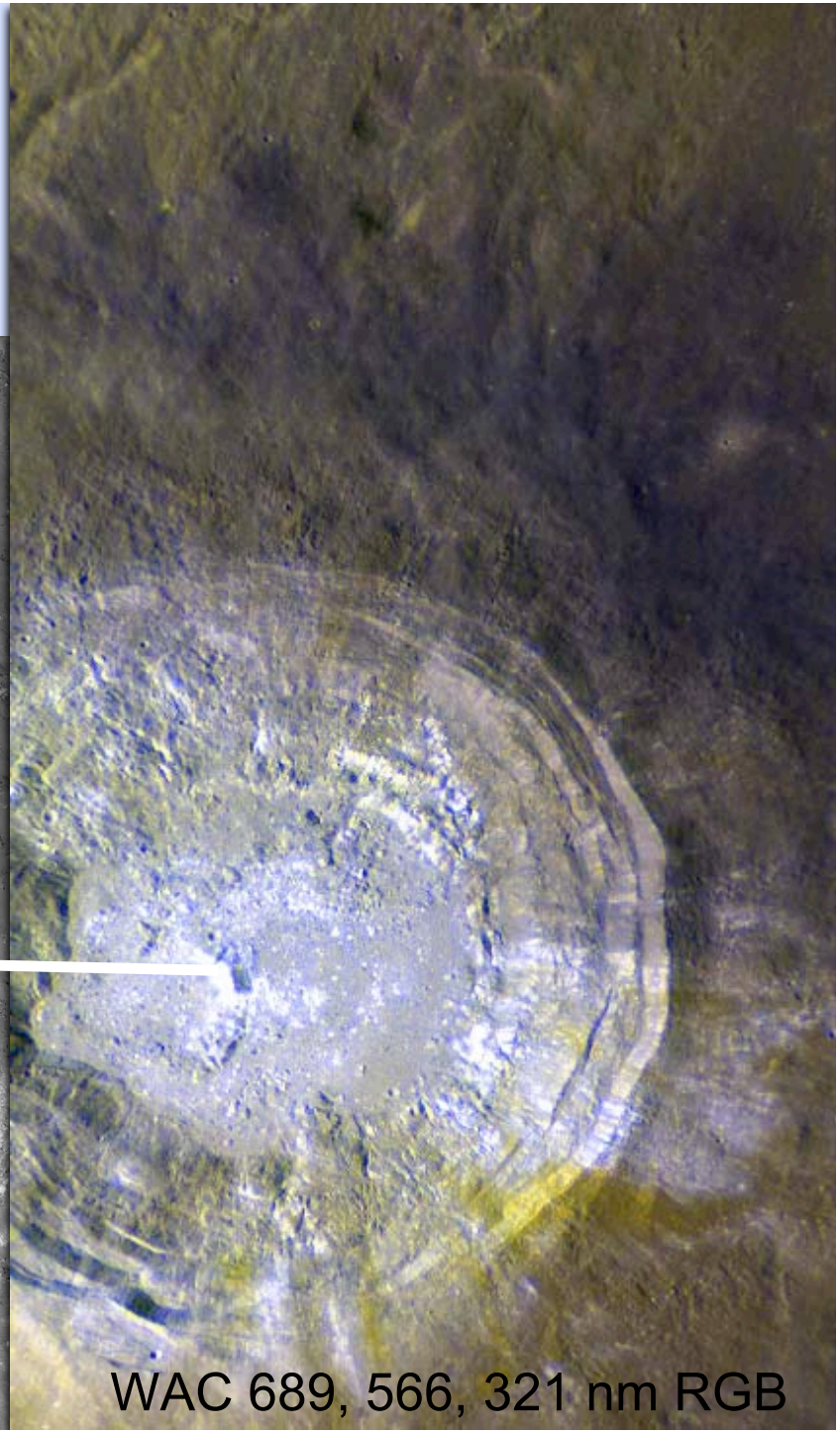
Impact Melts

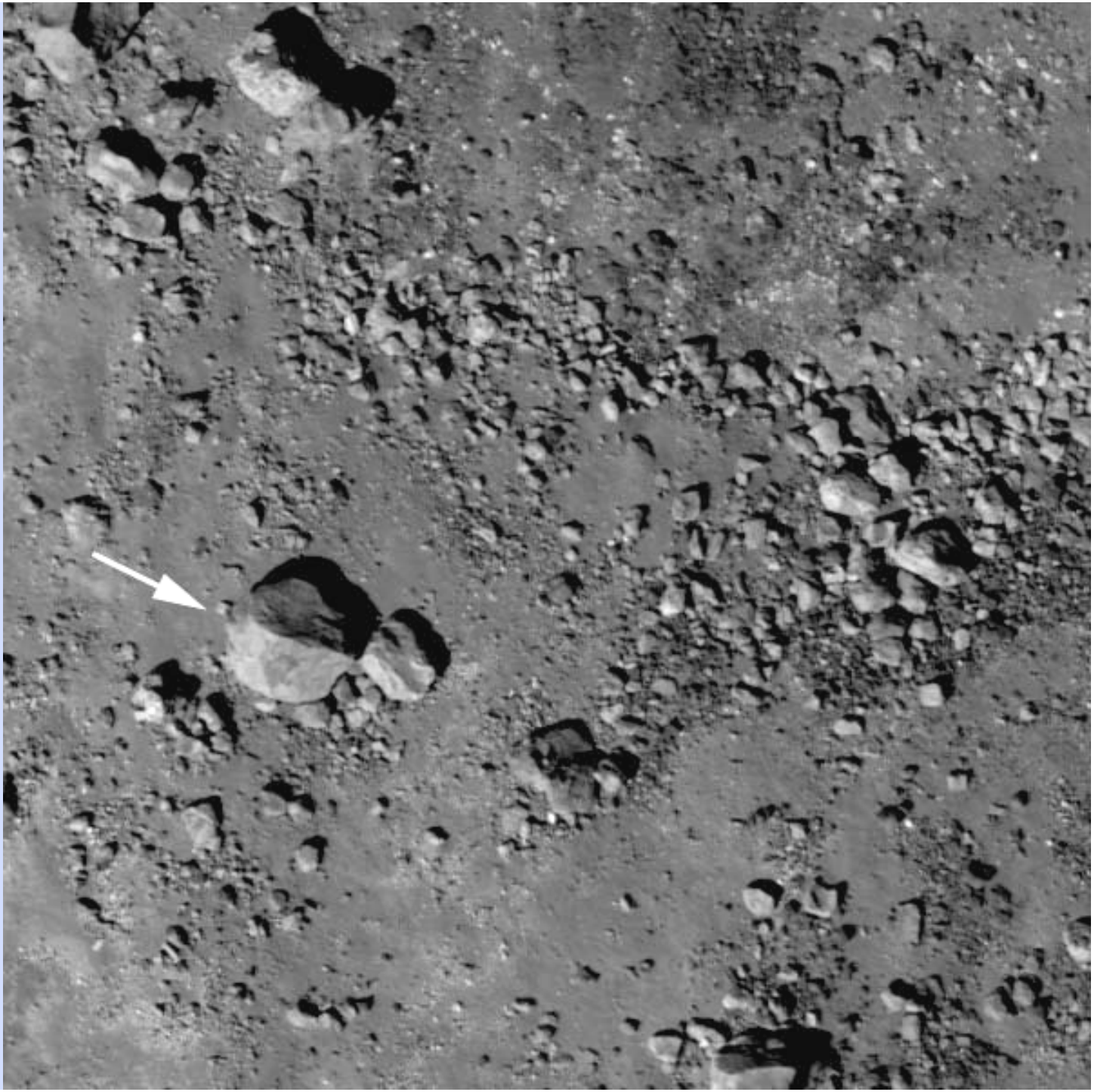
Impact melt deposits are well preserved in Copernican craters. Important markers of cratering dynamics and conditions. Giordano Bruno crater floor (22 km diam., below). Mandel'shtam F farside crater (17 km diam., right).



Aristarchus Crater



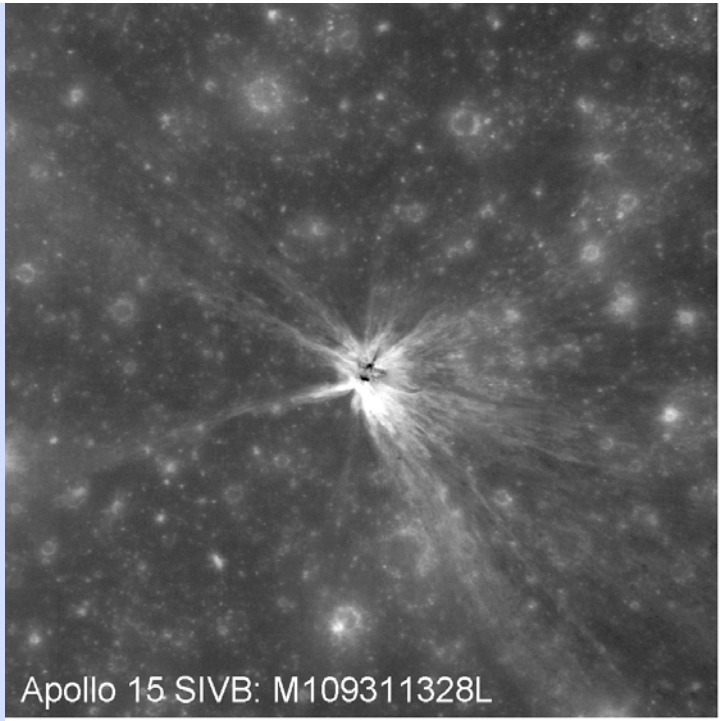


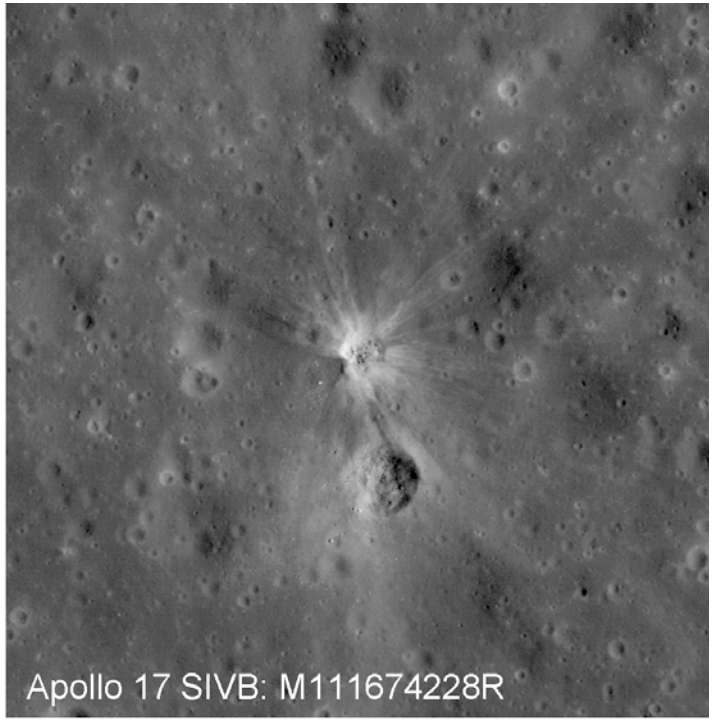


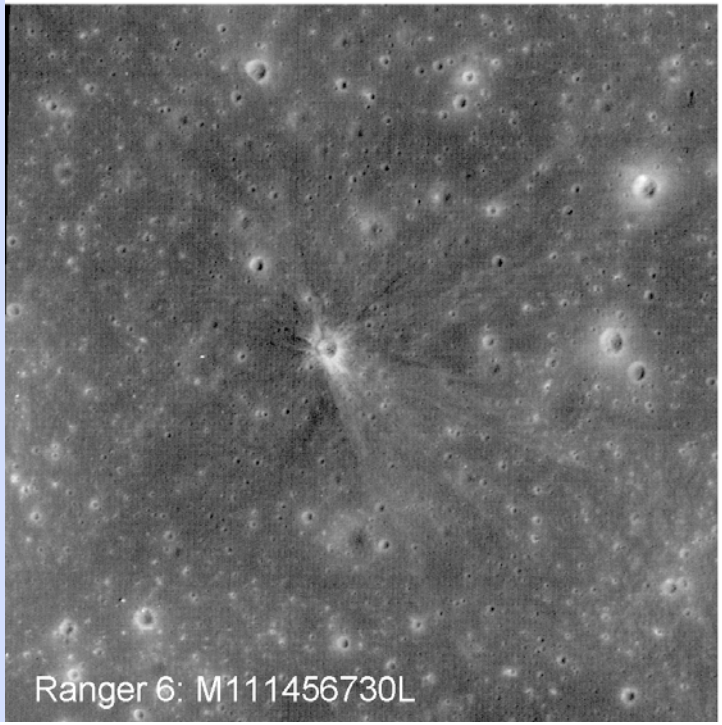
Boulders on floor of Aristarchus crater shed from central peak waiting for astronauts to sample!

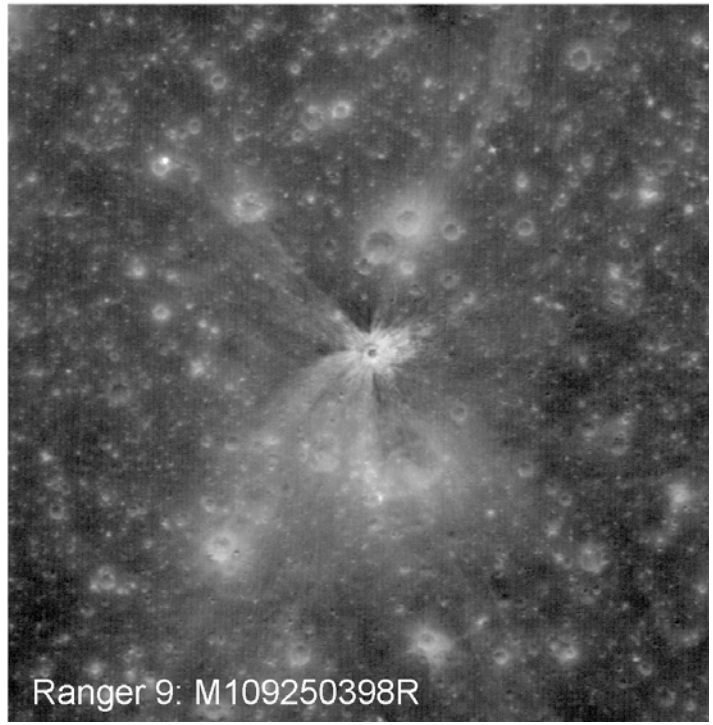
Arrowed rock is 35 meters wide

Photographed most anthropogenic impacts. LM ascent stage craters are elusive, probably due to grazing impact angle

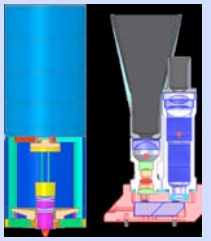






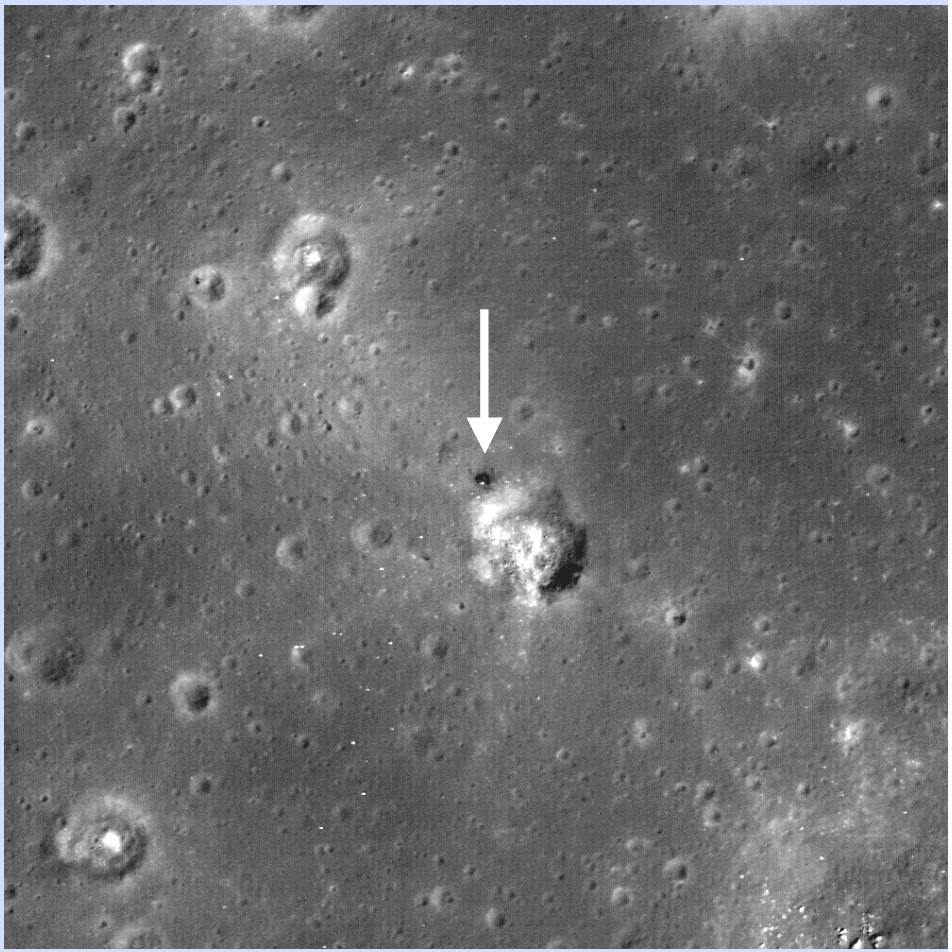


Luna 24



Sampled ejecta from small fresh crater. Perhaps Carle's prediction was right in the broad sense. Murphy's law dictated that a fresh sublayer was sampled rather than the regional surface measured from Earth?

Geologic context is everything!



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Luna 17 / Lunokhod 1

Luna 17 / Lunokhod 1 launched: 11/10/1970; EOM: 9/14/1971, Mission length: 322 days

Lunokhod 1 traversed 10.5 km of Mare Imbrium

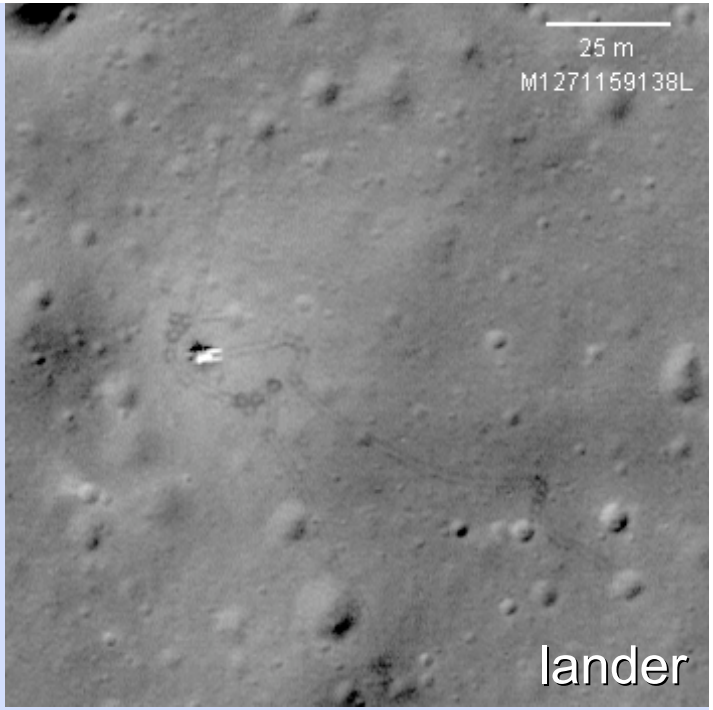
Earth-based laser ranging for a few days during the mission, subsequently no signal

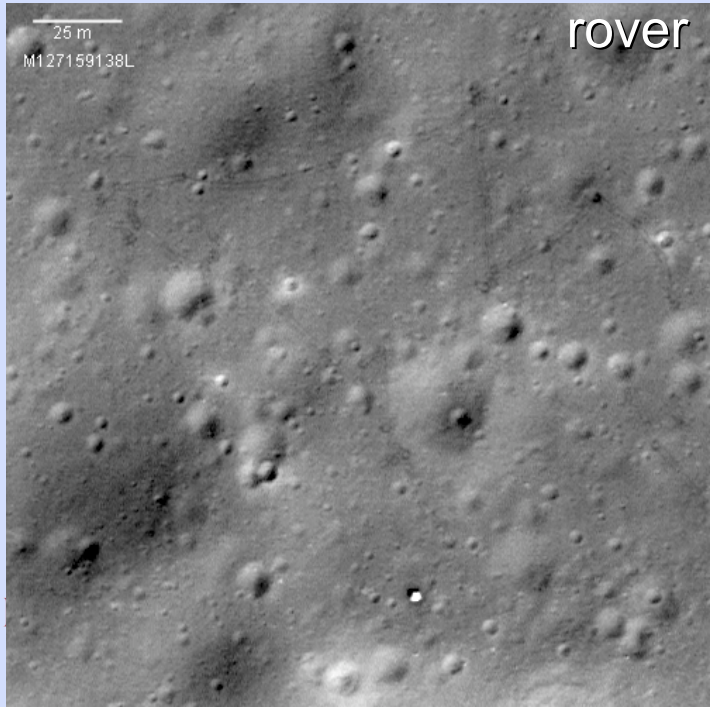
LROC images used to locate the rover

Coordinates sent to T. Murphy UCSD, he used Apache Point Lunar Laser to locate the rover!

Signal strength excellent

Significantly expands the spatial extent of the network of reflectors – better lunar geodesy and relativistic physics





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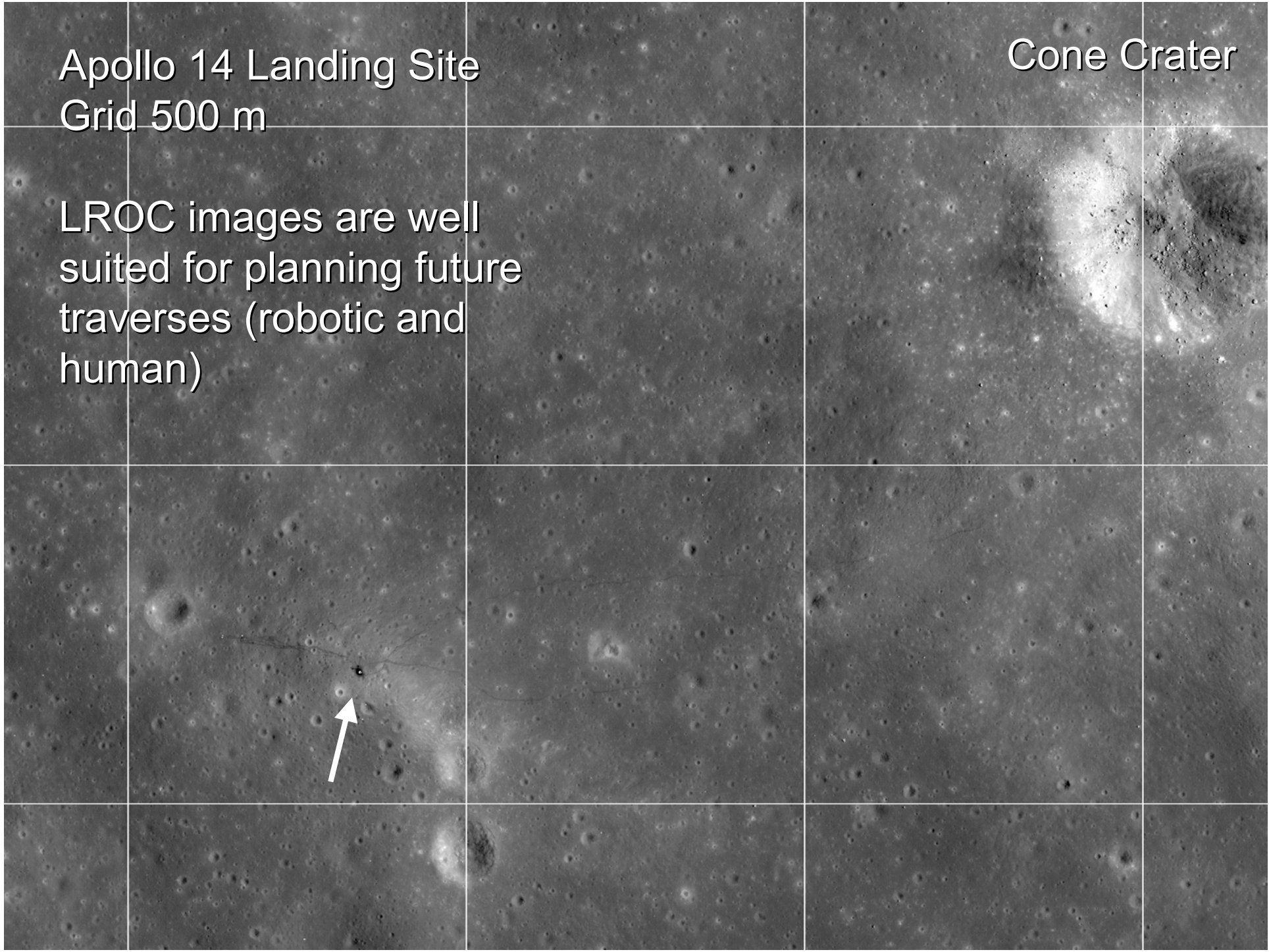
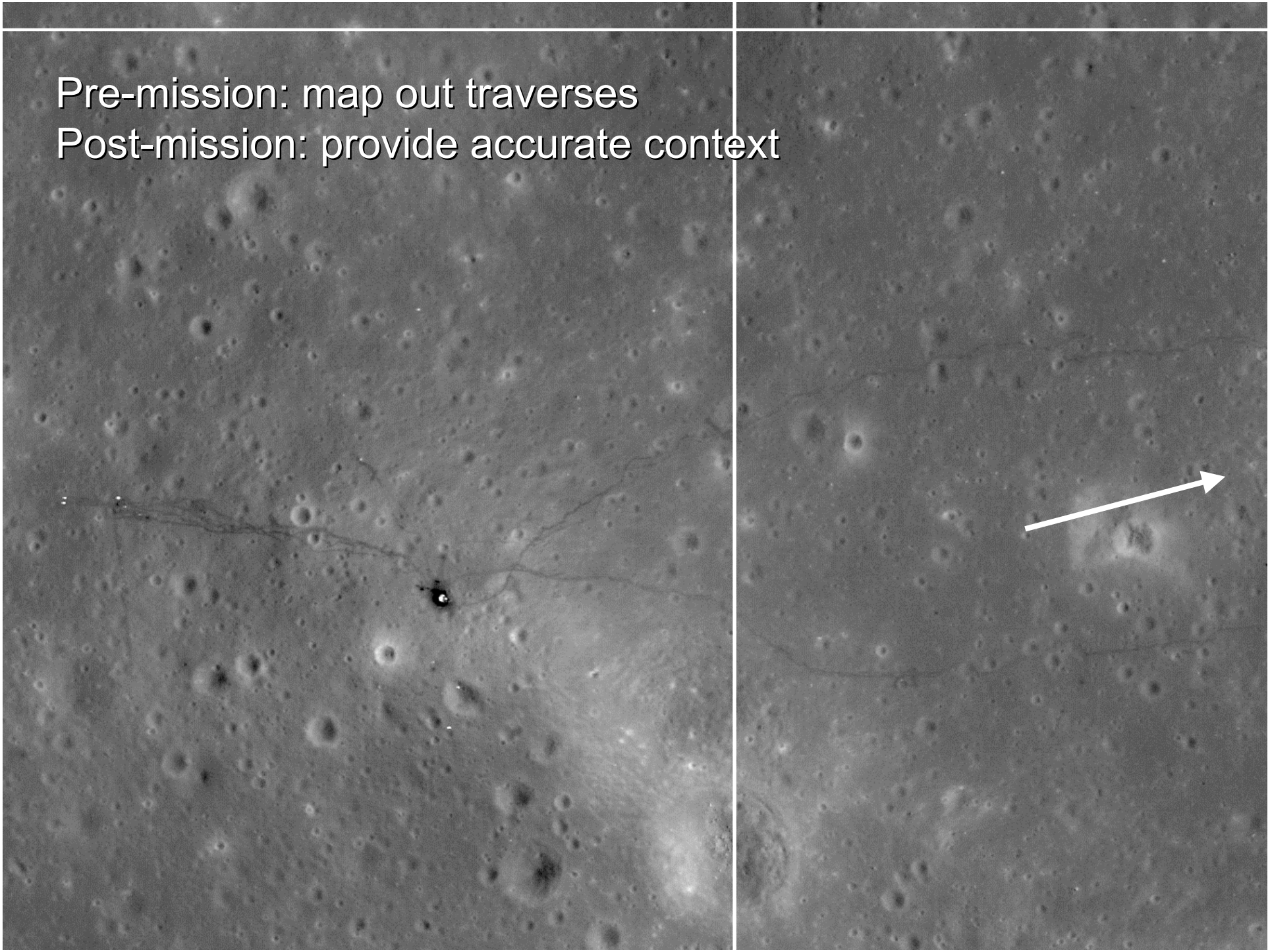
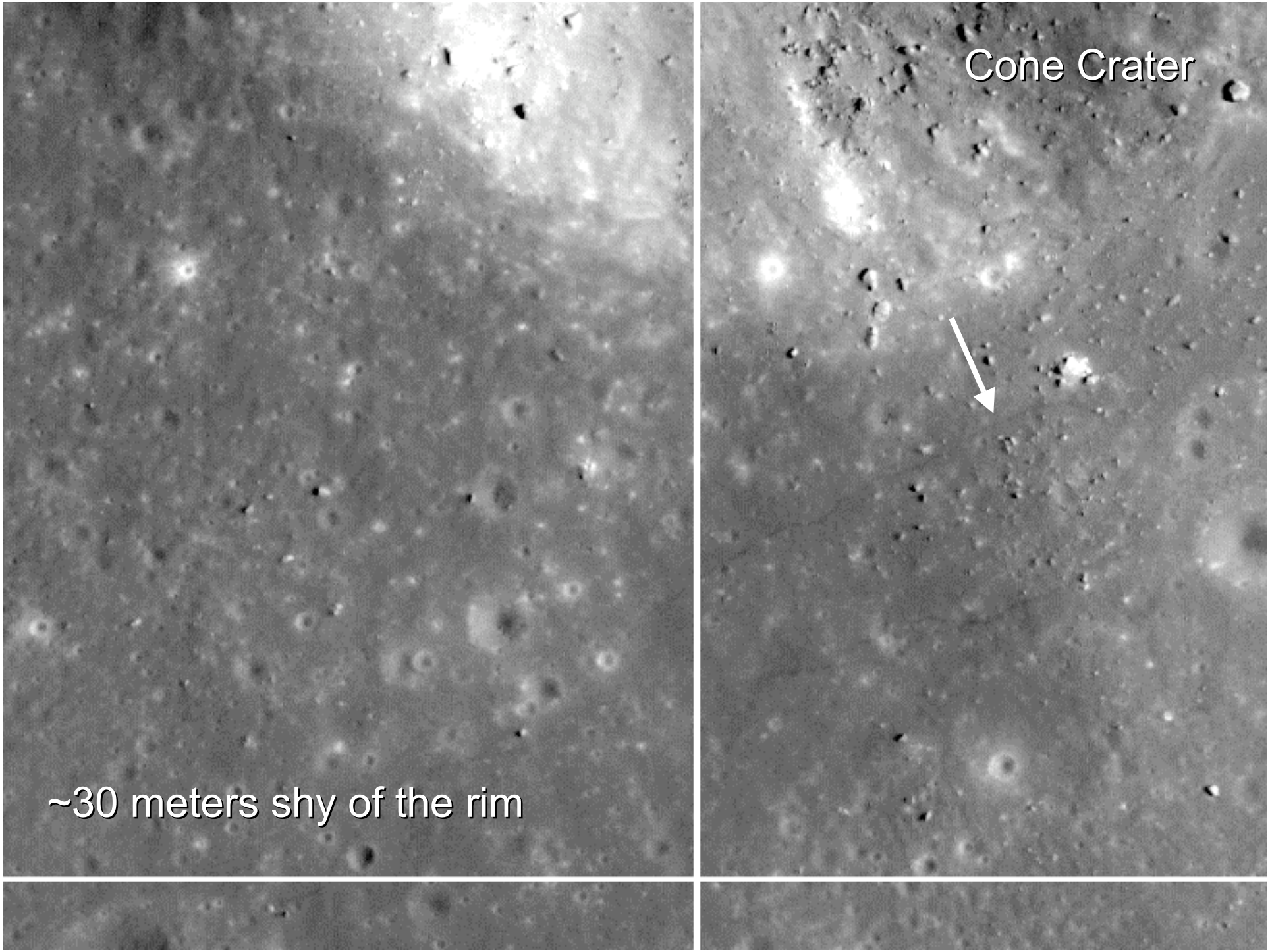
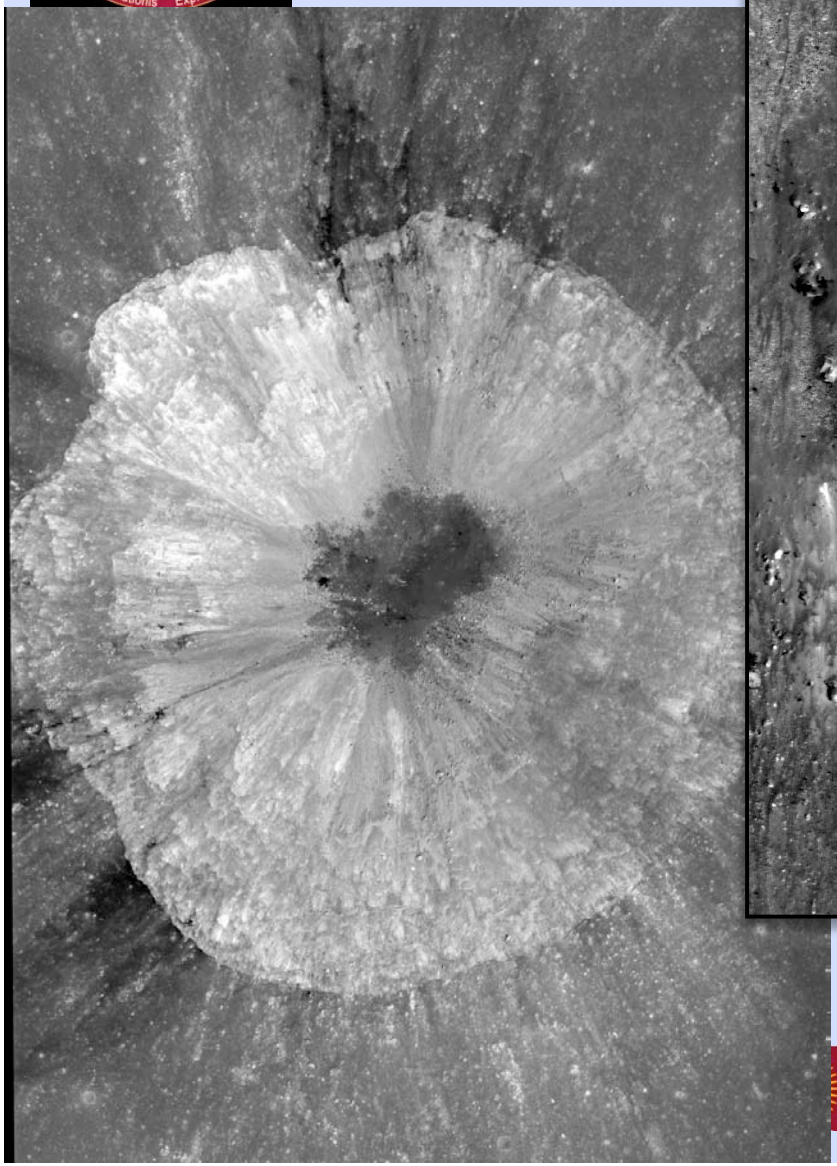
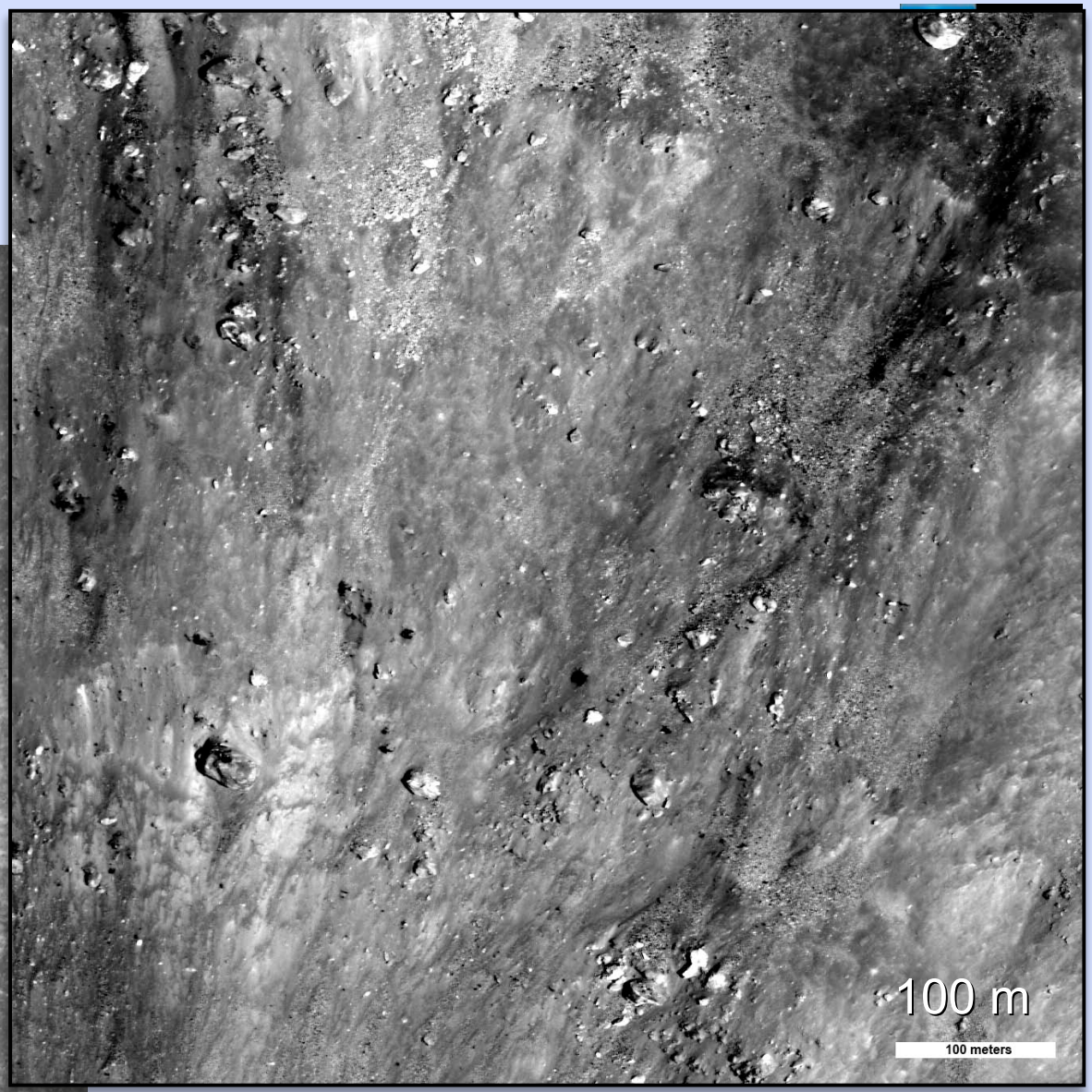

Apollo 14 Landing Site
Grid 500 m
LROC images are well suited for planning future traverses (robotic and human)
Cone Crater


Pre-mission: map out traverses
Post-mission: provide accurate context


Cone Crater
~30 meters shy of the rim



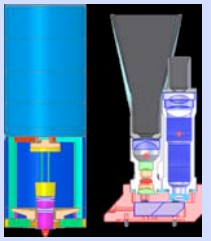
5 km diameter



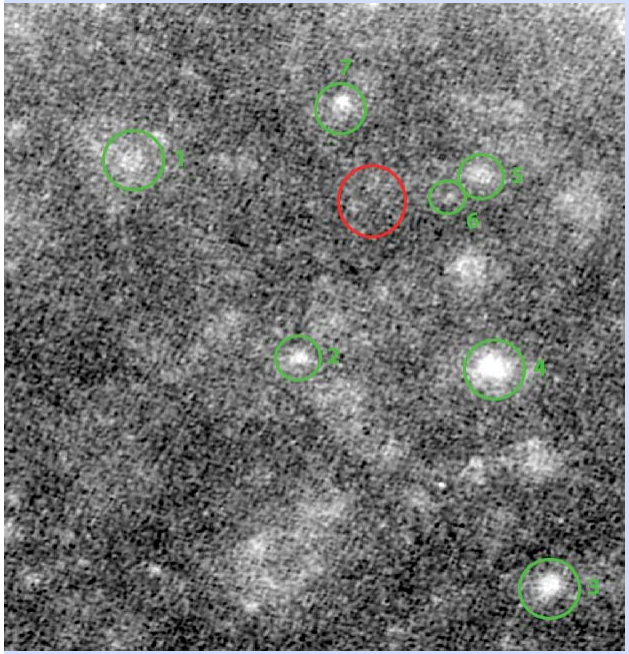
Trace path of impact melt during crater formation

Arizona State University

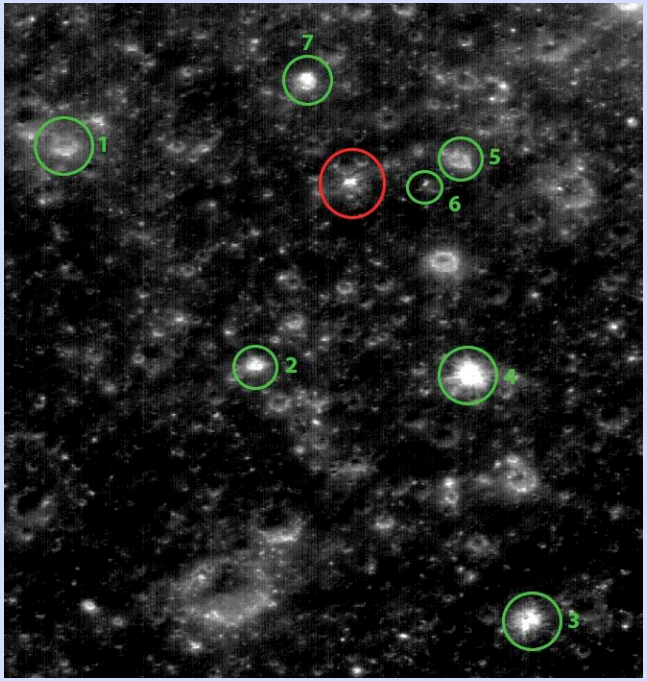
New asteroid impact craters



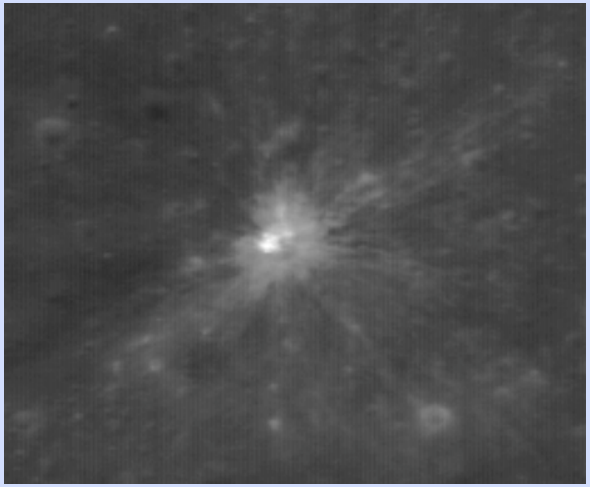
- Goal: determine current rate of impact by asteroids typically 0.1-1 m diameter; compare to current rate at Mars
- 4 new craters detected so far from comparison of ~12 image pairs
  - Scanned Apollo Pan images vs. LROC NAC
  - Many more new craters expected now that effort is underway



Apollo as15_p_9527



LROC M108971316LE



New crater ~10 m diameter

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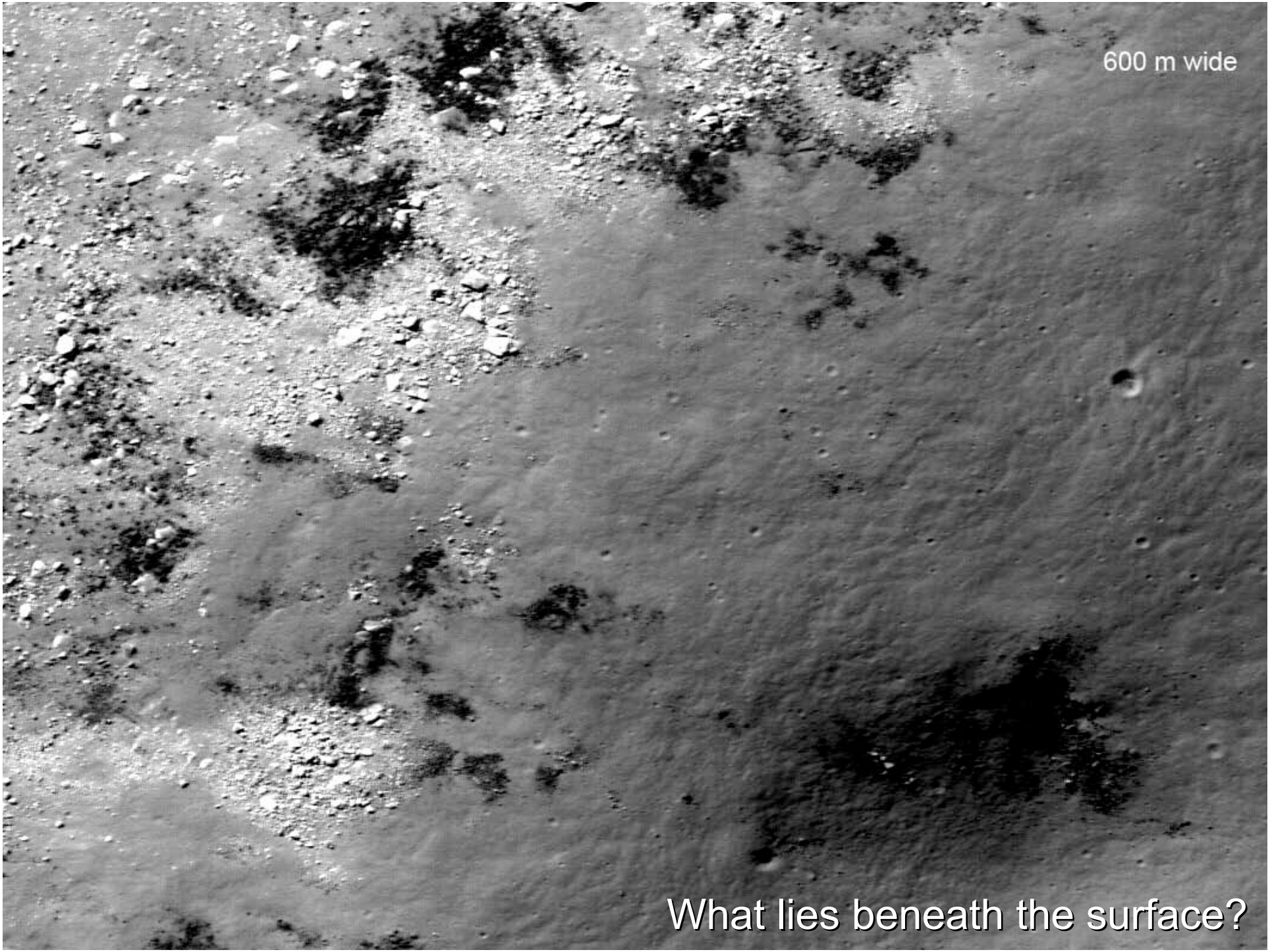
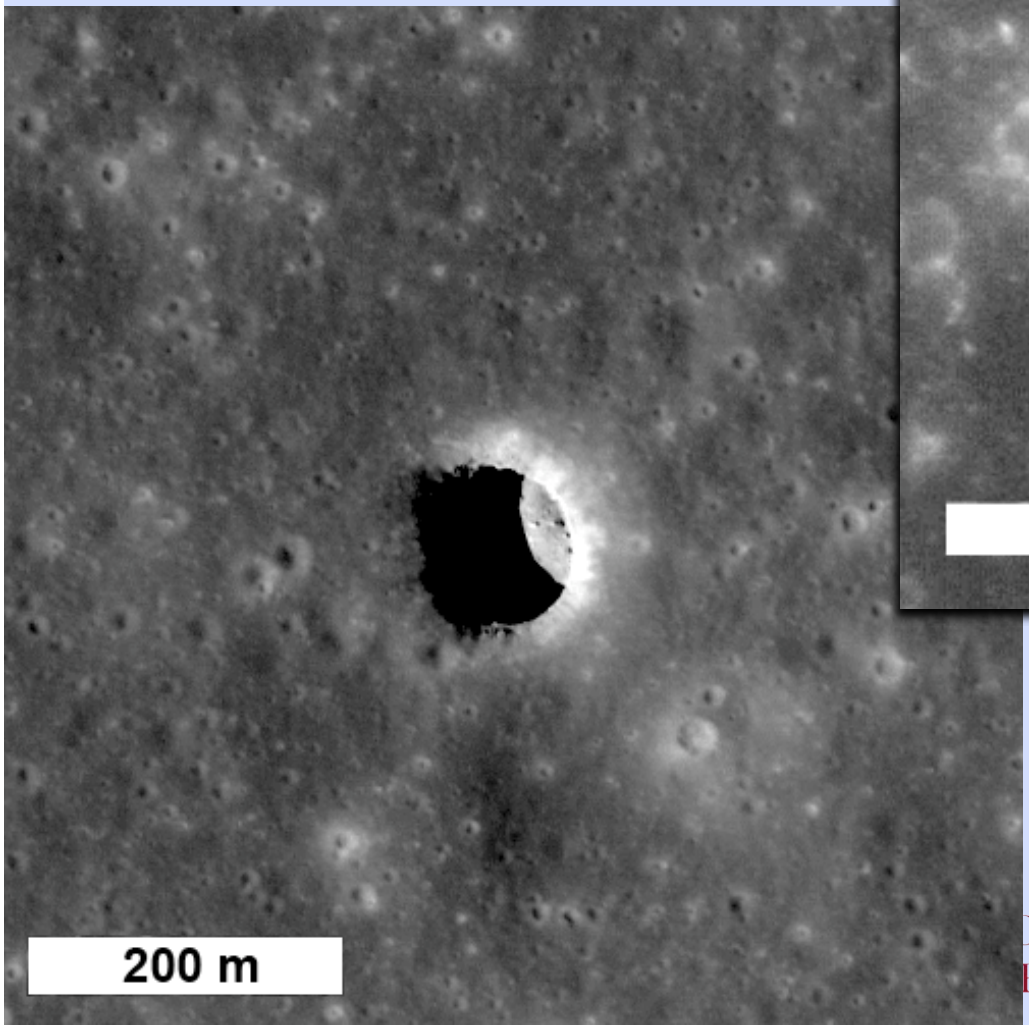
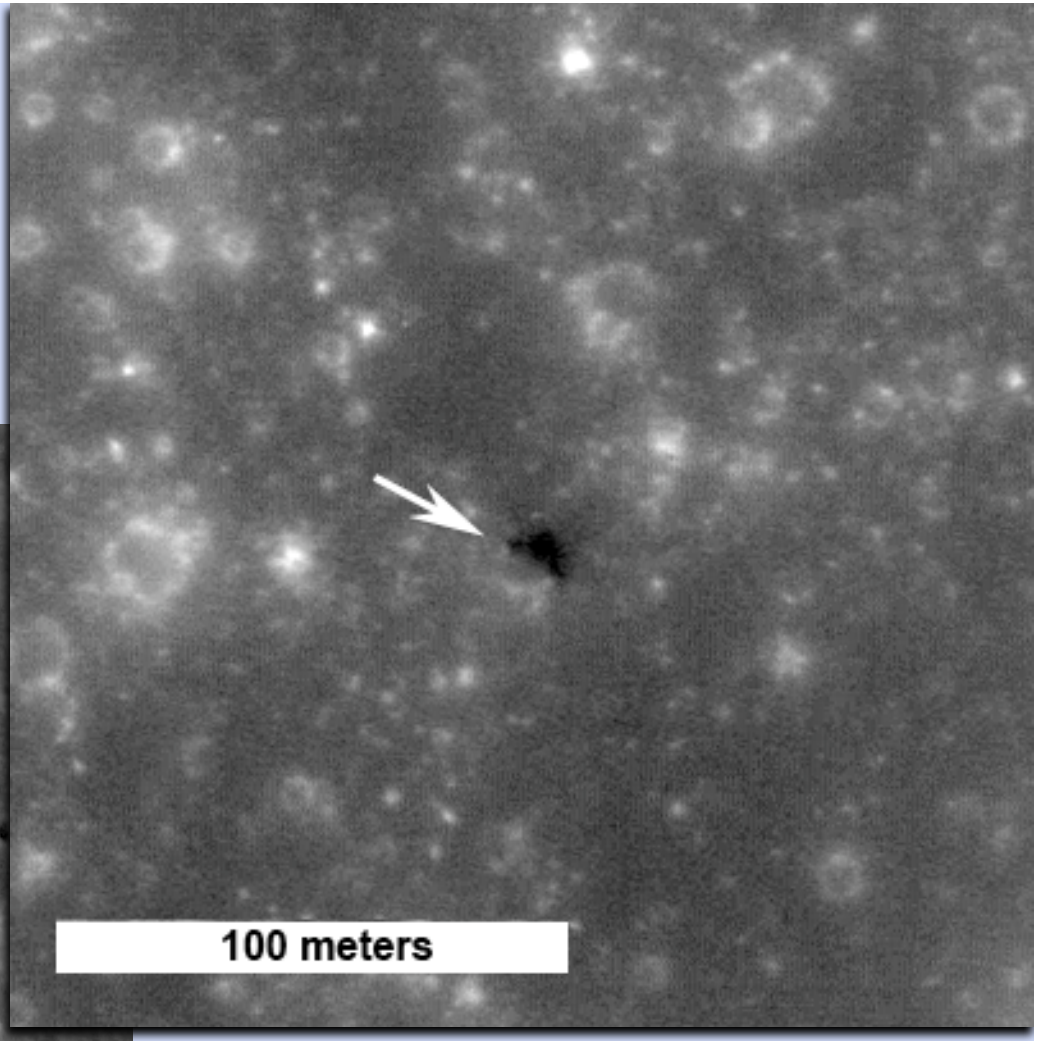
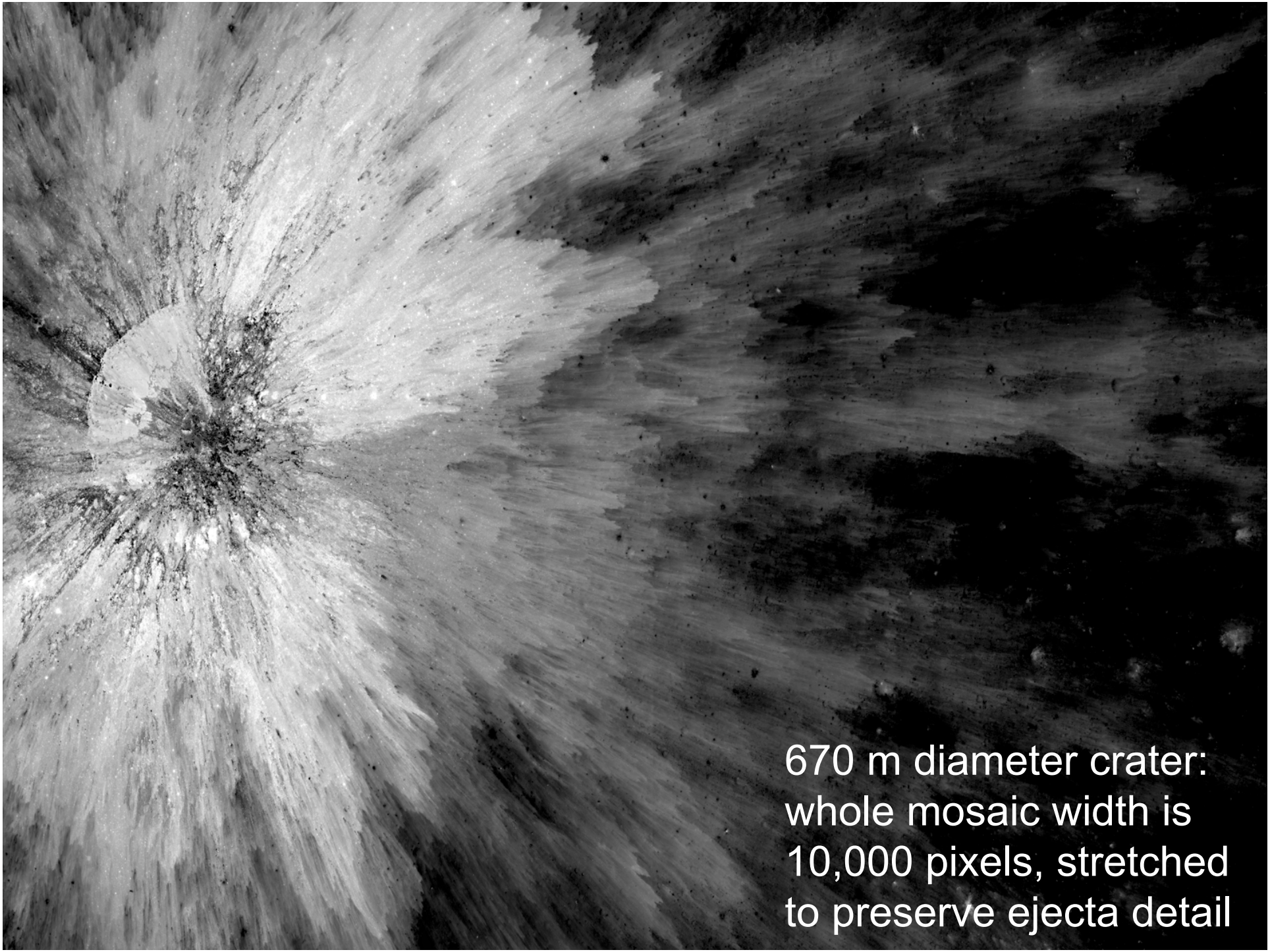

600 m wide
What lies beneath the surface?

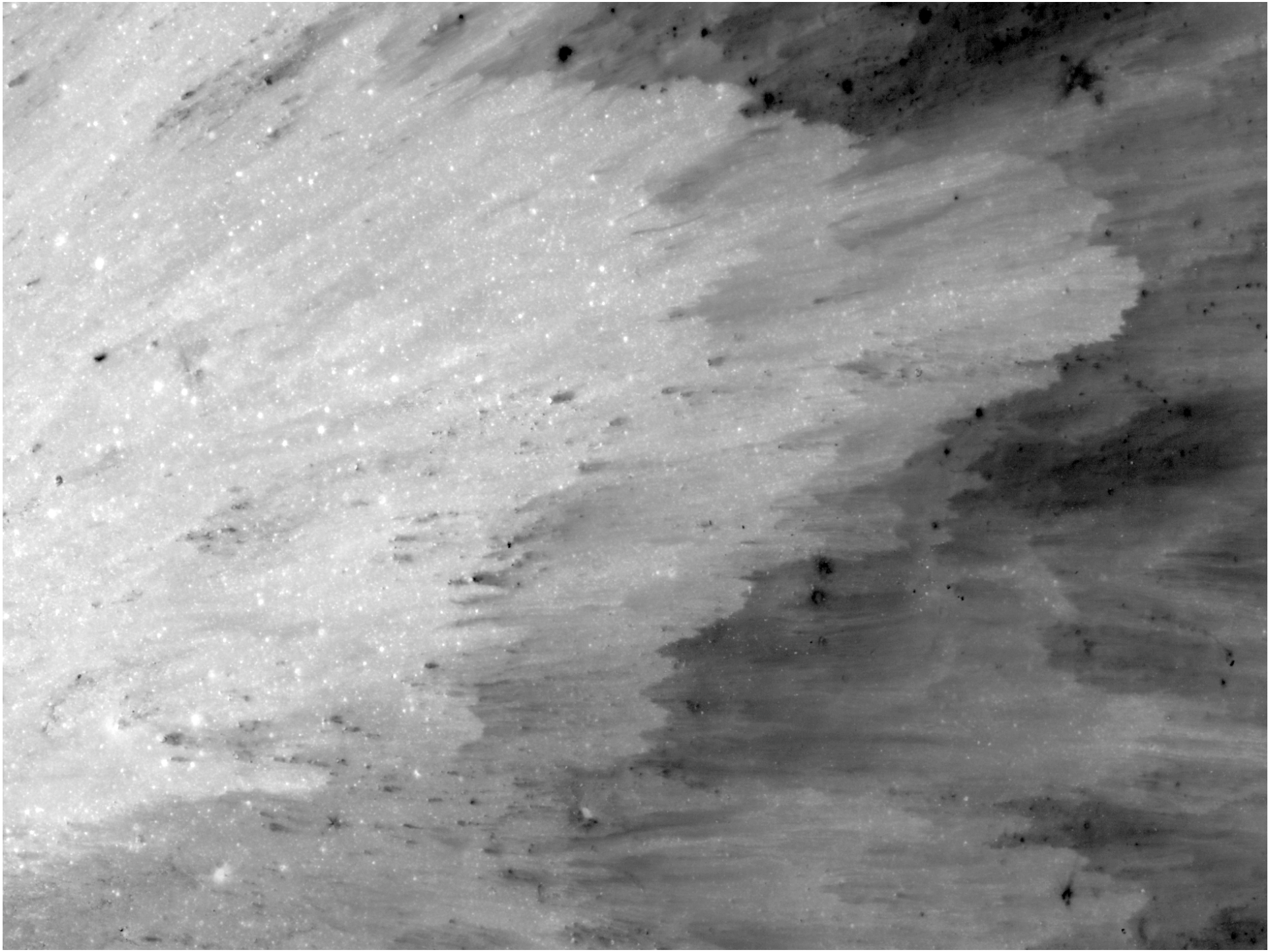
Mare Pit Craters

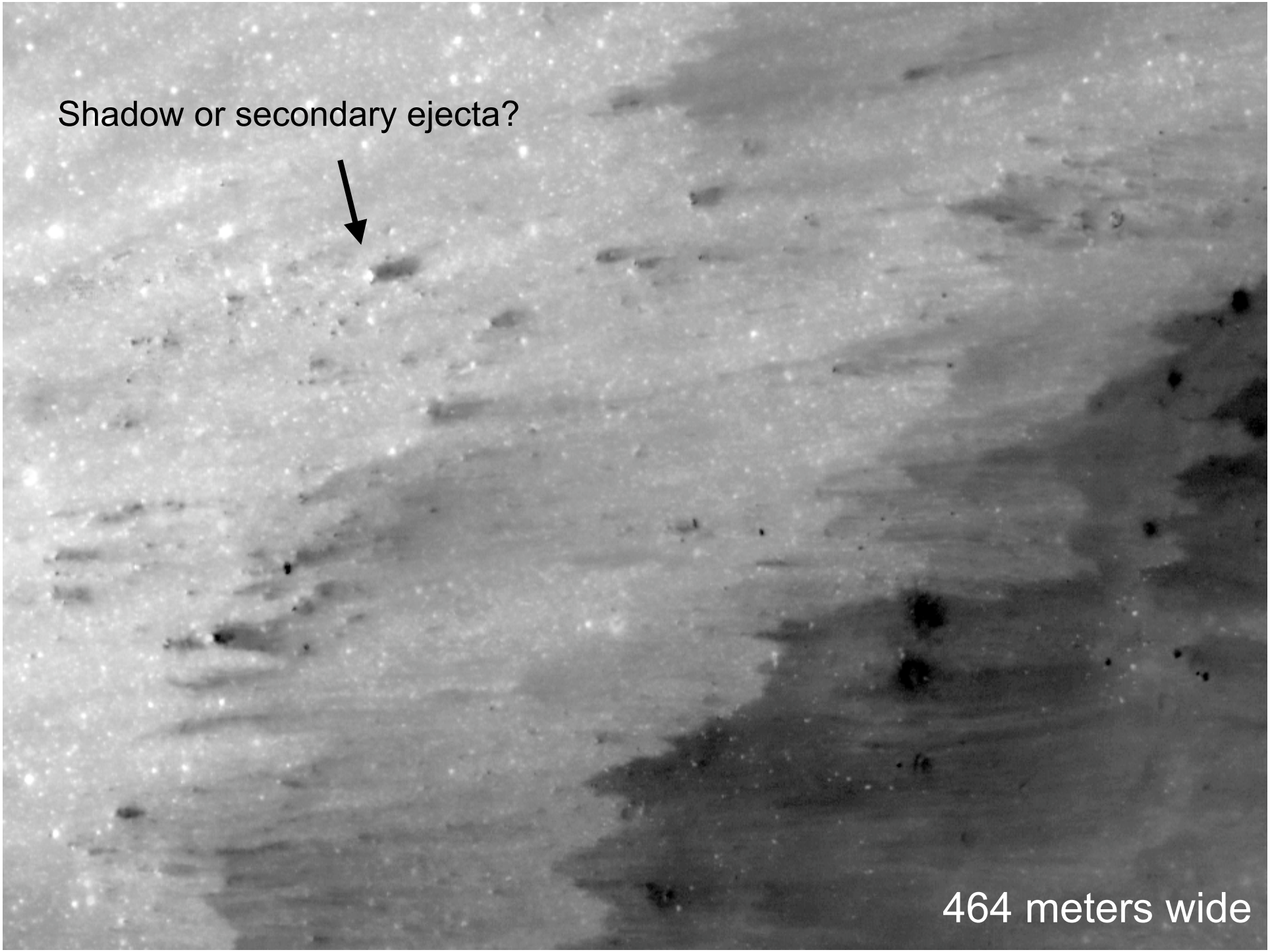


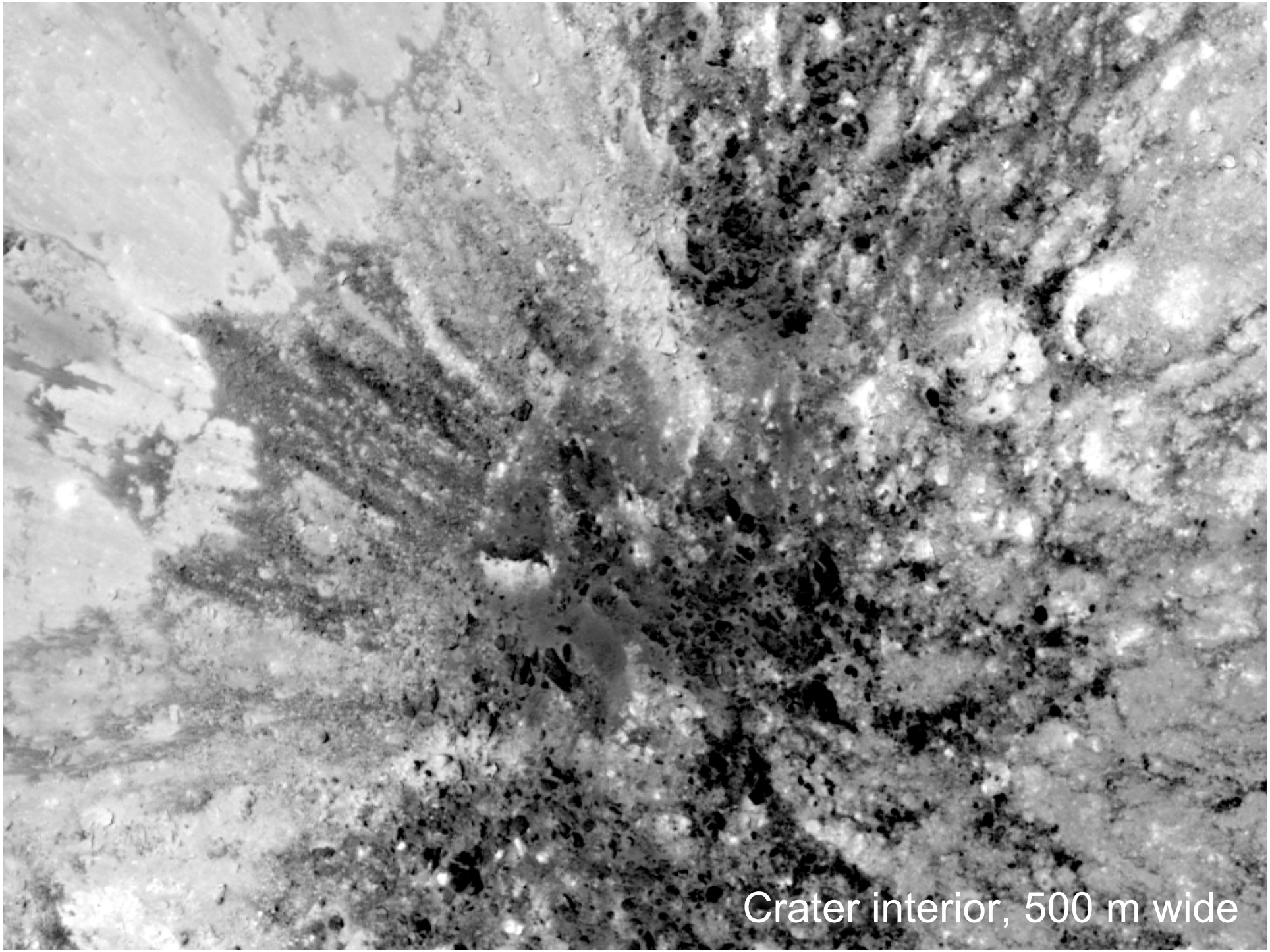


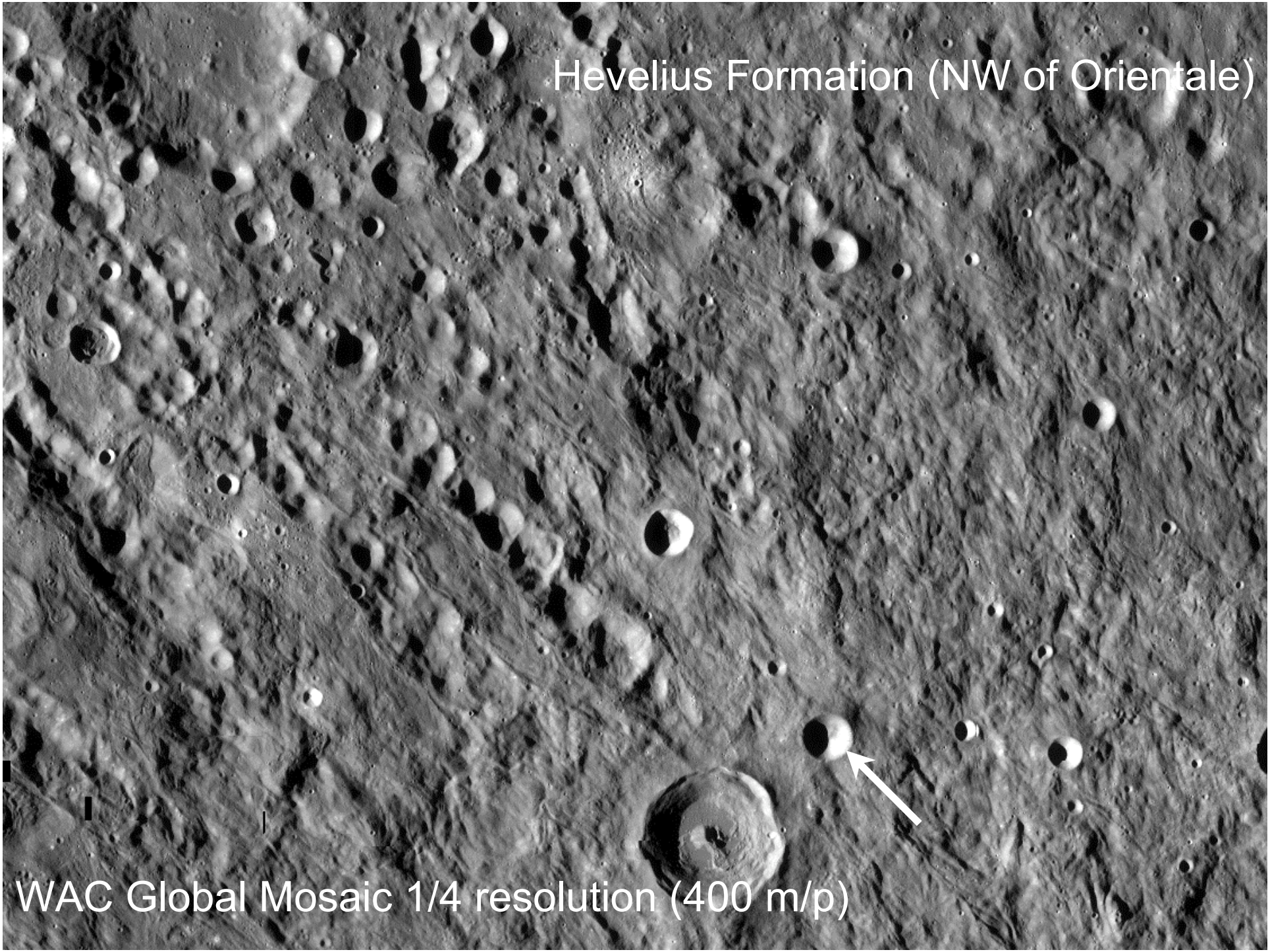
Kaguya team discovered three 100-m diameter pit craters, LROC team identified ten “possibles” in Mare Tranq! Perhaps pit craters are common?

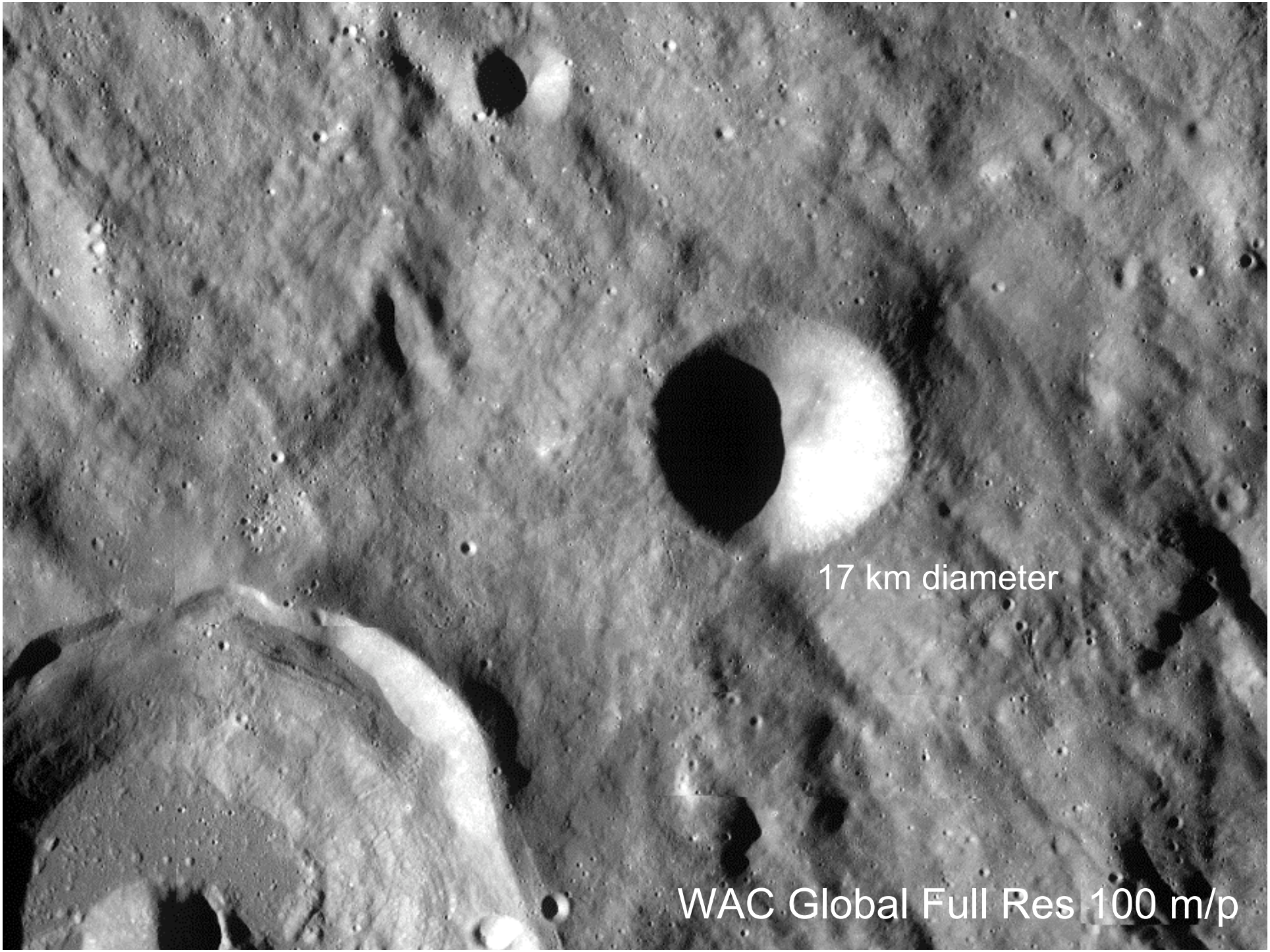

670 m diameter crater:
whole mosaic width is
10,000 pixels, stretched
to preserve ejecta detail

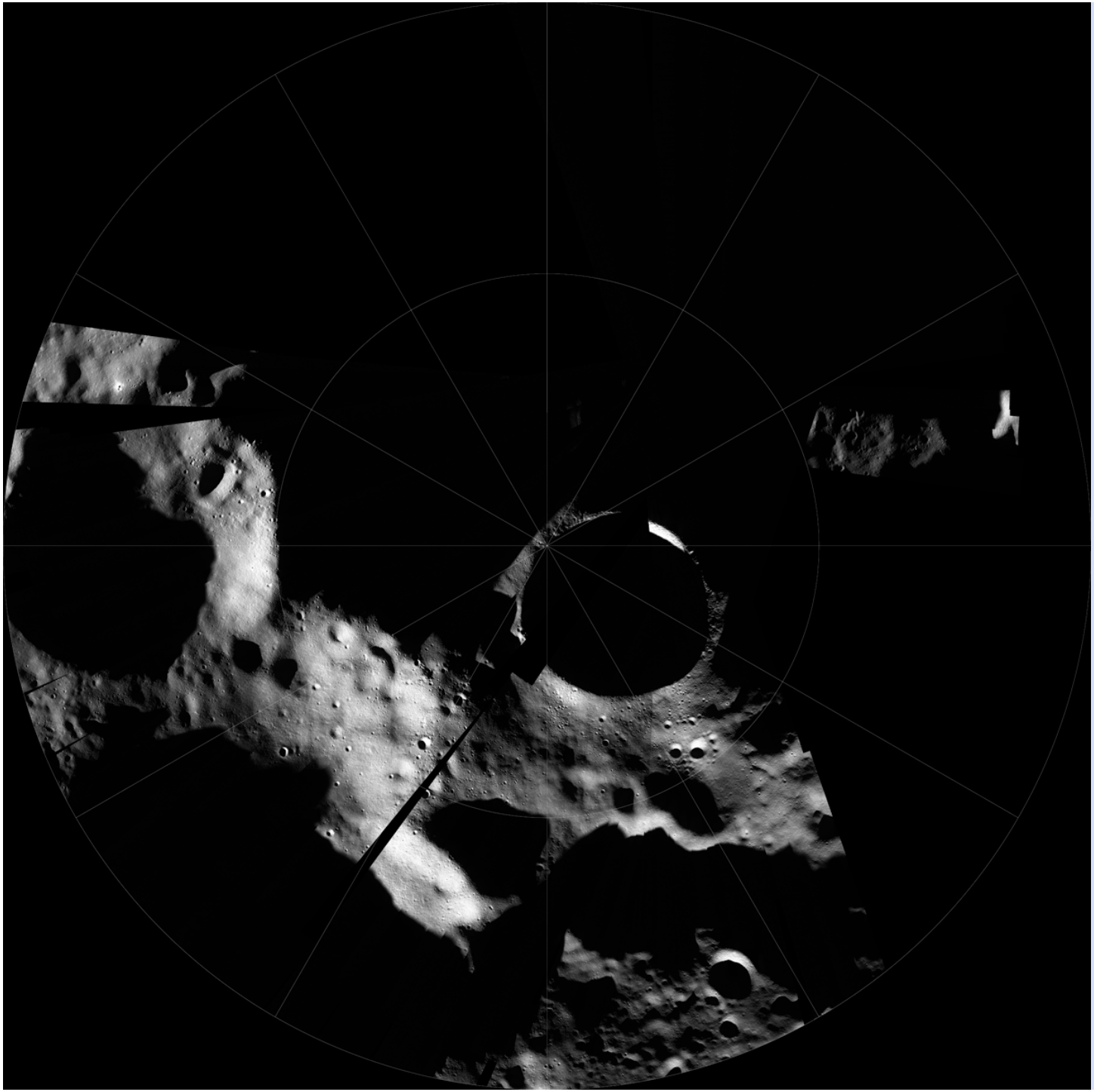



Shadow or secondary ejecta?
464 meters wide

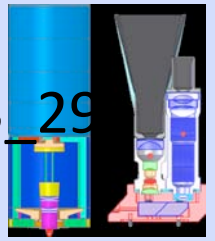

Crater interior, 500 m wide

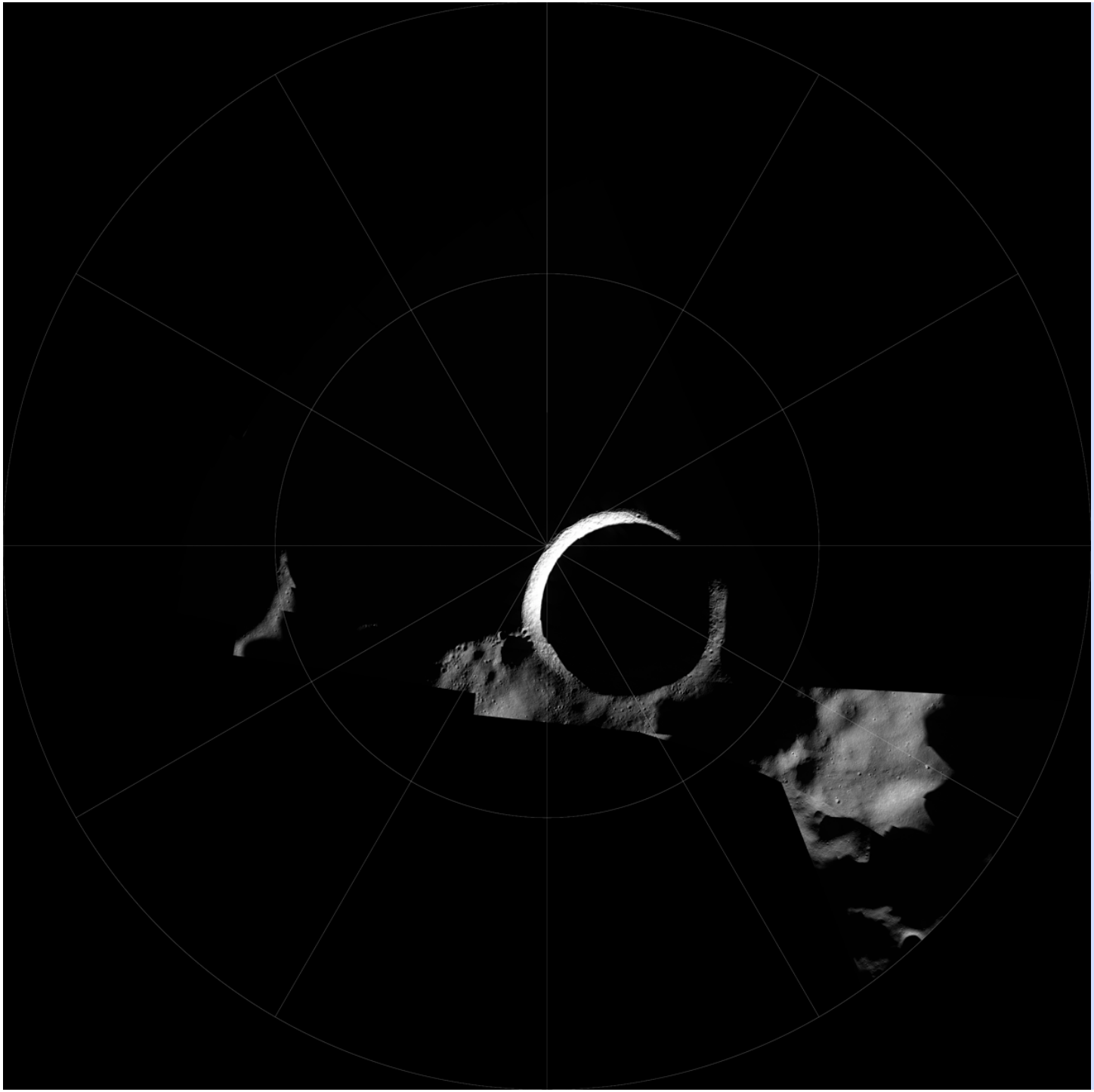

Hevelius Formation (NW of Orientale)
WAC Global Mosaic 1/4 resolution (400 m/p)


17 km diameter
WAC Global Full Res 100 m/p

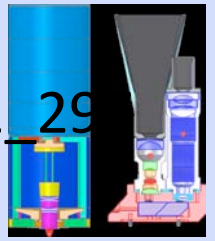


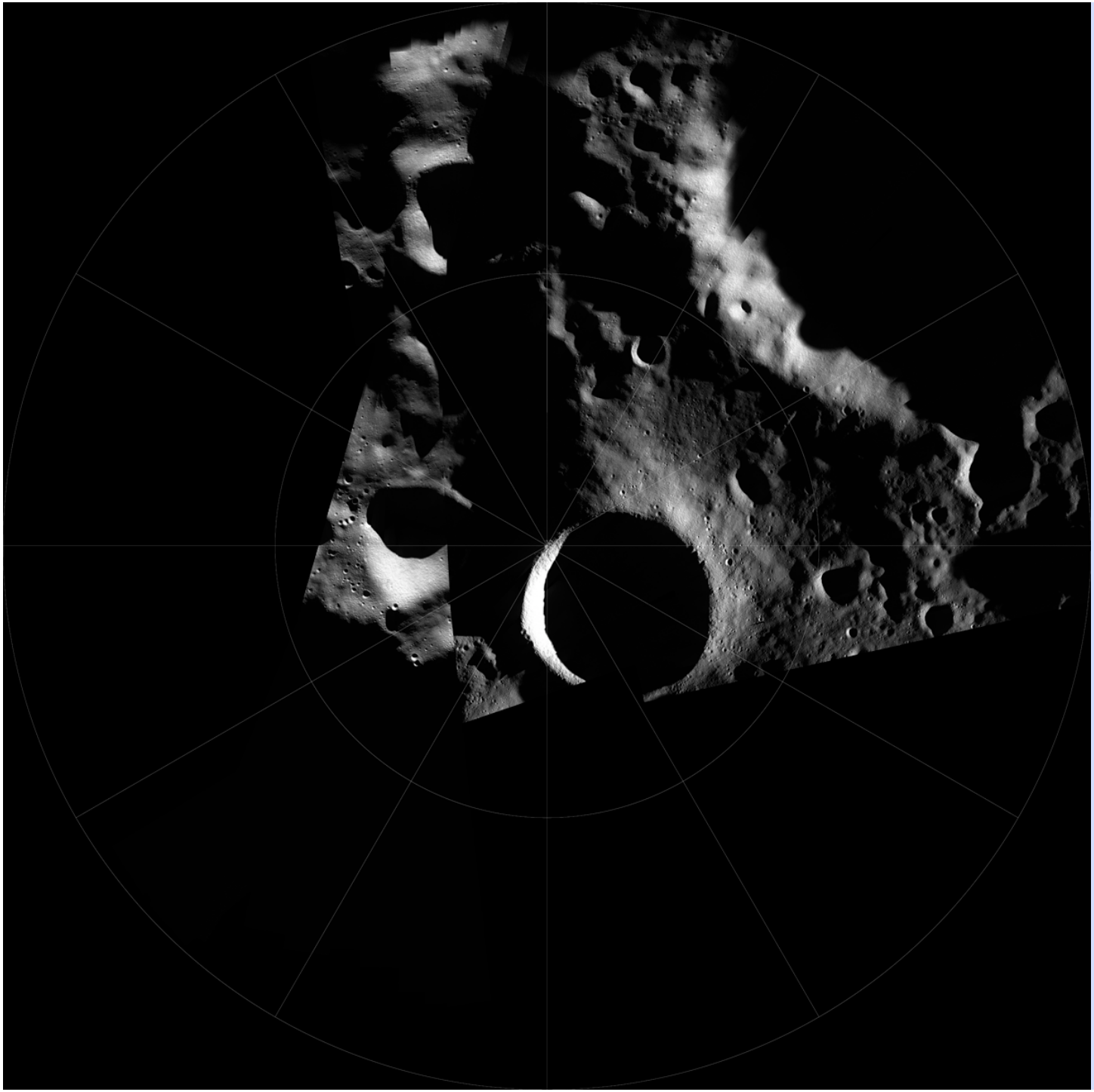
DOY:283_29



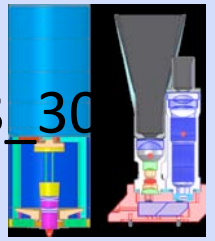


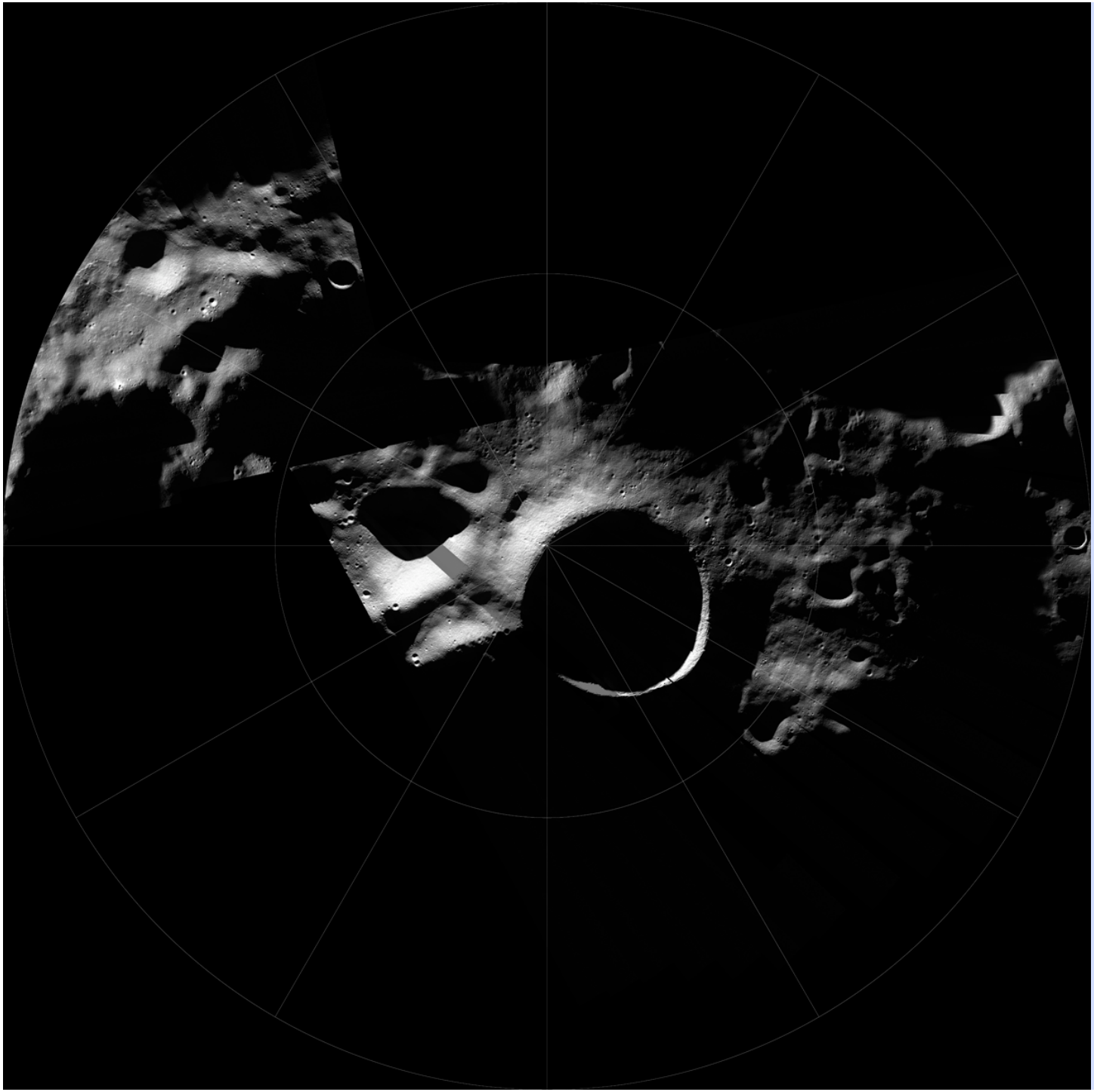
DOY:292_29



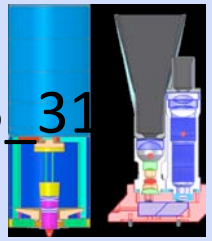


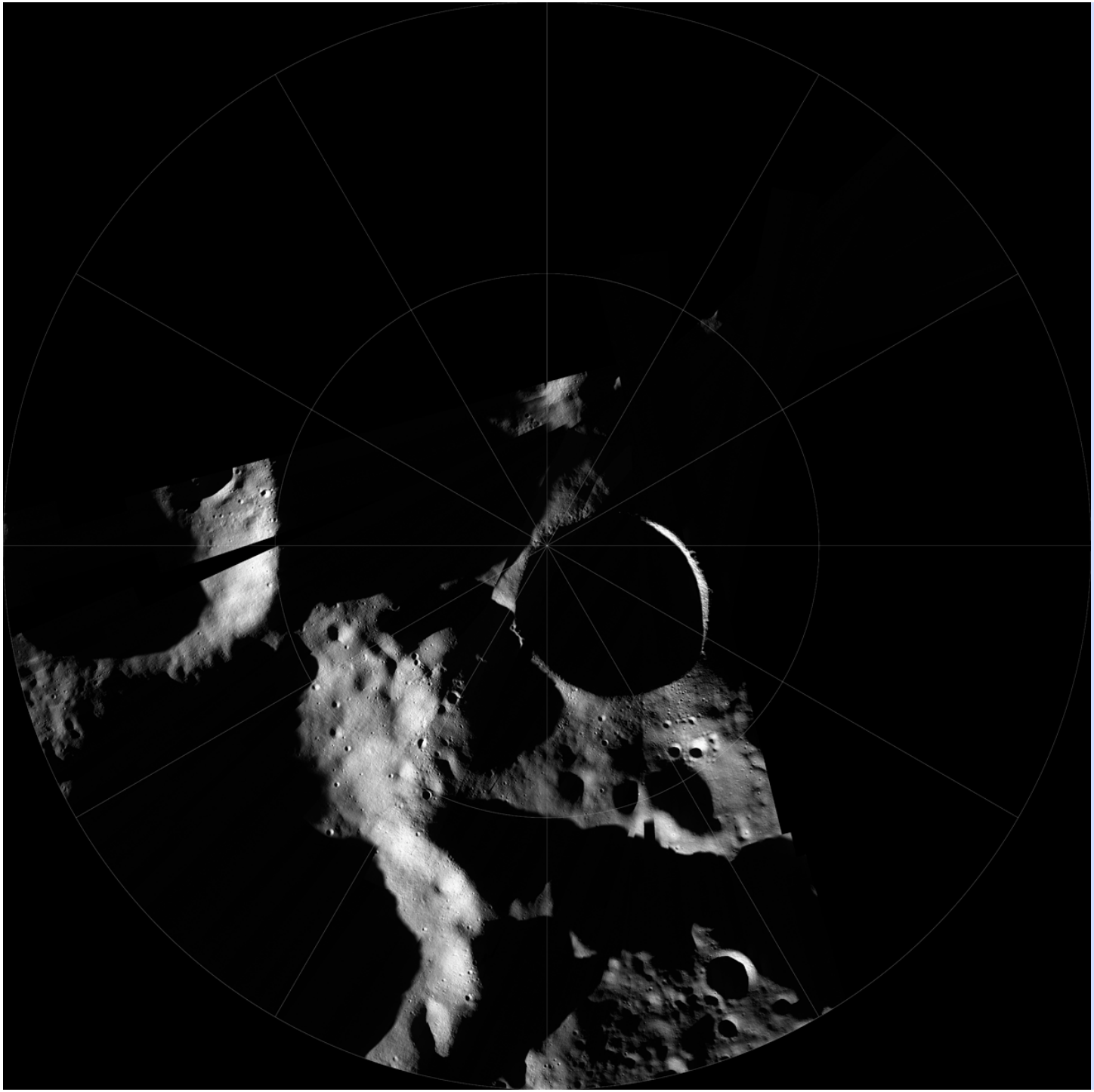
DOY:298_30



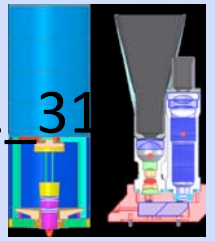


DOY:305_31

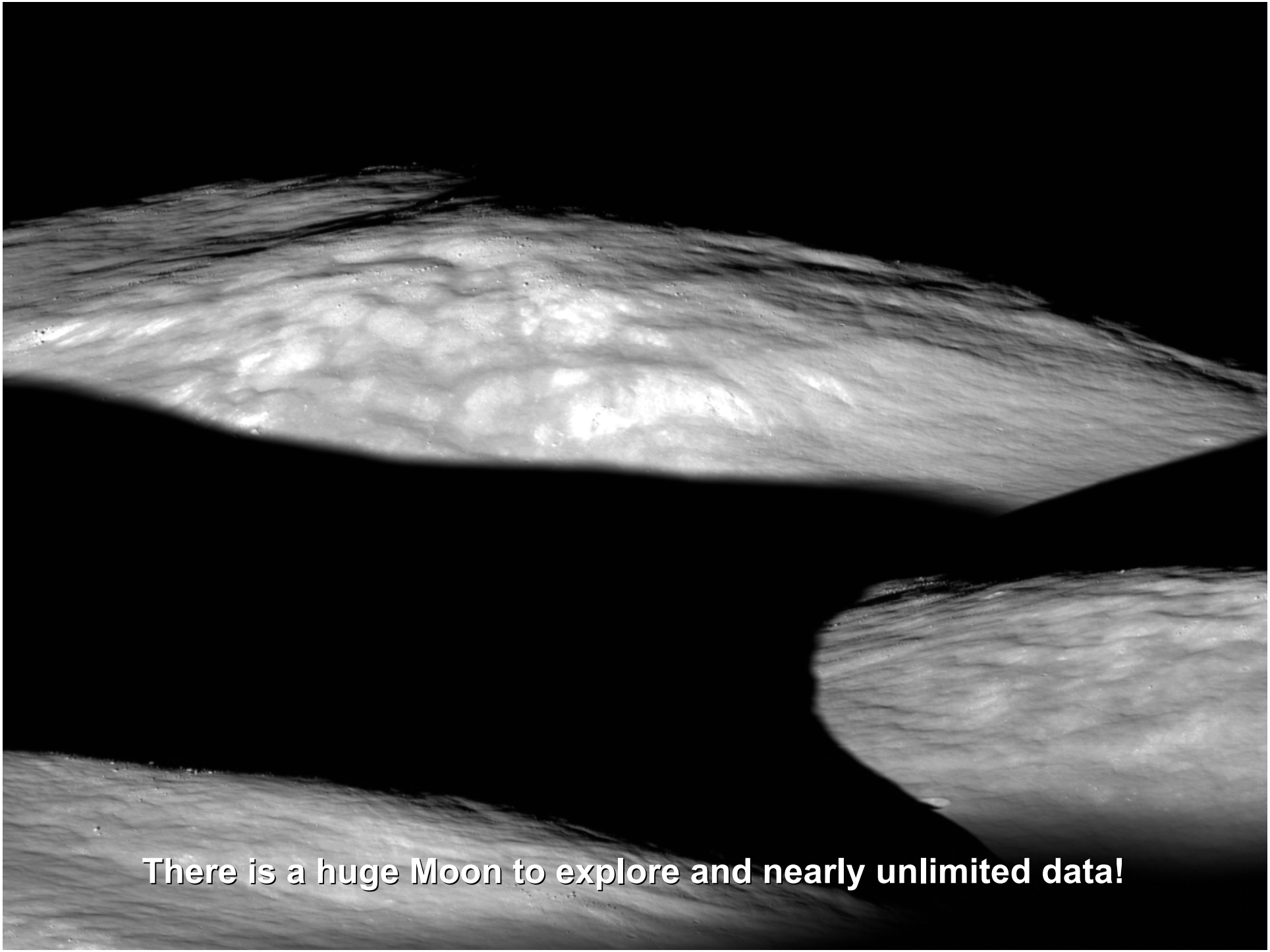




DOY:312_31



Sunset at Bhabha Crater


There is a huge Moon to explore and nearly unlimited data!