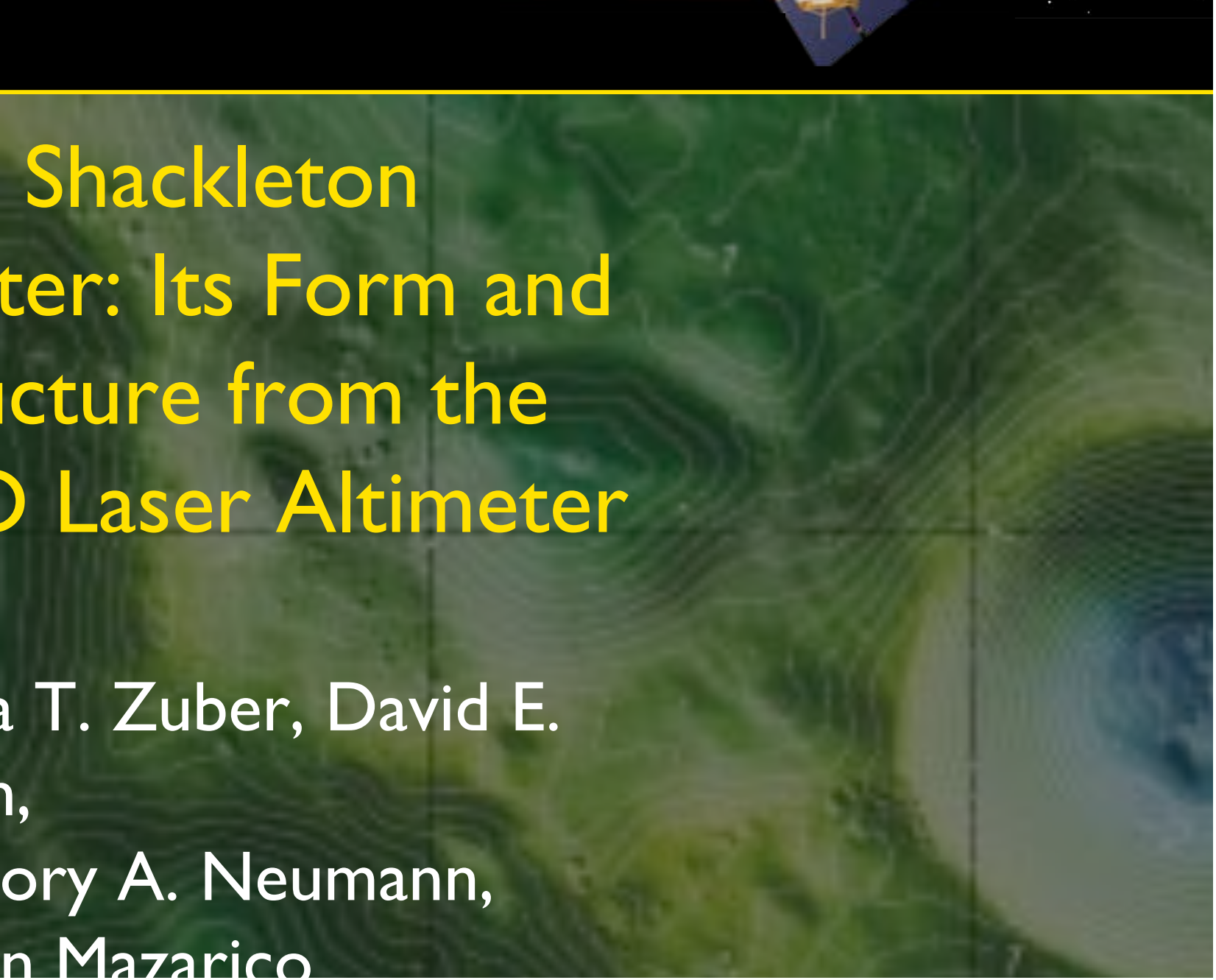
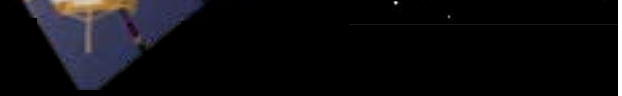


Shackleton
ter: Its Form and
ucture from the
D Laser Altimeter

a T. Zuber, David E.
n,
ory A. Neumann,
n Mazarico

Presentation outline



Use LOLA observations of elevation, roughn
eflectivity to provide quantitative analysis:

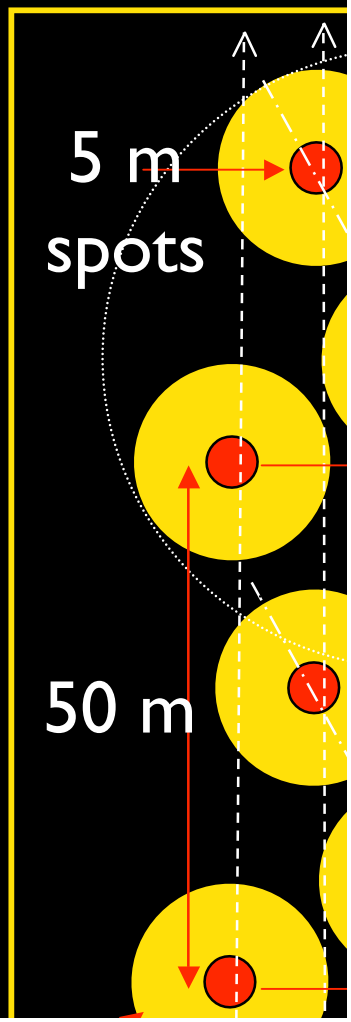
- regional topography, shaded relief, slopes
- crater morphology
- local topography, slopes, roughness, reflec

ERO 50-km mapping orbit

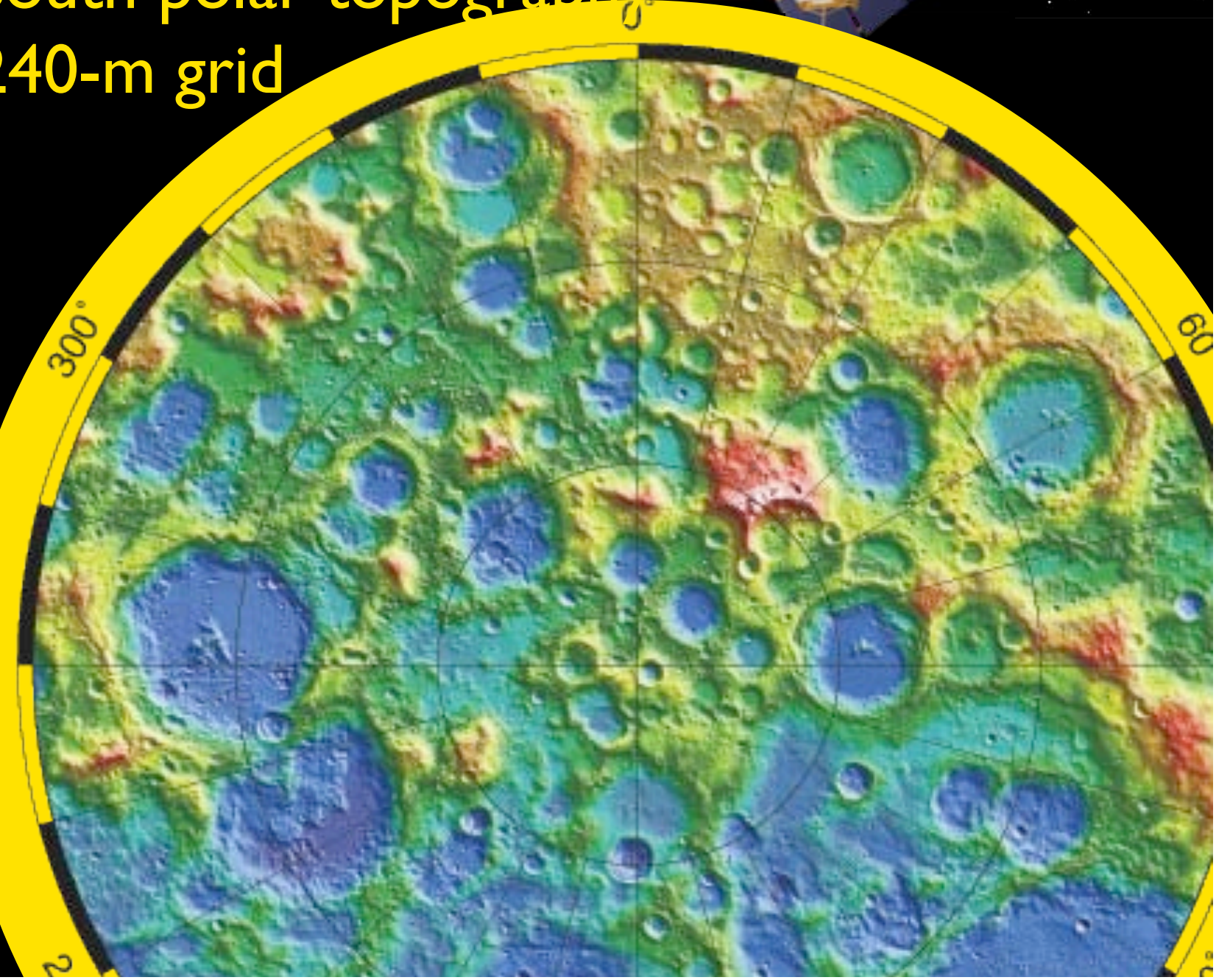
5-m spot provides:
ange to surface
ootprint-scale surface roughness
064-nm reflectance of surface

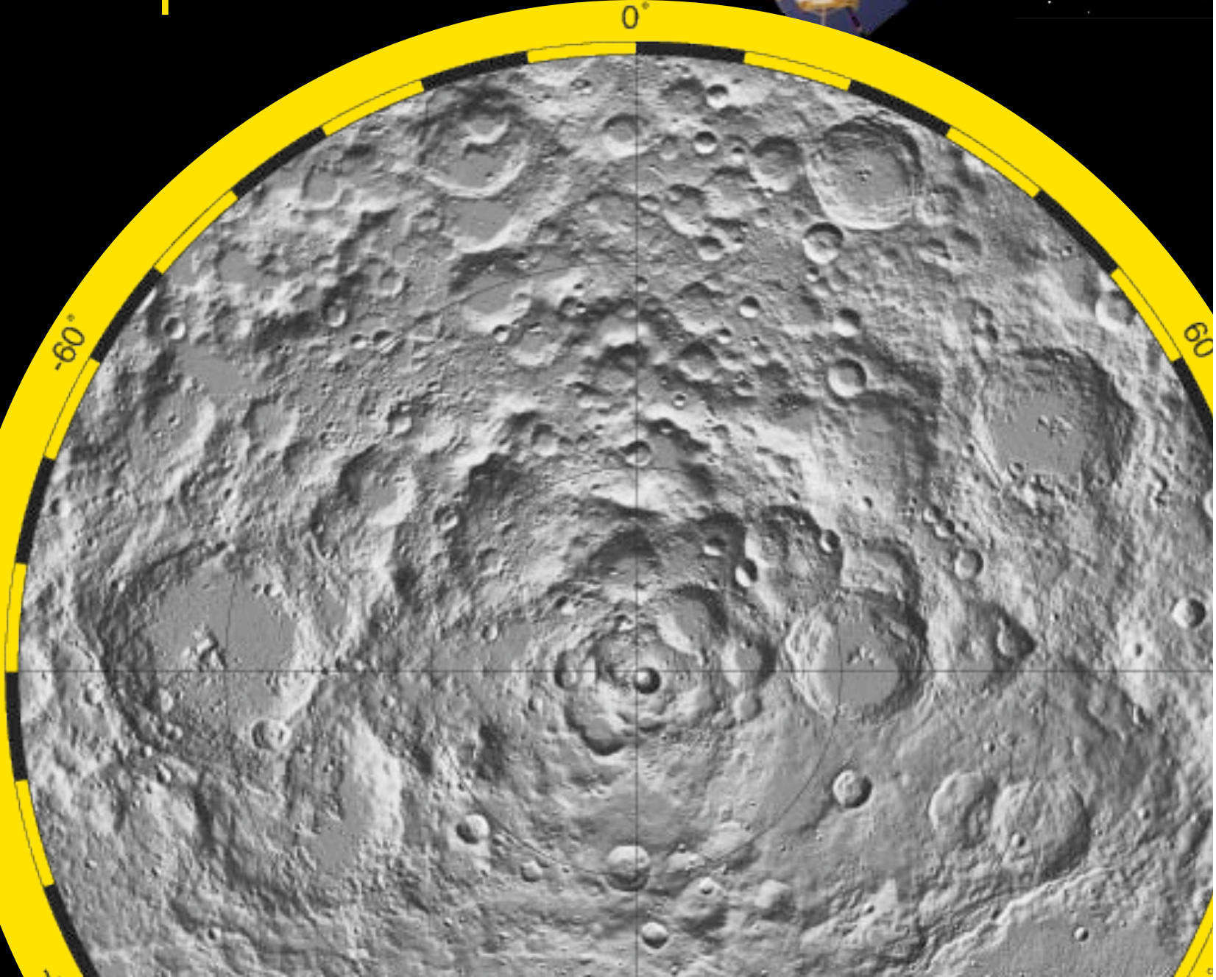
smitter Energy: 2.7/3.2 mJ

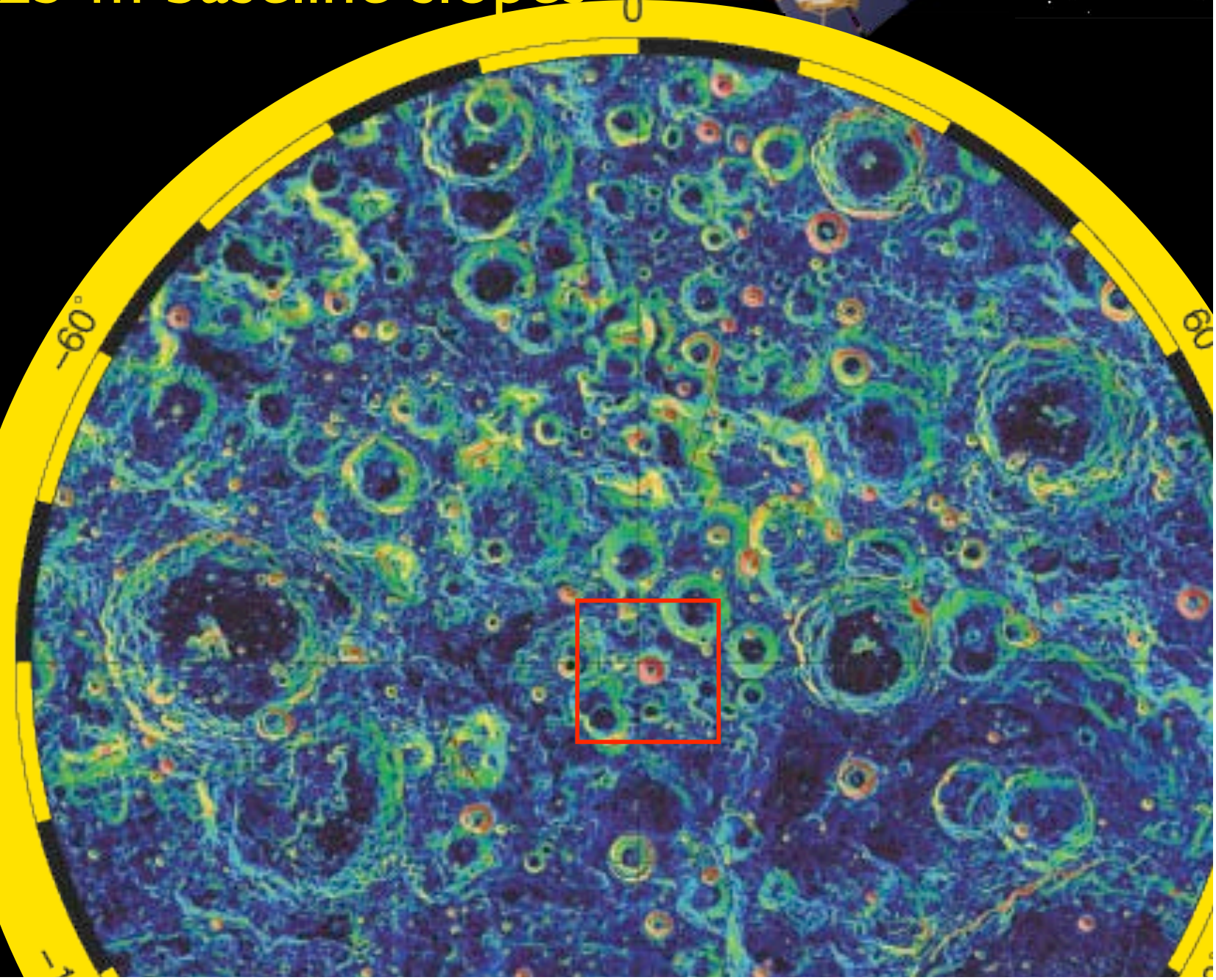
<u>active Optical Element</u>: 5 beams
100-μrad divergence (red spot)
<u>eiver</u>: 0.14-m diameter
: 400-μrad each spot (gold area)

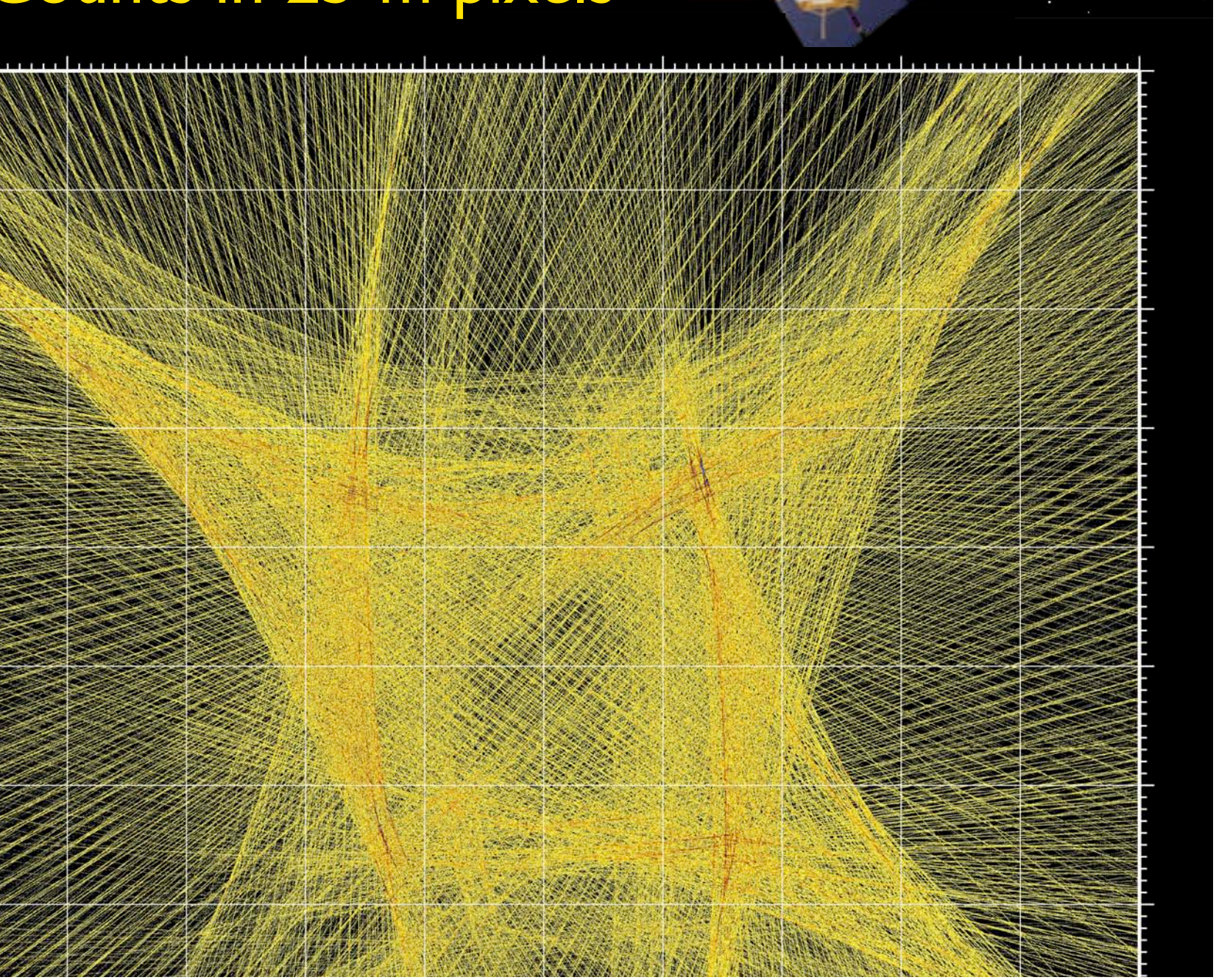


South polar topography
240-m grid

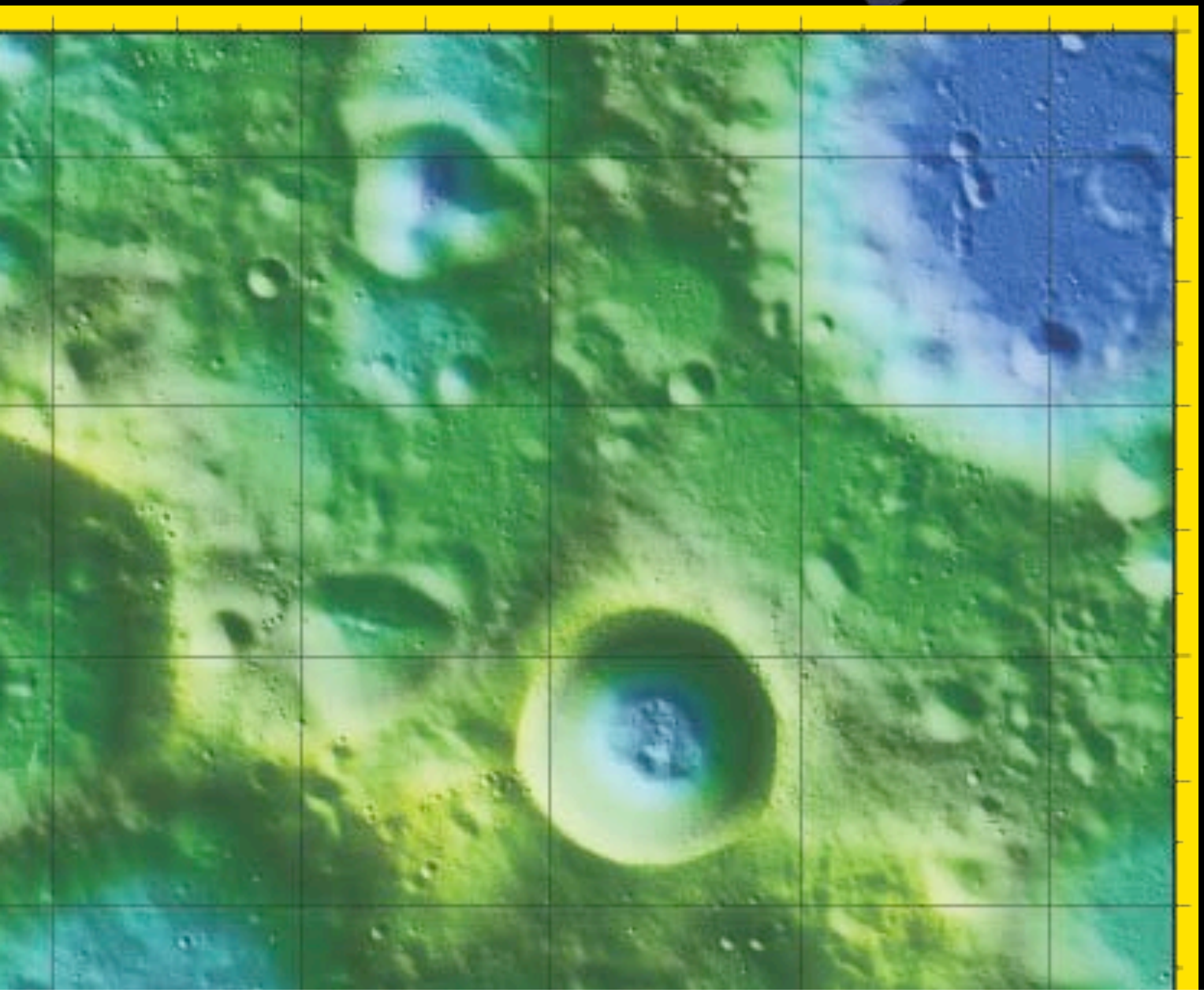


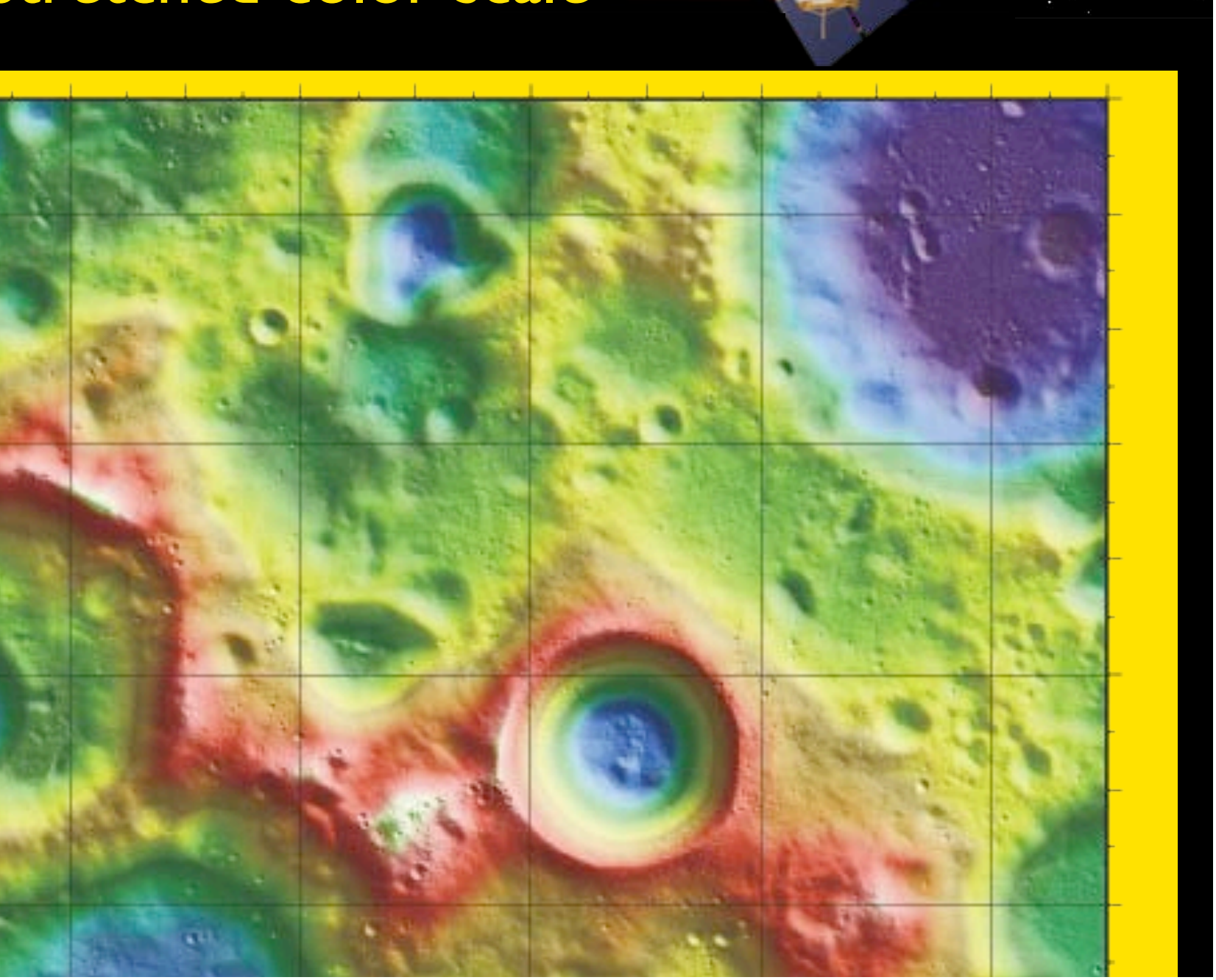

0°
-60°
60

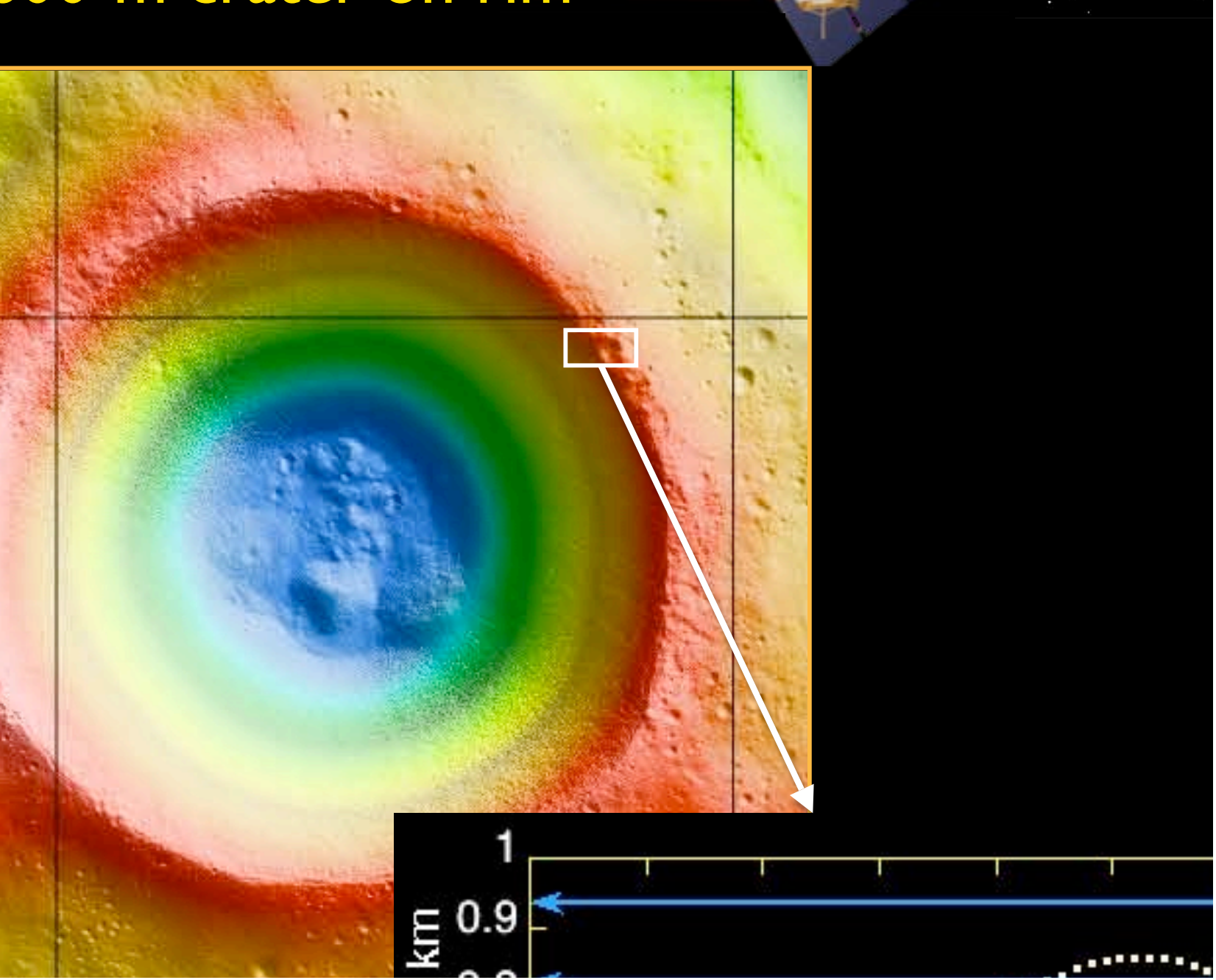

0
-60°
60

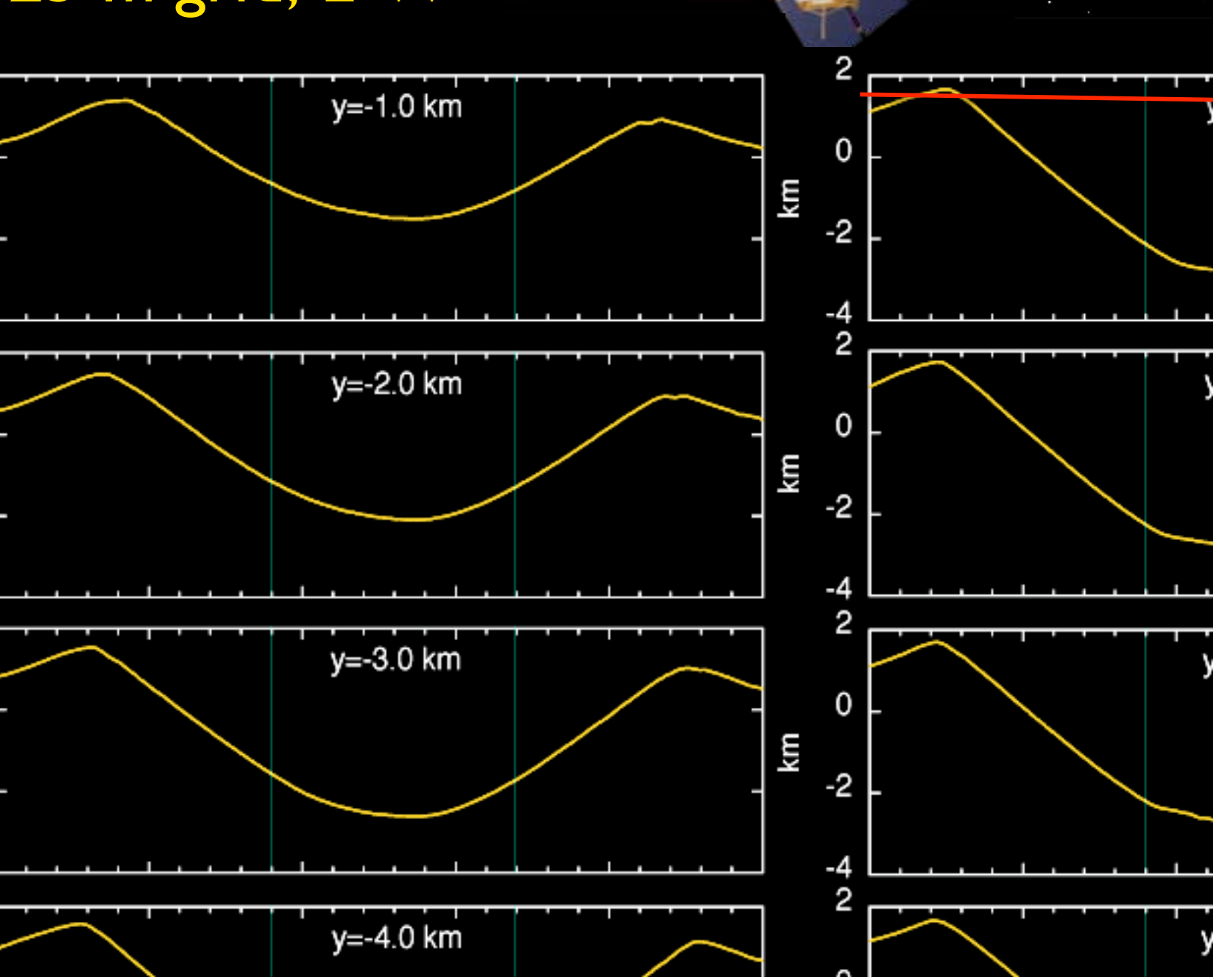

Counts in 10 m pixels

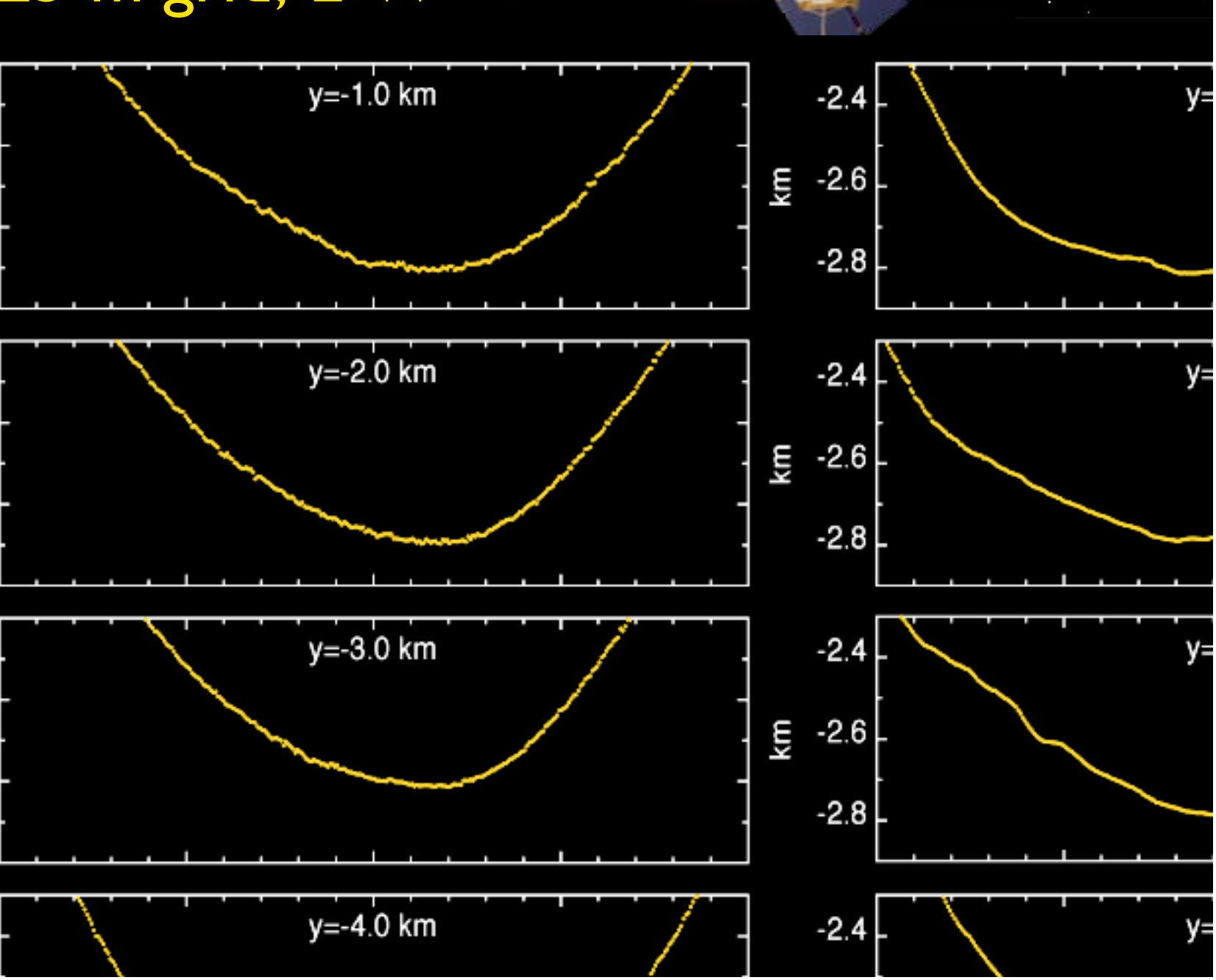
Local topography

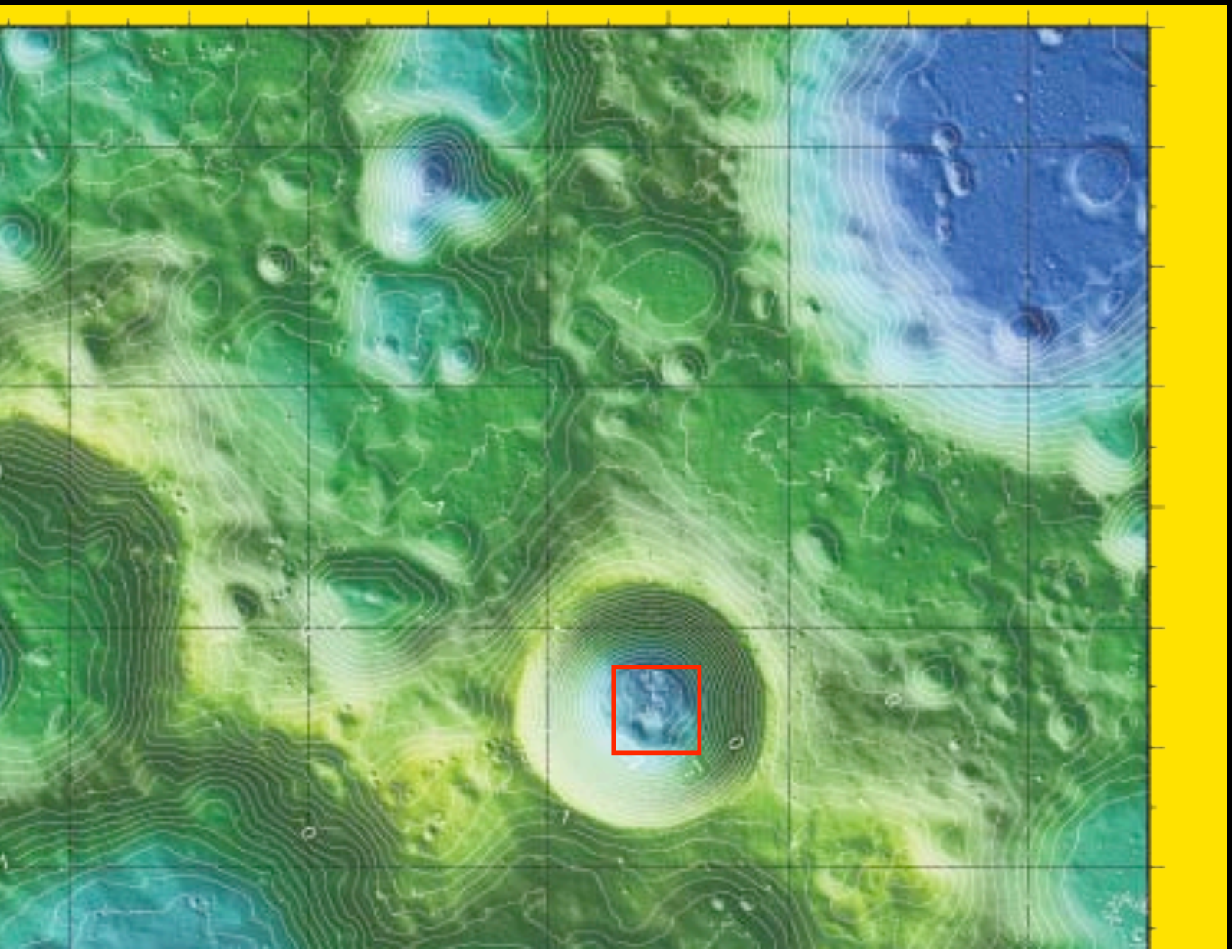




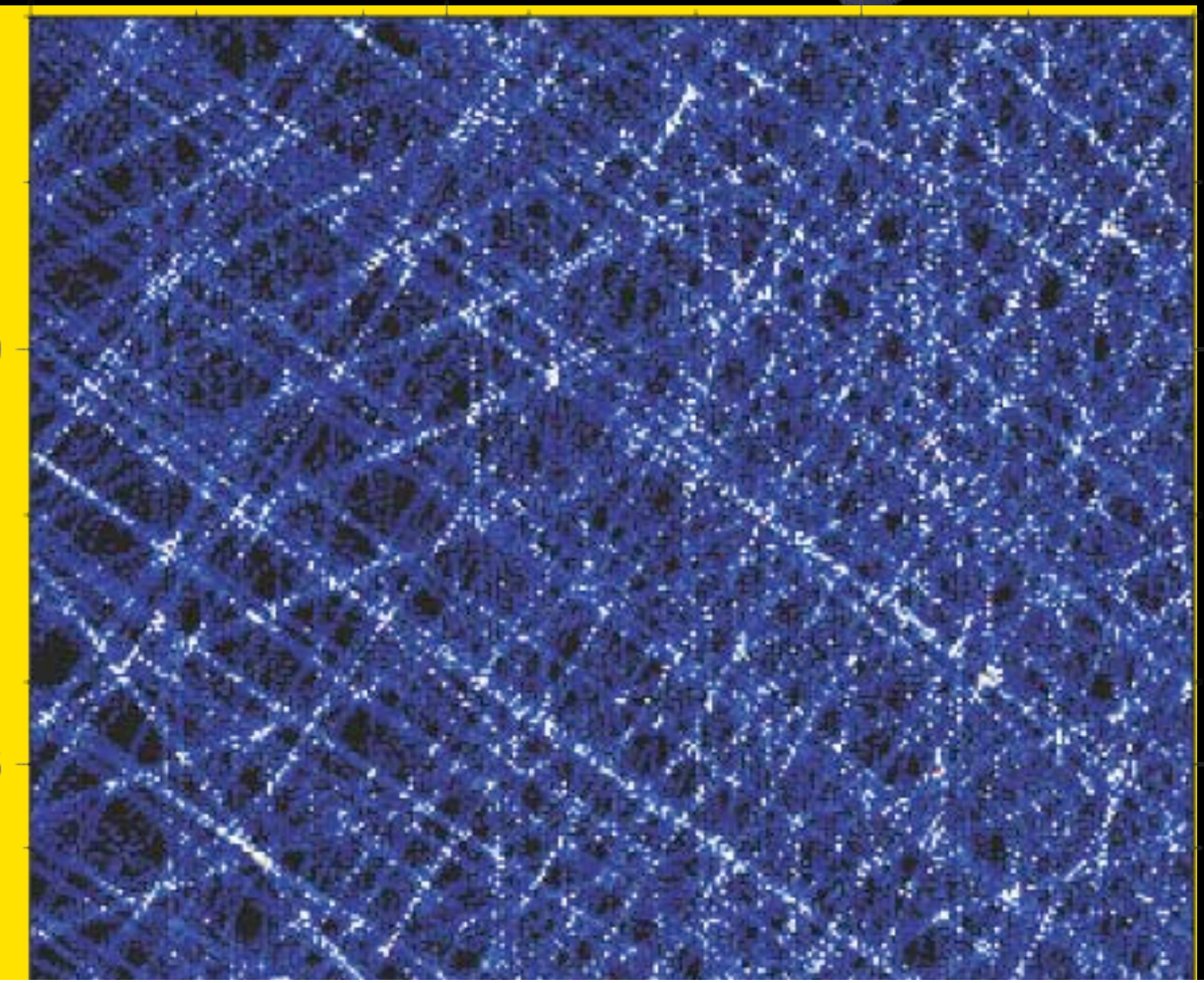

1
0.9
km


y=-1.0 km
y=-2.0 km
y=-3.0 km
y=-4.0 km
km
2
0
-2
-4

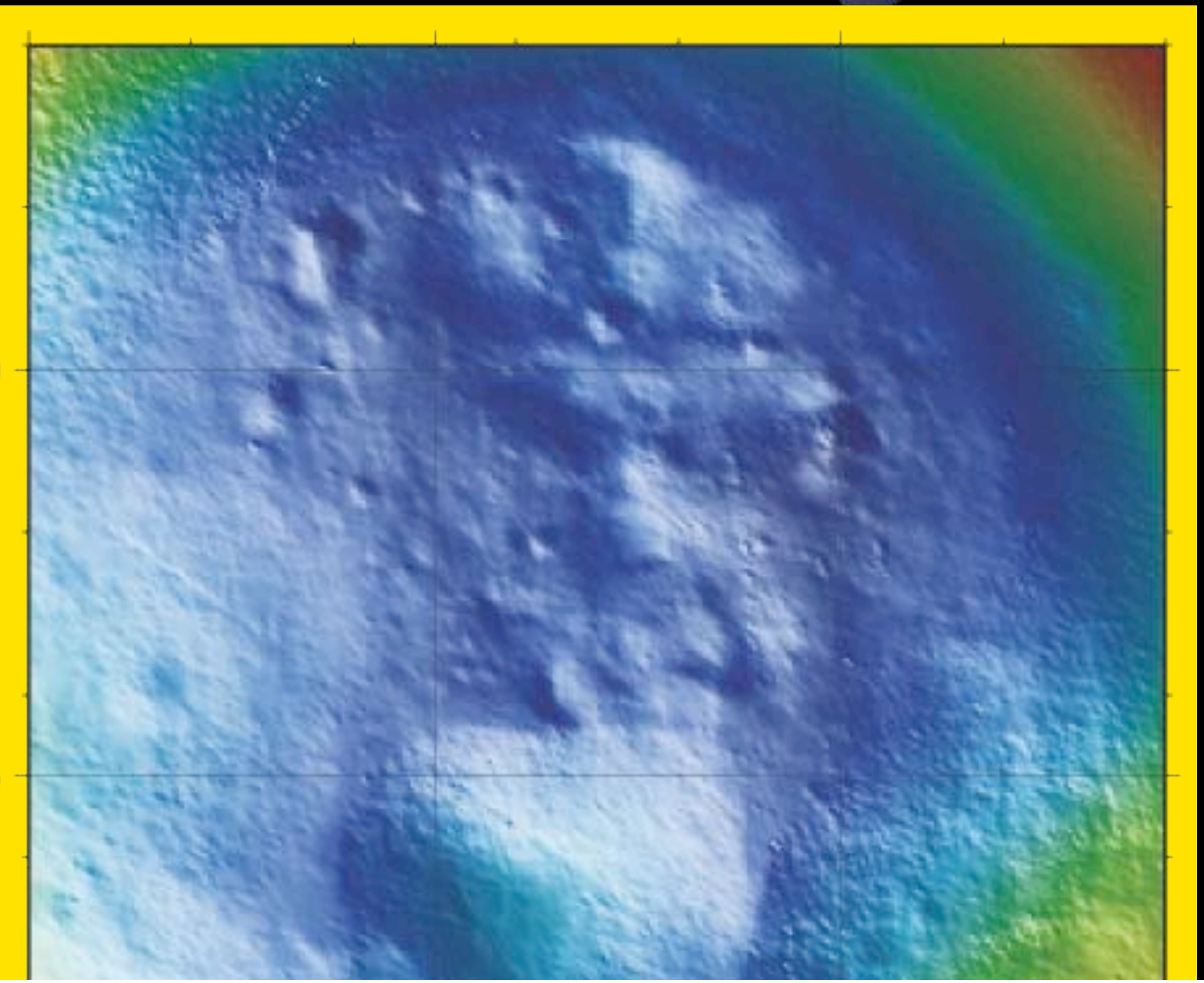

y=-1.0 km
y=-2.0 km
y=-3.0 km
y=-4.0 km
km
-2.4
-2.6
-2.8

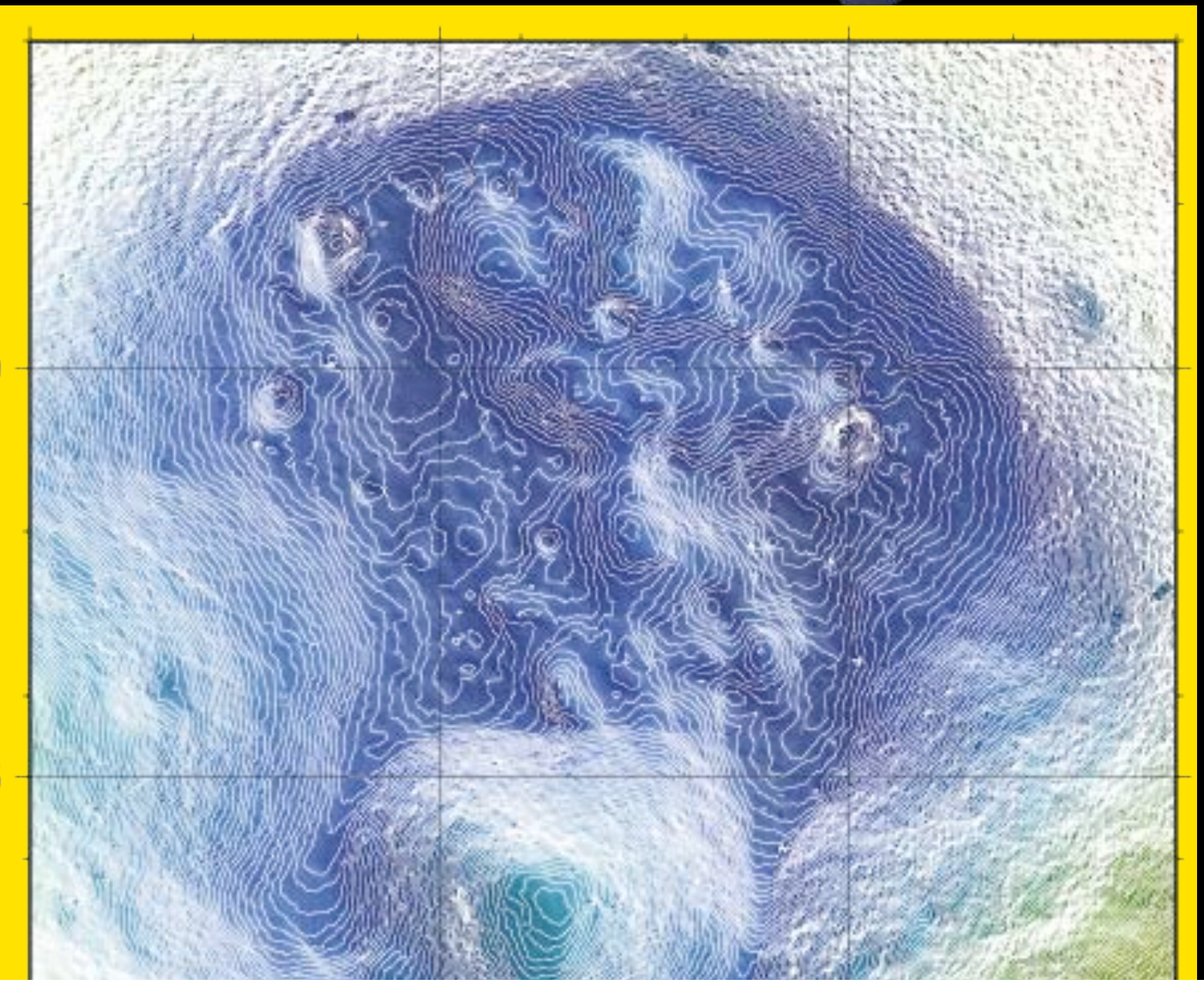


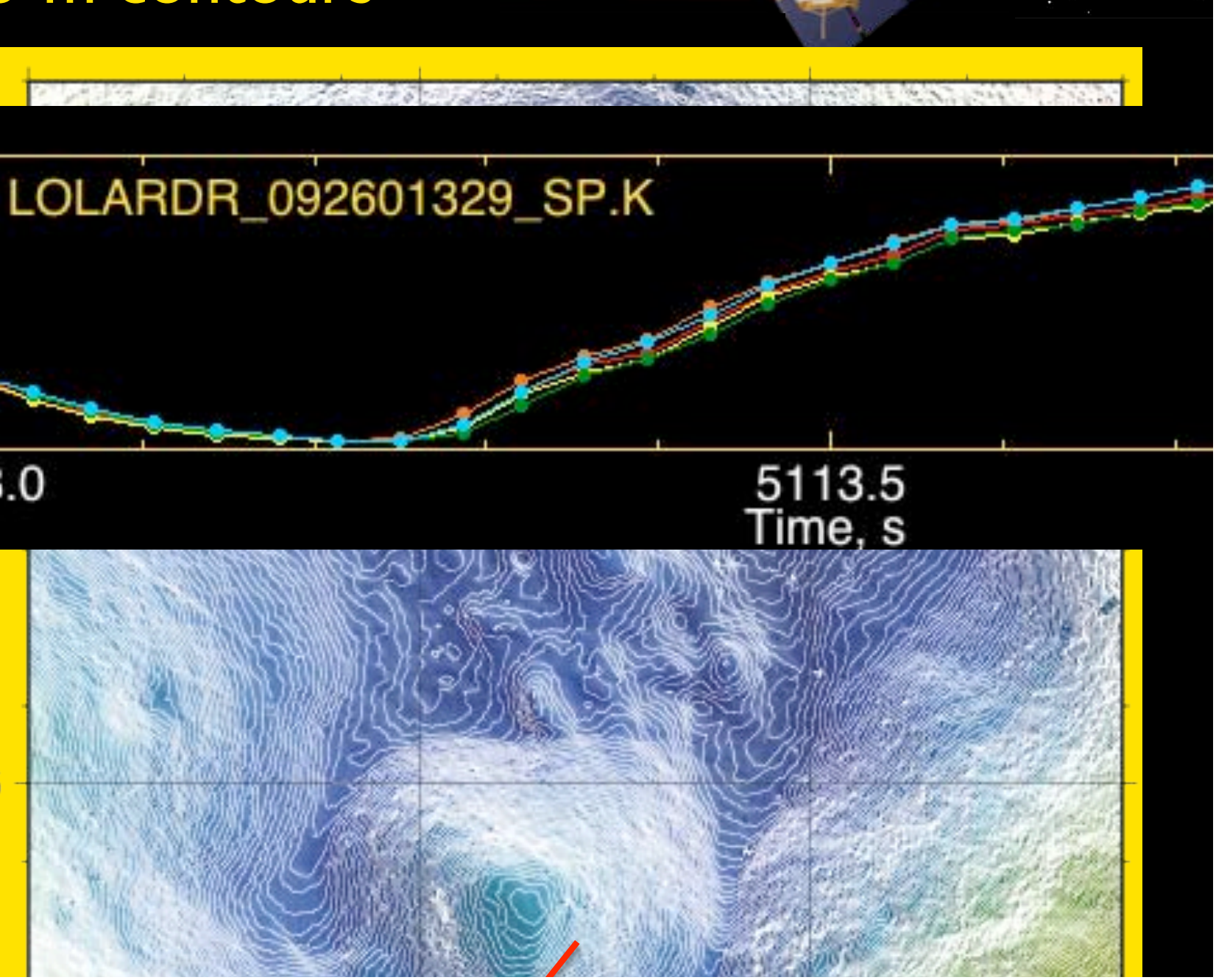
Measurement counts



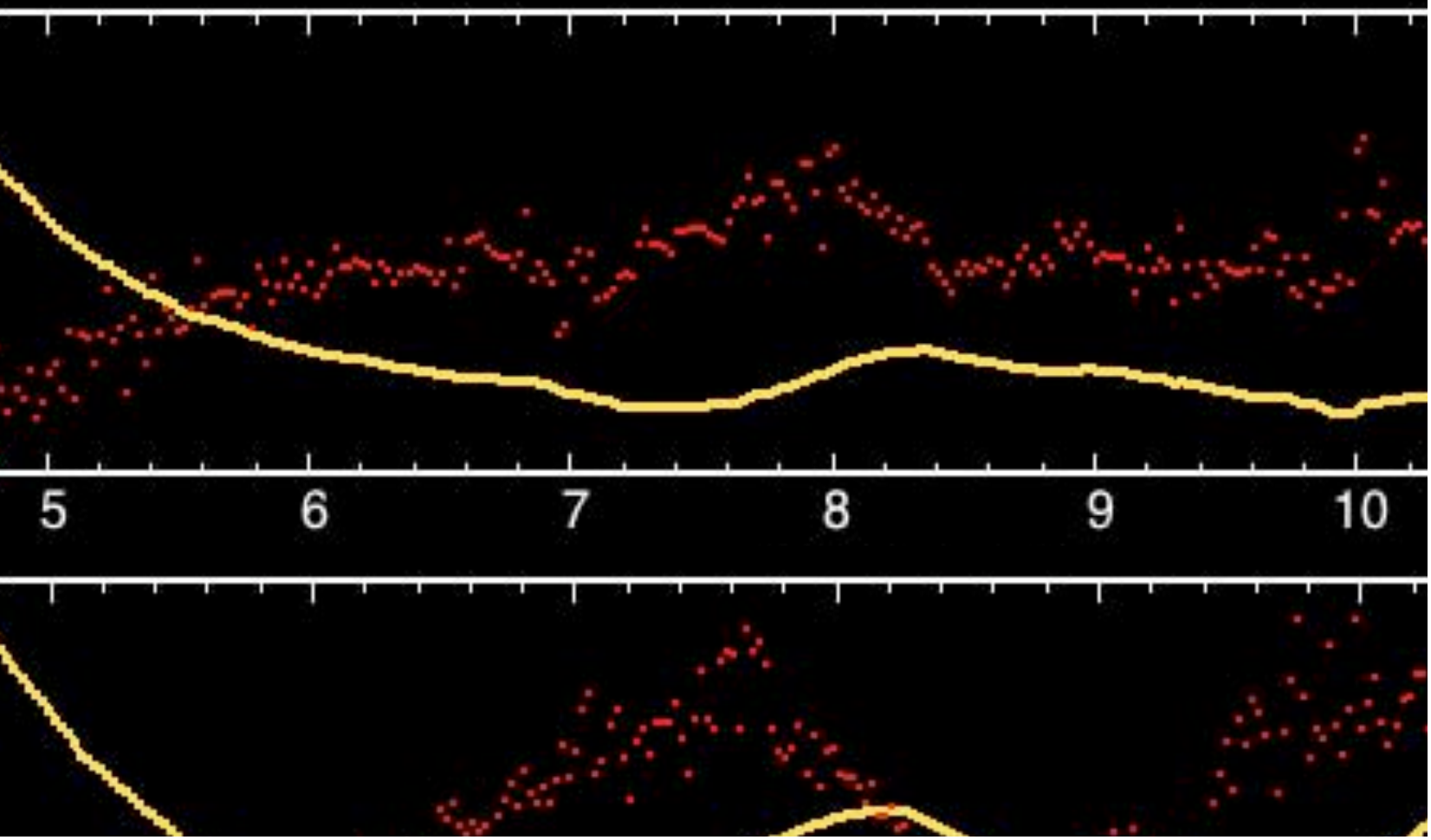
es in Resolution Elevation

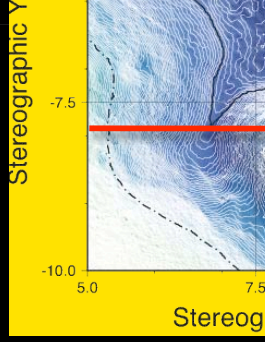


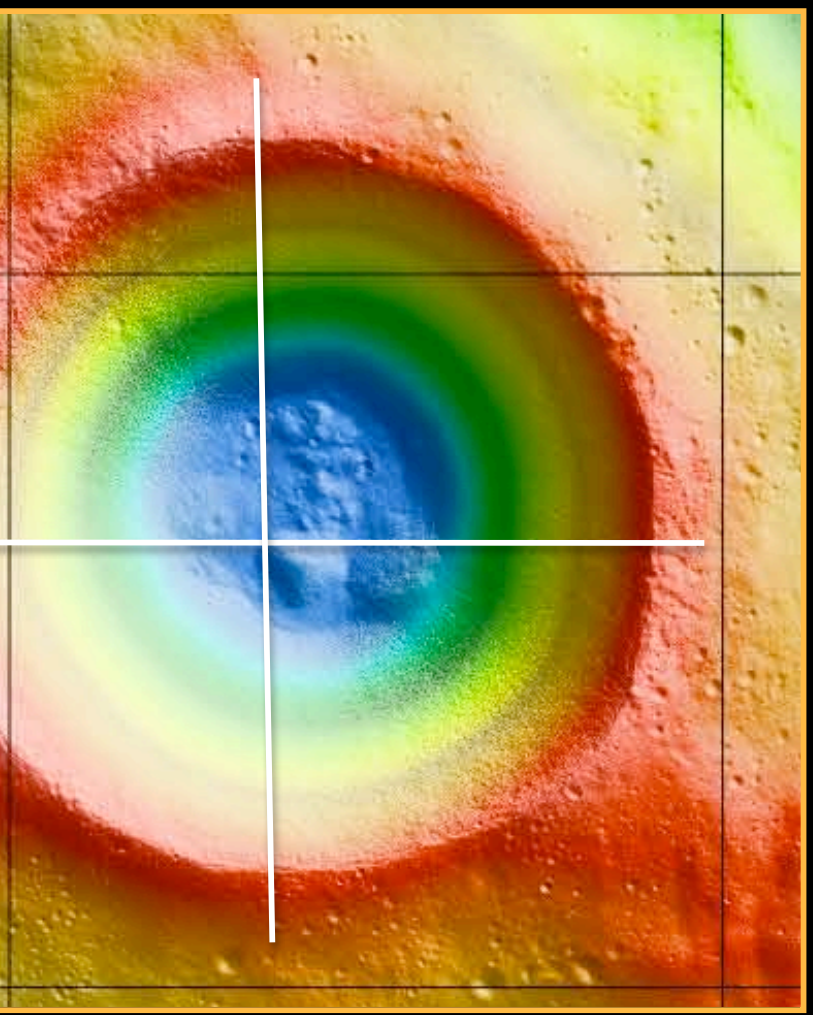


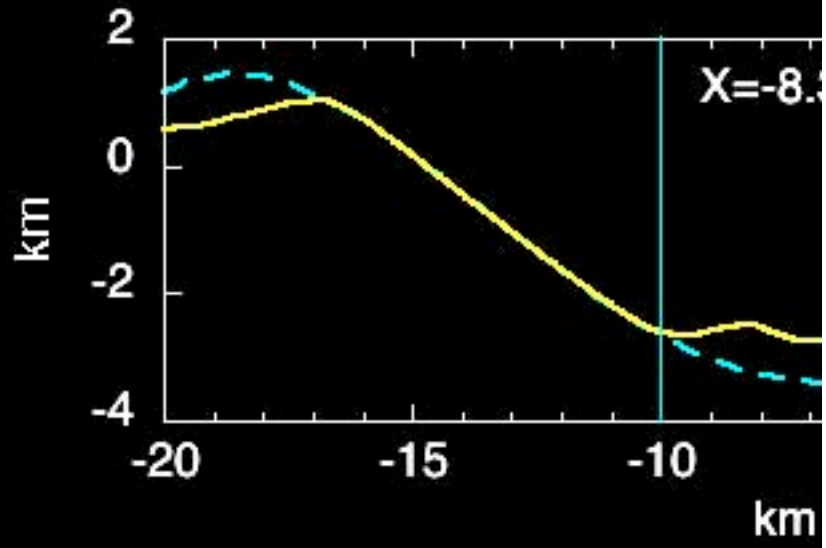

LOLARDR_092601329_SP.K
5113.5
Time, s

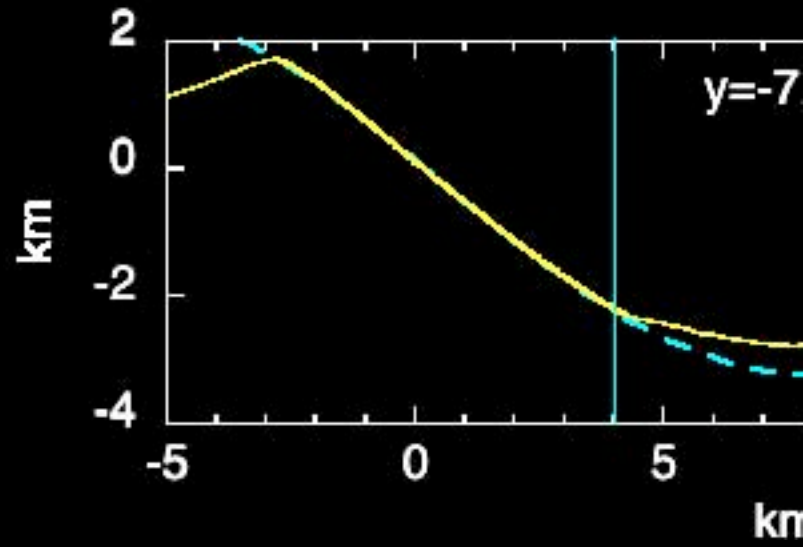
Topography and slope
25-m baselines

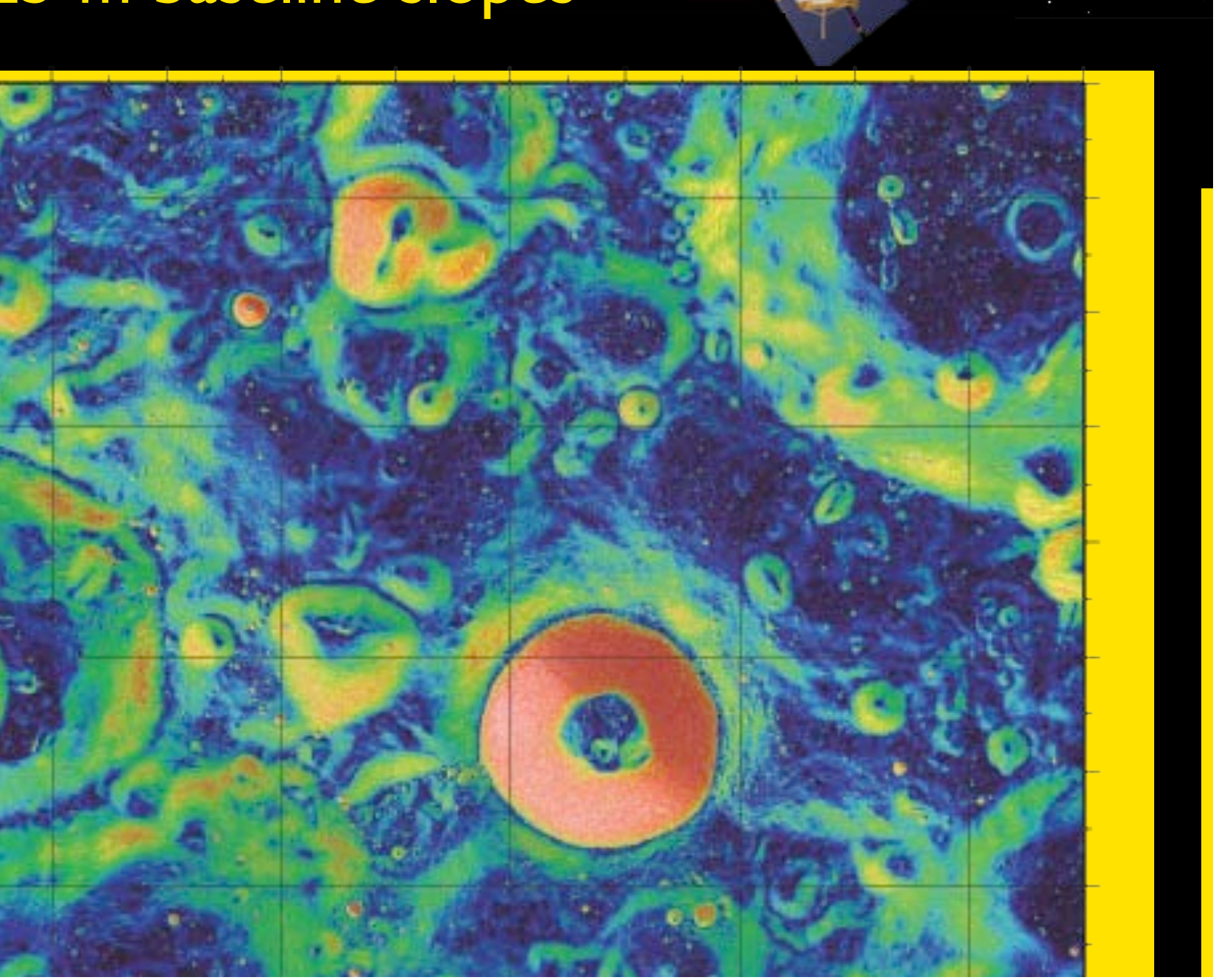




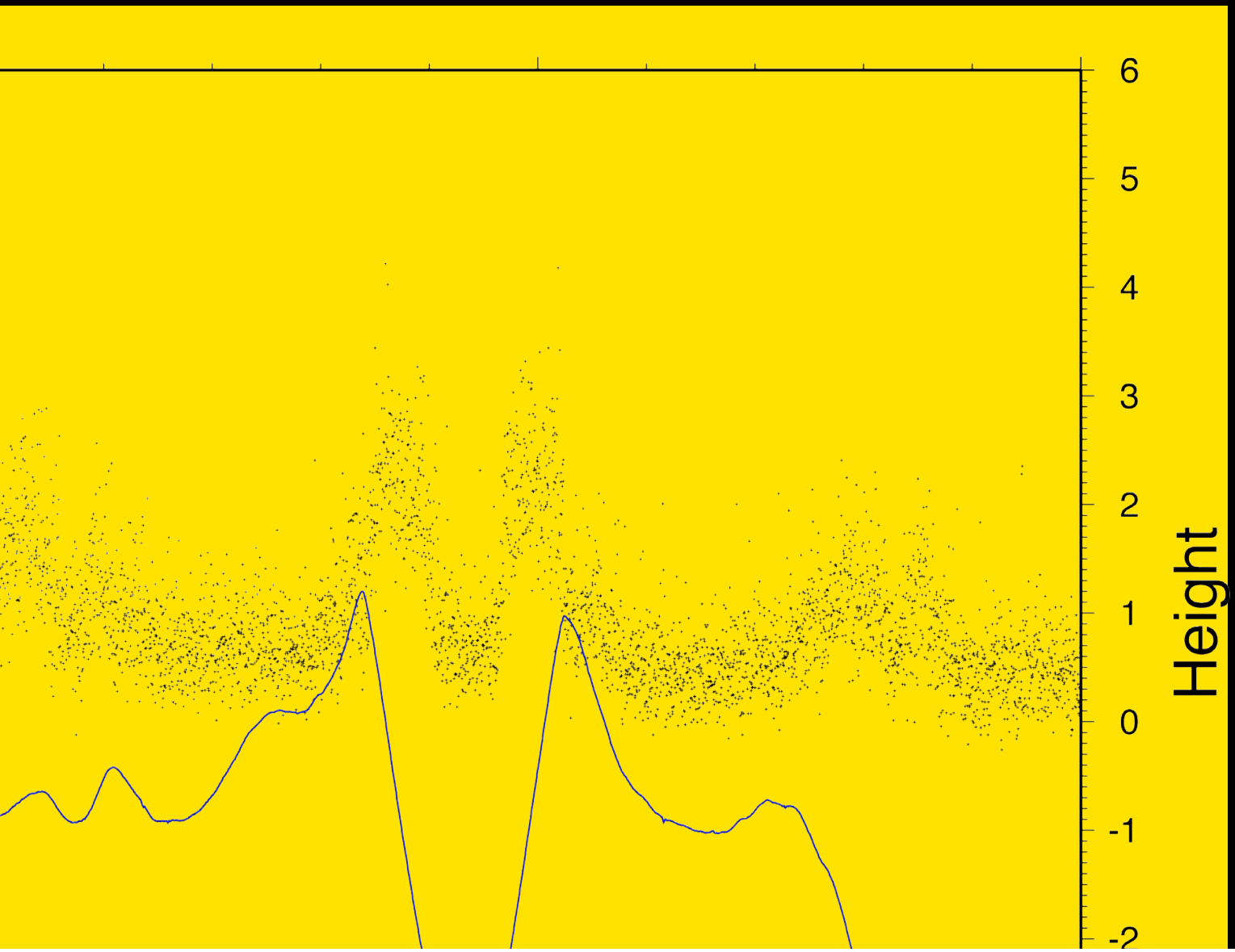



2
0
-2
-4
km
-20
-15
-10
km
X=-8.

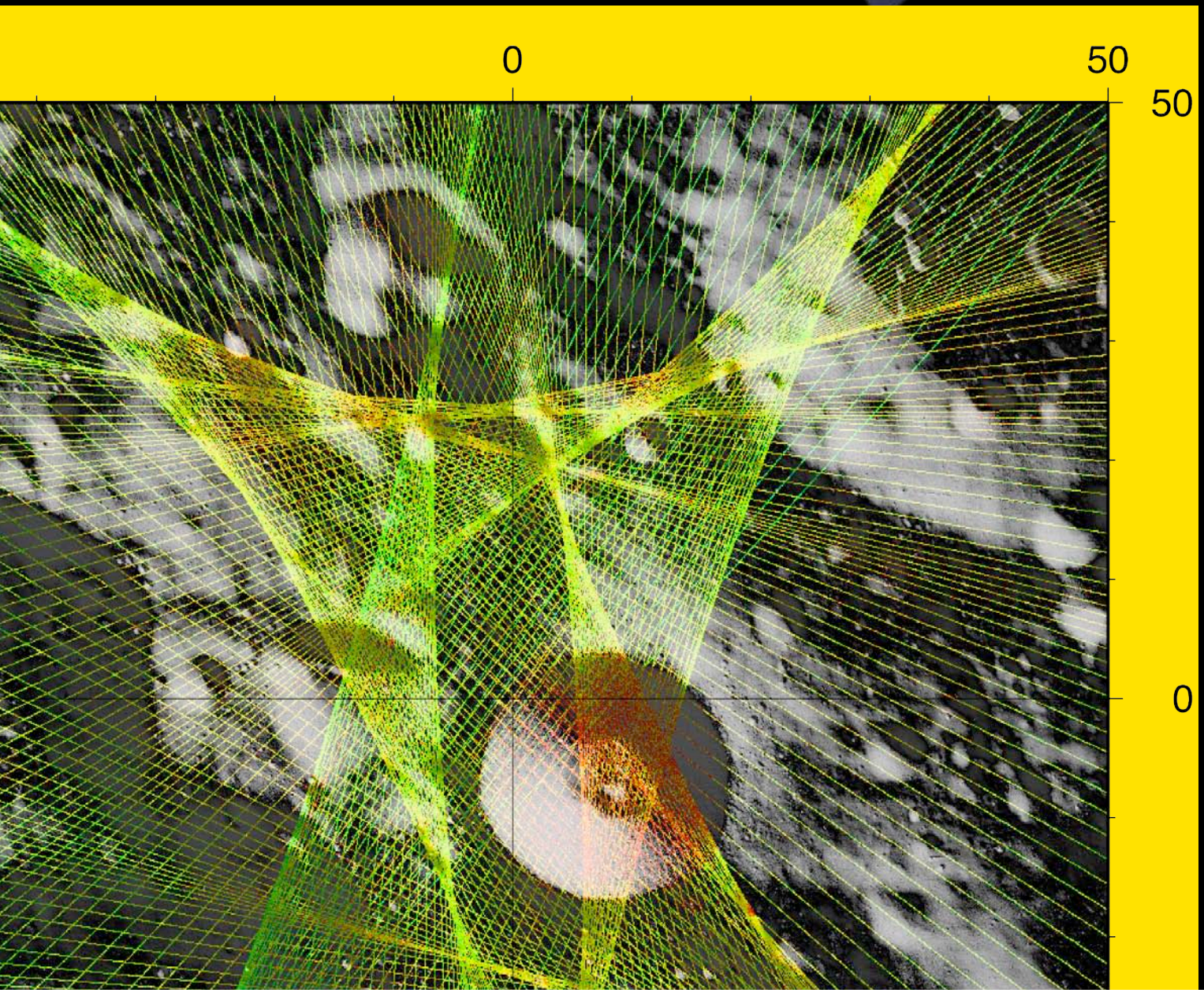

2
0
-2
-4
km
-5
0
5
km
y=-7



o-m roughness from pulse width



Sectional Penetrance



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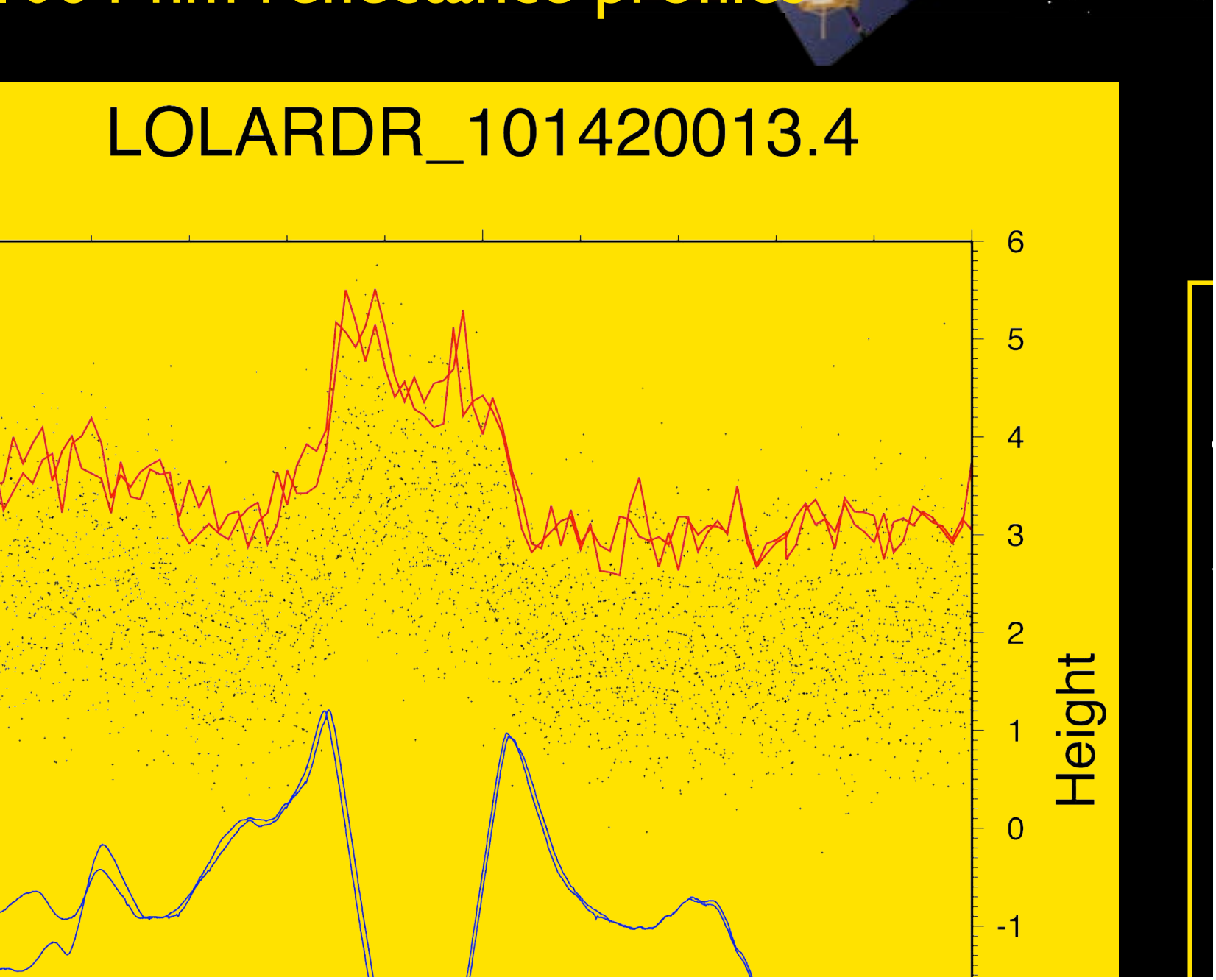
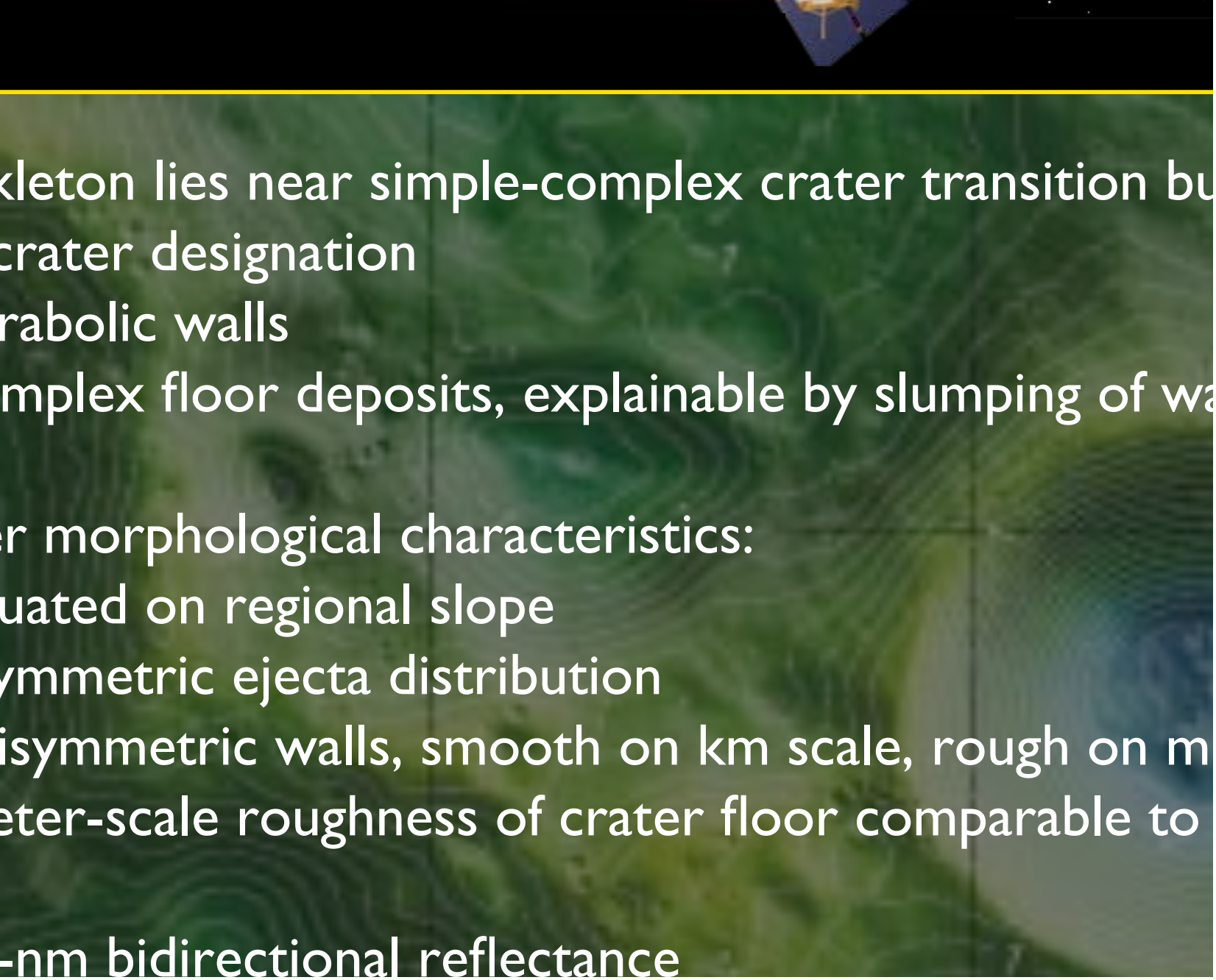

LOLARDR_101420013.4
6
5
4
3
2
1
0
-1
Height

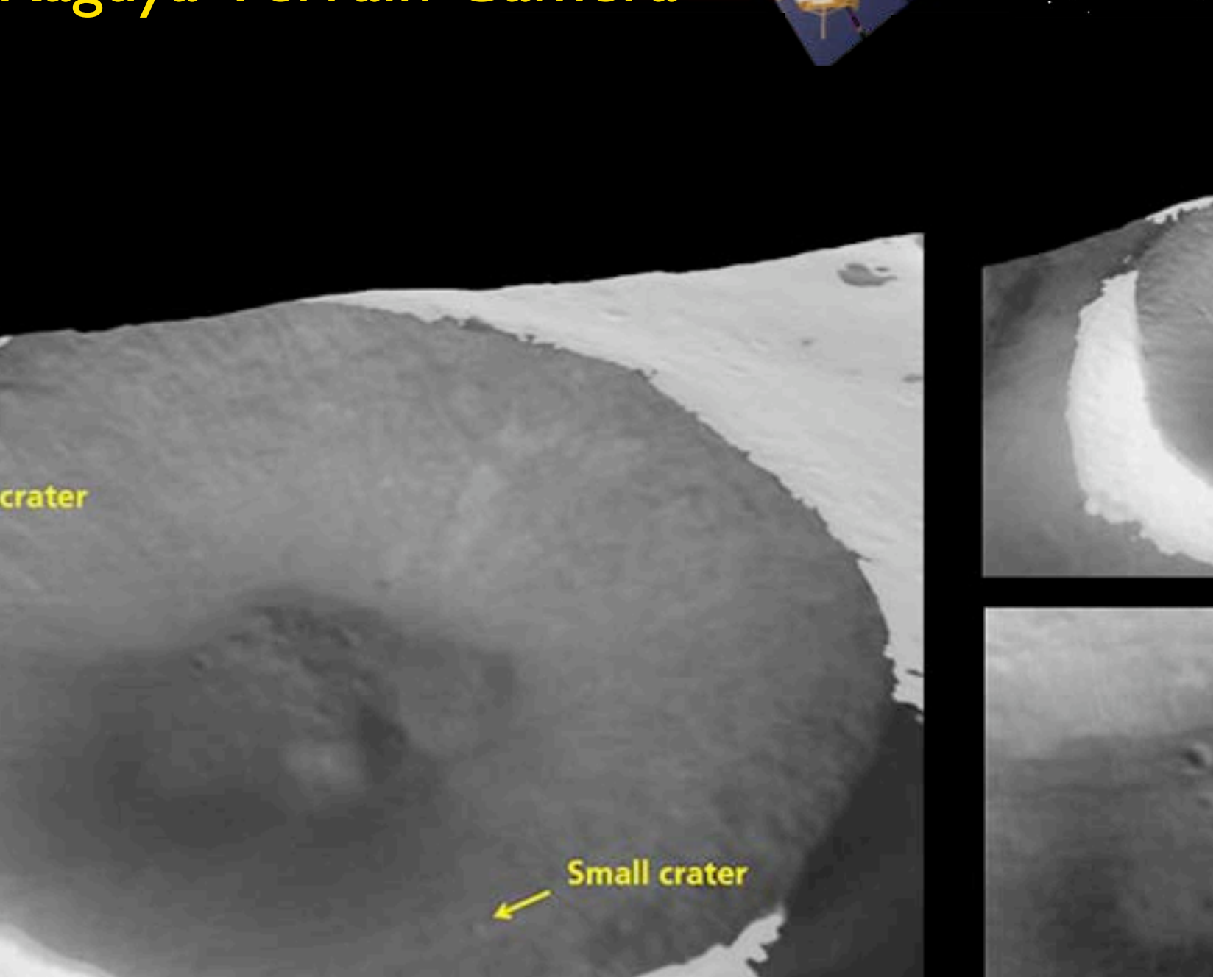


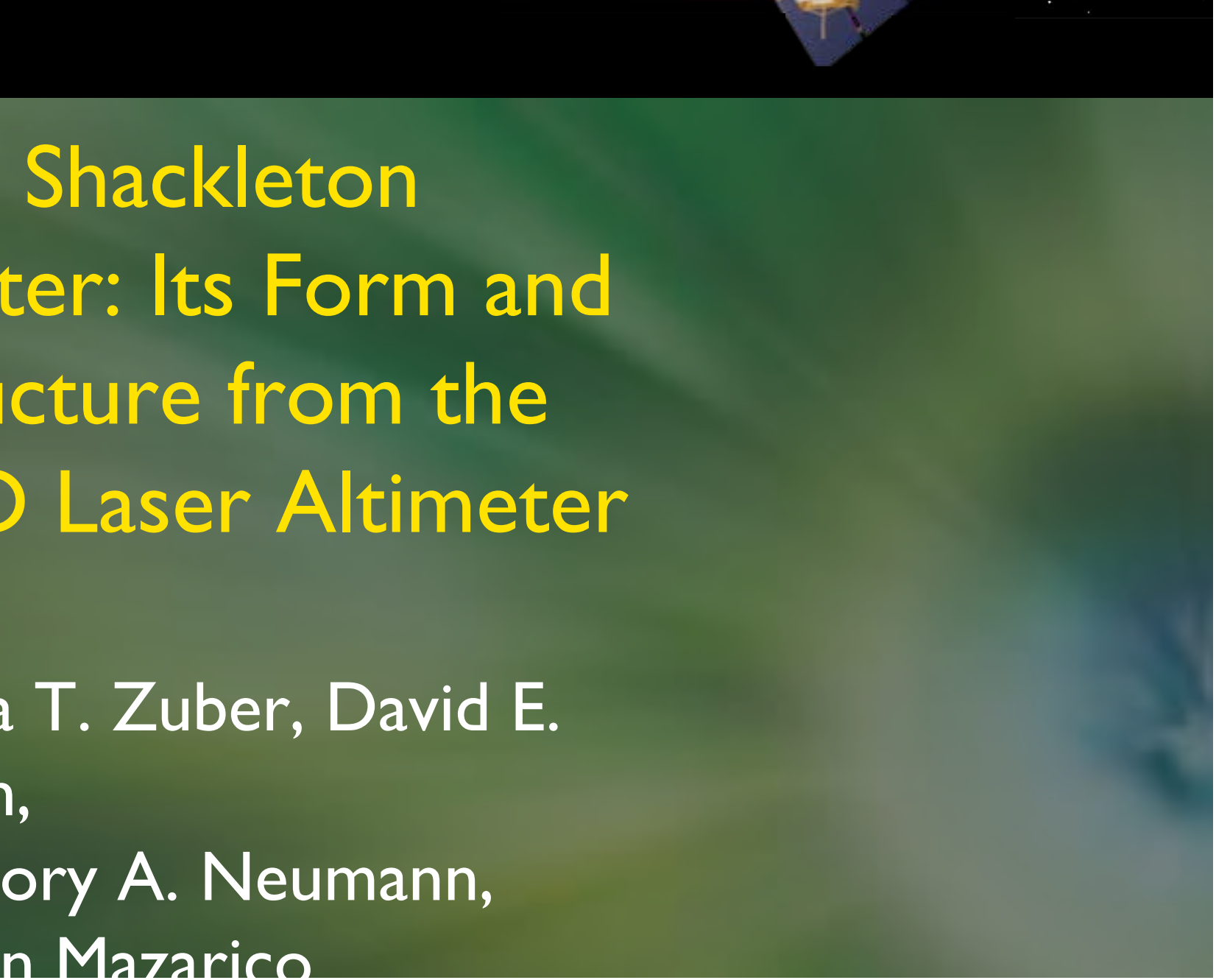
kleton lies near simple-complex crater transition bu
crater designation
rabolic walls
mplex floor deposits, explainable by slumping of wa

er morphological characteristics:
uated on regional slope
ymmetric ejecta distribution
isymmetric walls, smooth on km scale, rough on m
eter-scale roughness of crater floor comparable to

-nm bidirectional reflectance

Hayabusa Terrain Camera



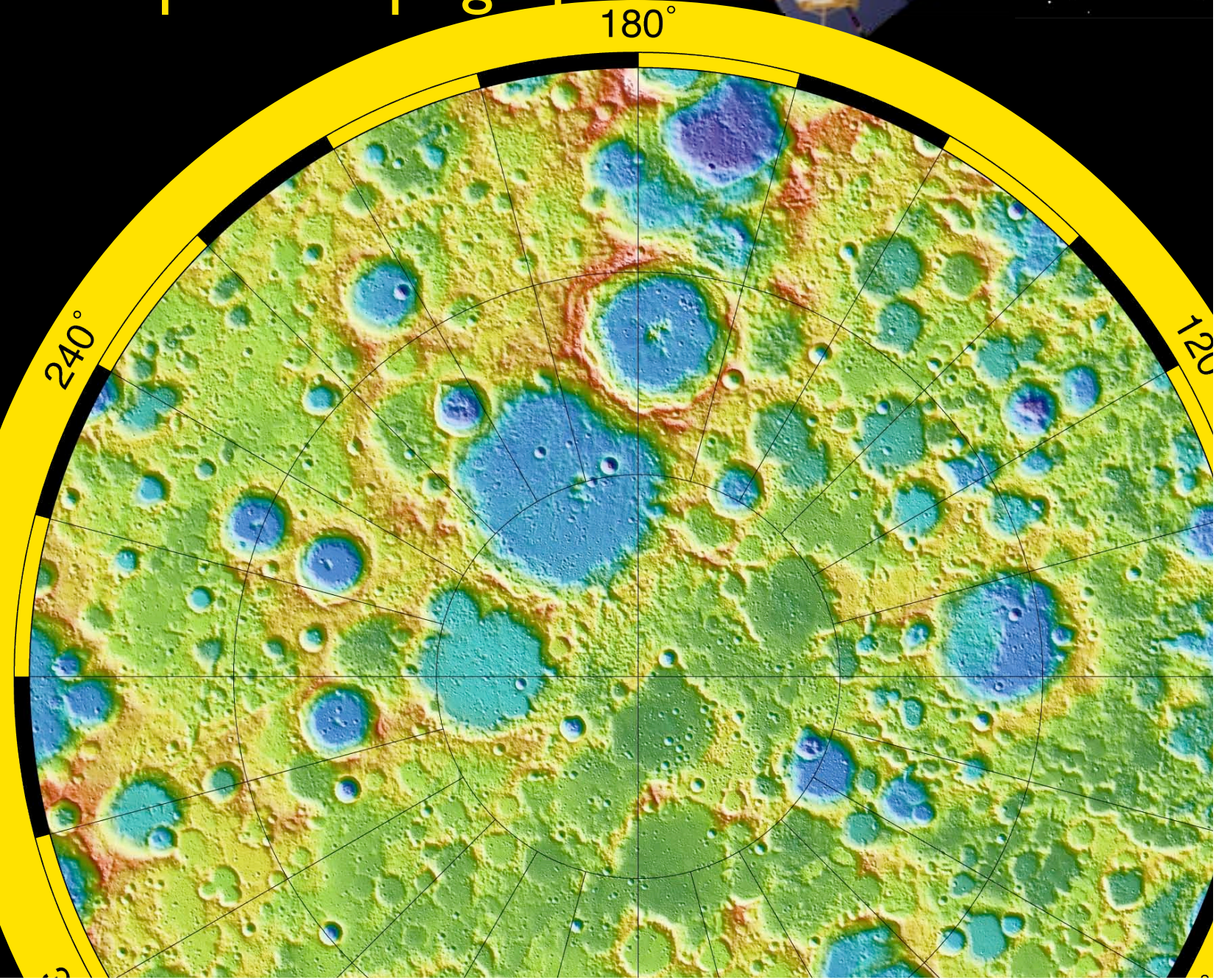


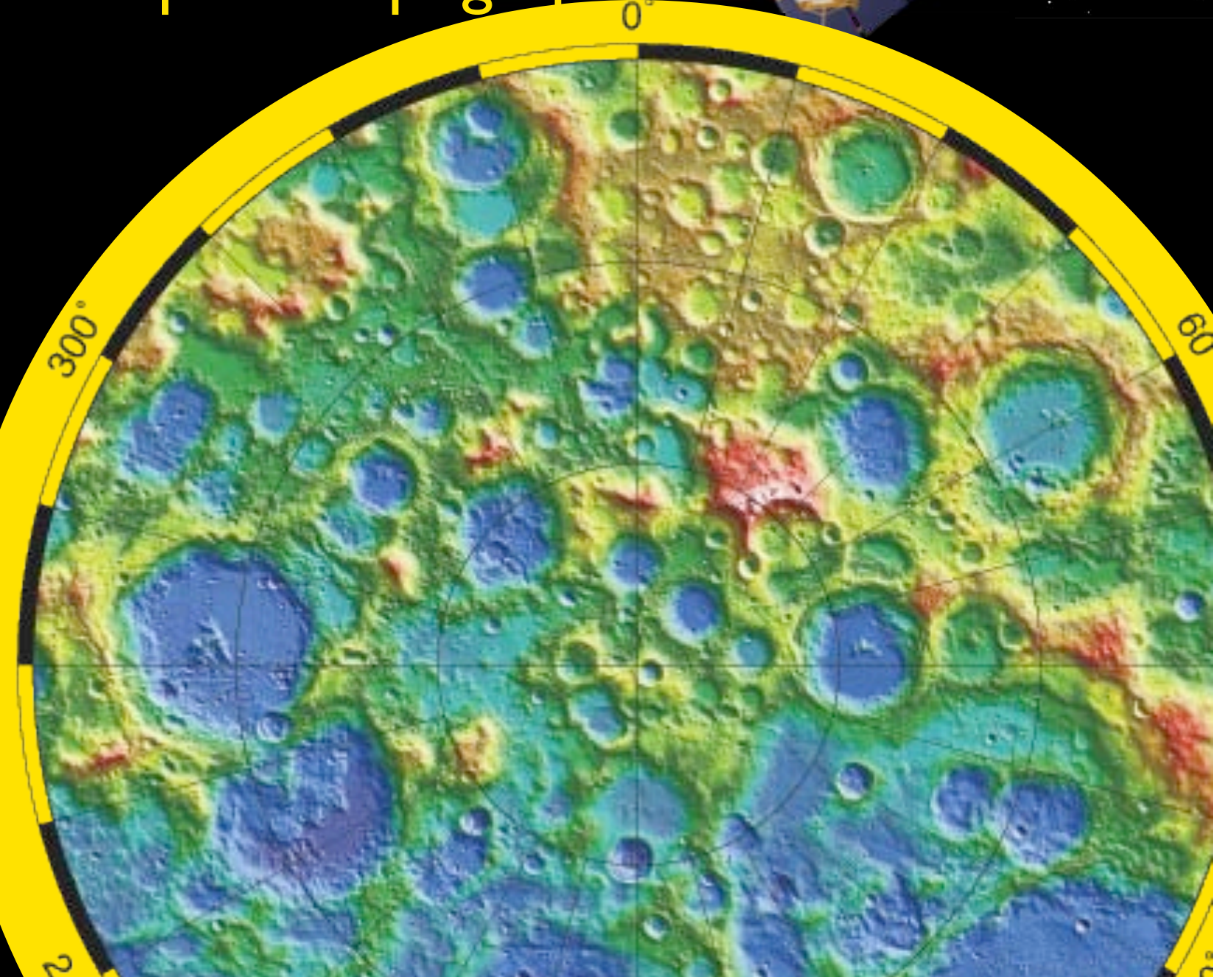
Shackleton ter: Its Form and cture from the D Laser Altimeter

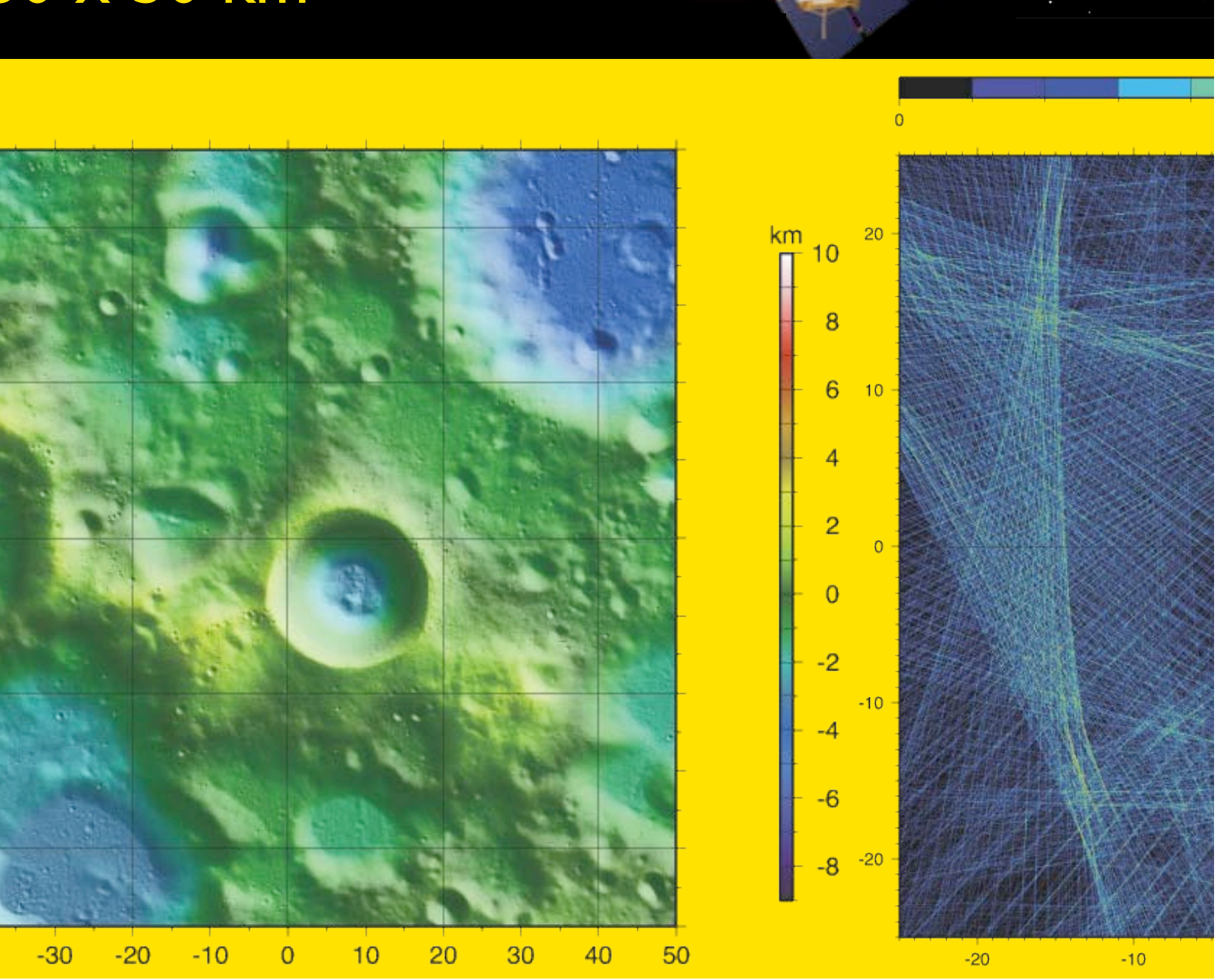
a T. Zuber, David E.
n,
ory A. Neumann,
n Mazarico

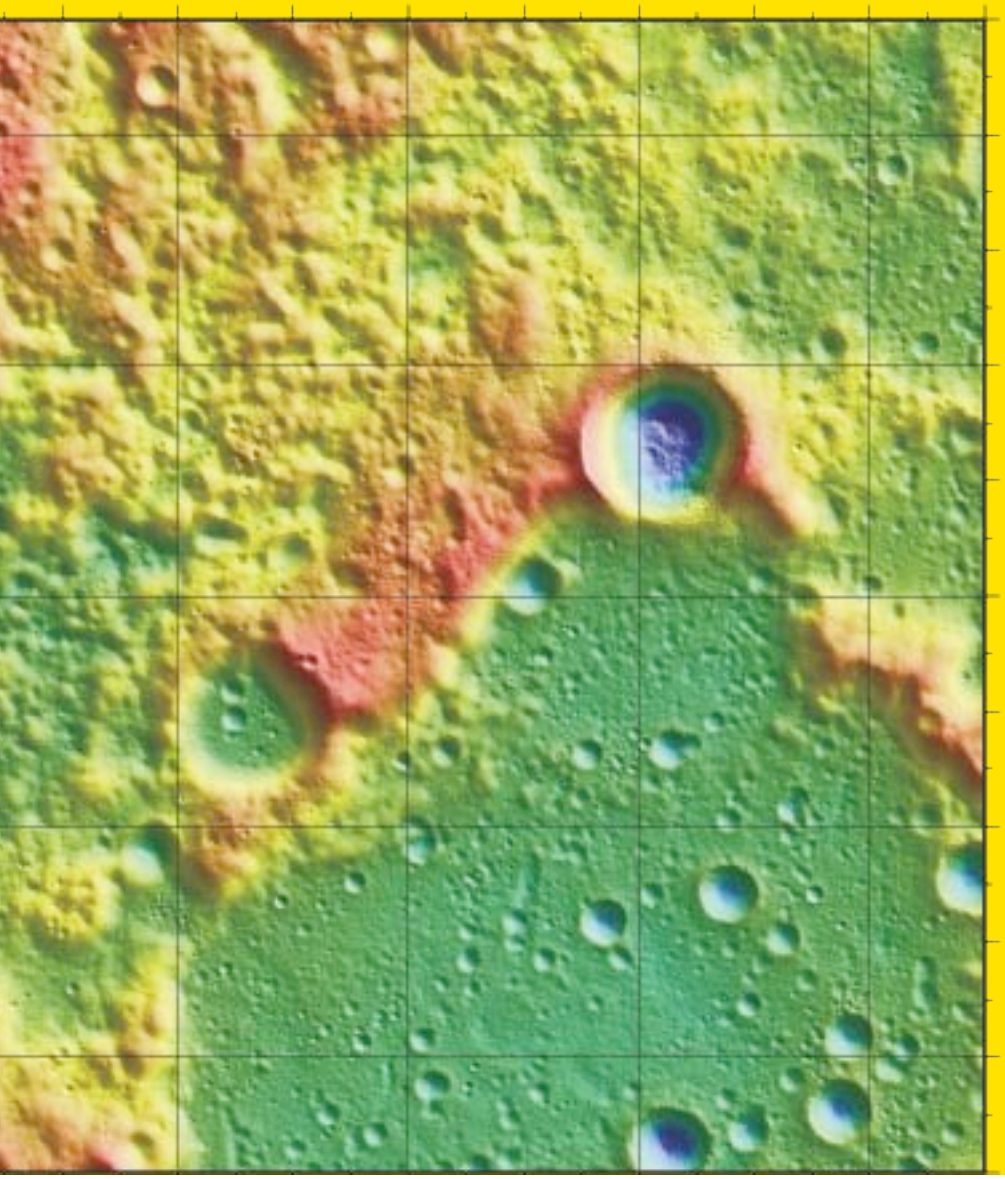
e First Year of Operation of the N
Laser Altimeter on LRO

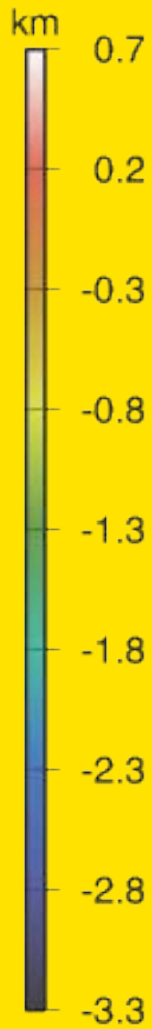
avid E. Smith, Maria T. Zuber, Gregory A.
van Mazarico, Thomas H. Duxbury, James
rk S. Robinson, Olivier S. Barnouin, Oded
Paul G. Lucey, Mark H. Torrence

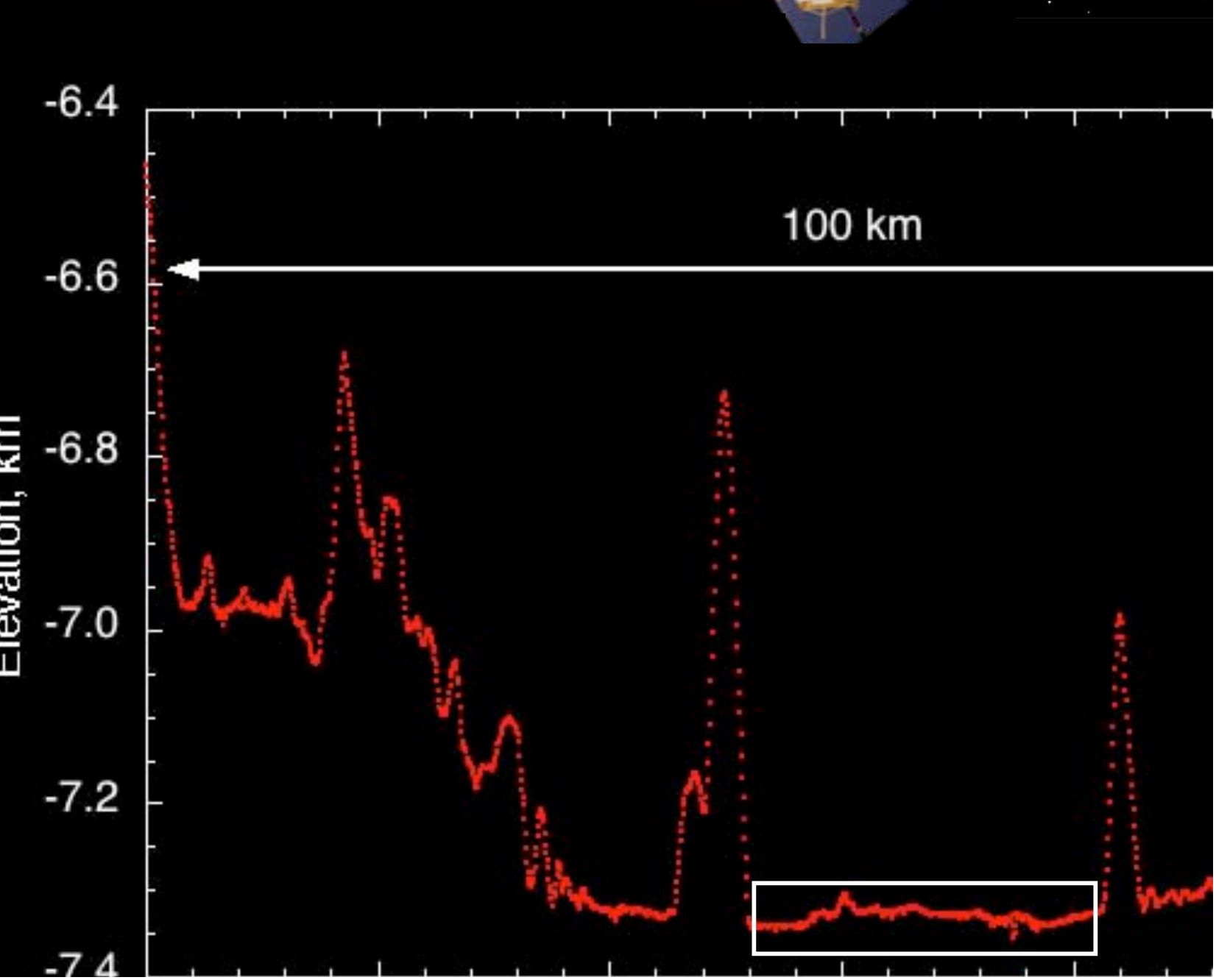

180°
240°
120


0°
300°
60°

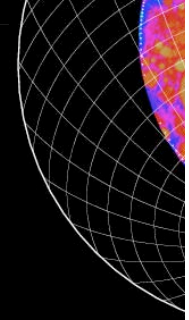

-30
-20
-10
0
10
20
30
40
50
km
10
8
6
4
2
0
-2
-4
-6
-8
20
10
0
-10
-20
0
-20
-10



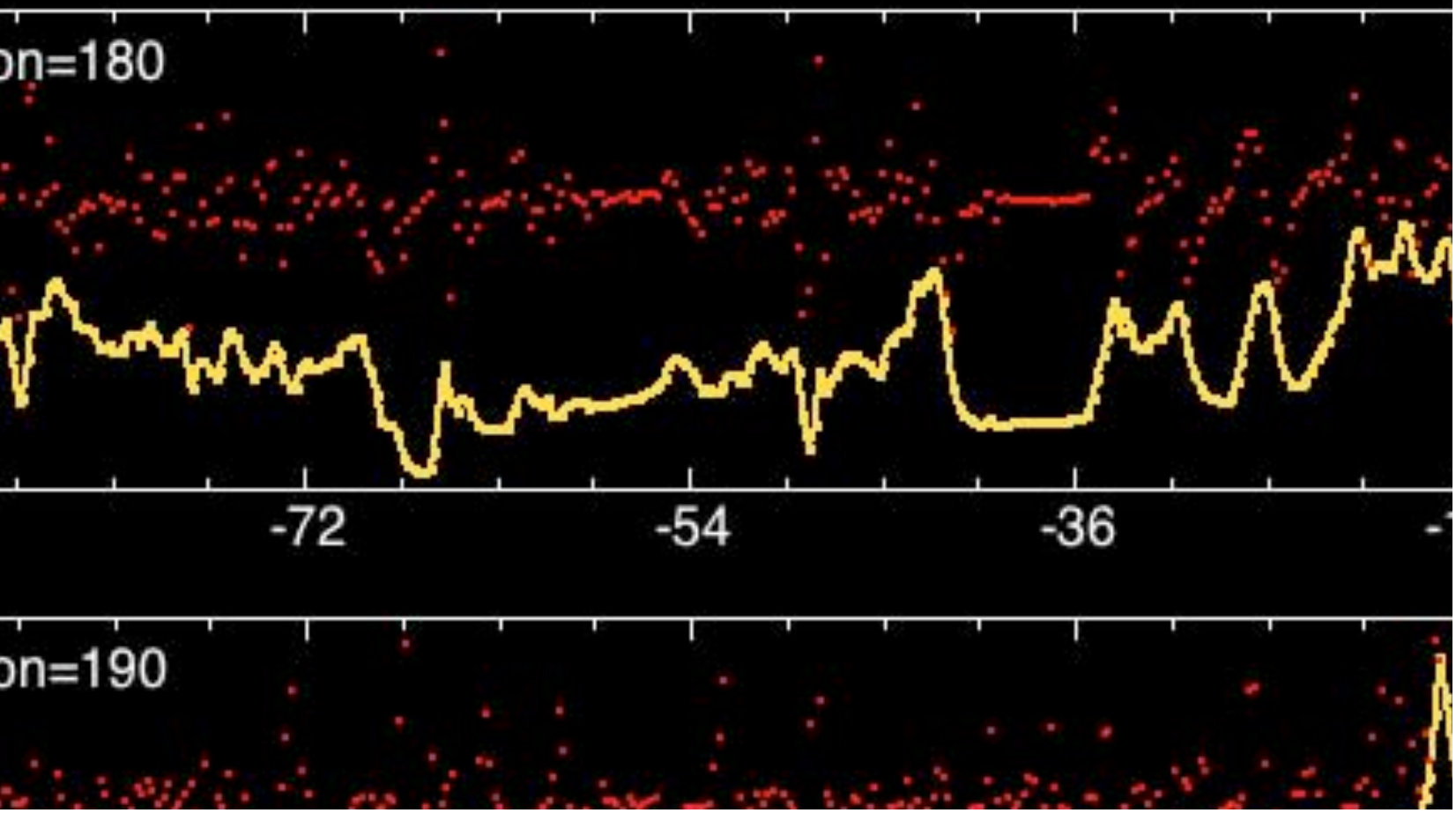

km
0.7
0.2
-0.3
-0.8
-1.3
-1.8
-2.3
-2.8
-3.3


-6.4
-6.6
-6.8
-7.0
-7.2
-7.4
Elevation, km
100 km

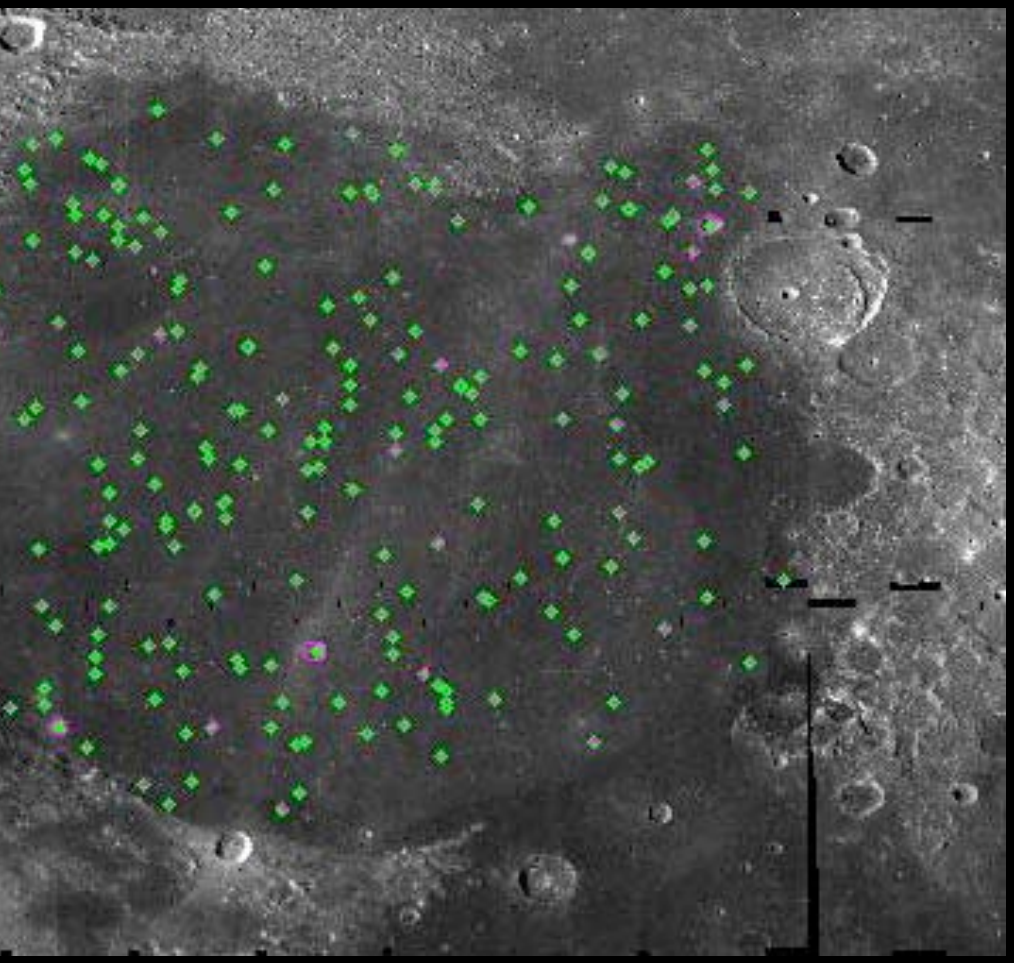
Topography and slope 1/4° baseline



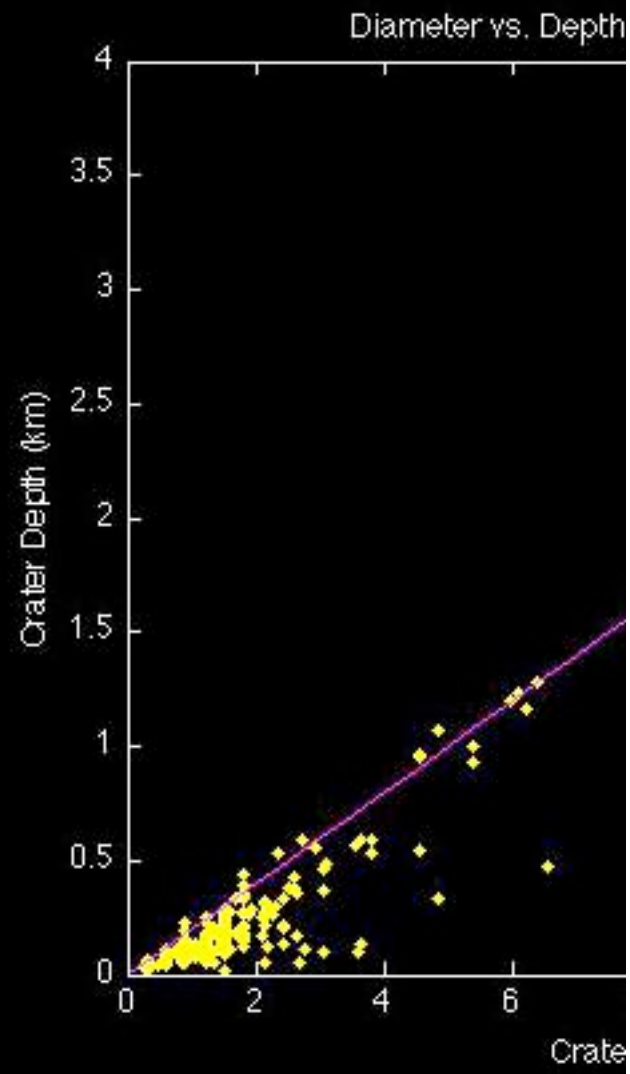
$_{vg}$= 0.015± 4.58



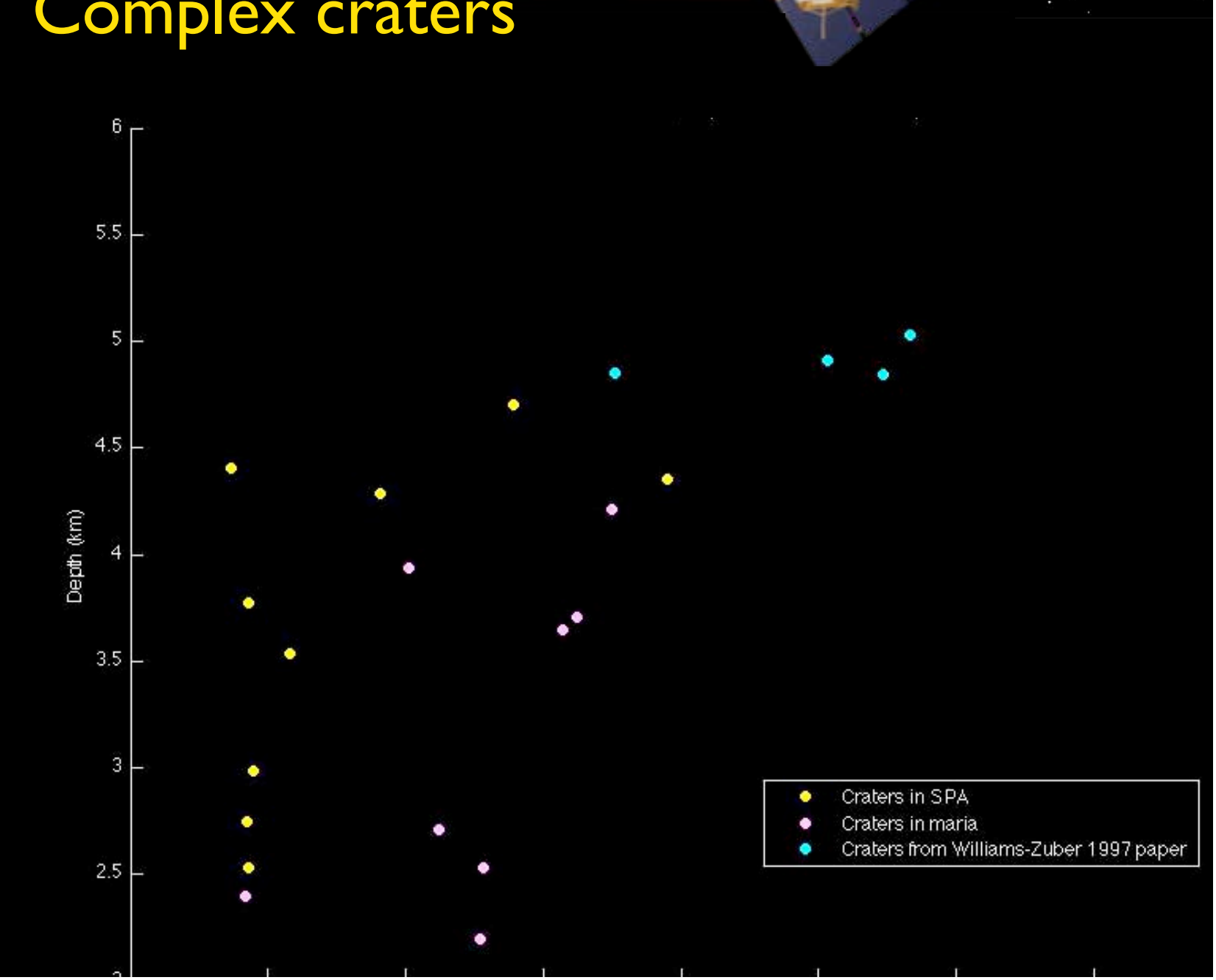
Mare Serenitatis

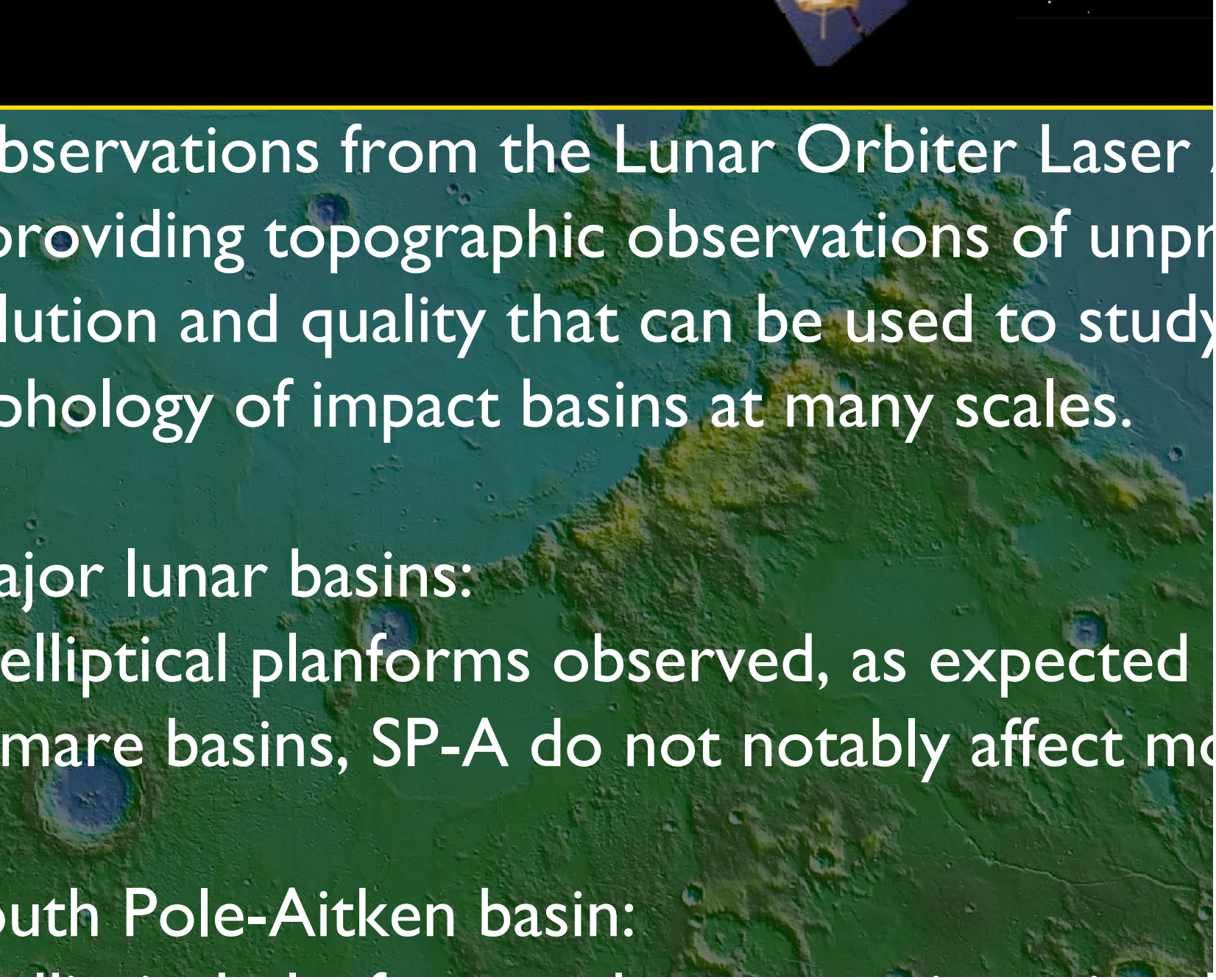


LRO/LROC



Complex craters





bservations from the Lunar Orbiter Laser
providing topographic observations of unpr
lution and quality that can be used to study
phology of impact basins at many scales.

ajor lunar basins:
elliptical planforms observed, as expected
mare basins, SP-A do not notably affect mo

uth Pole-Aitken basin:

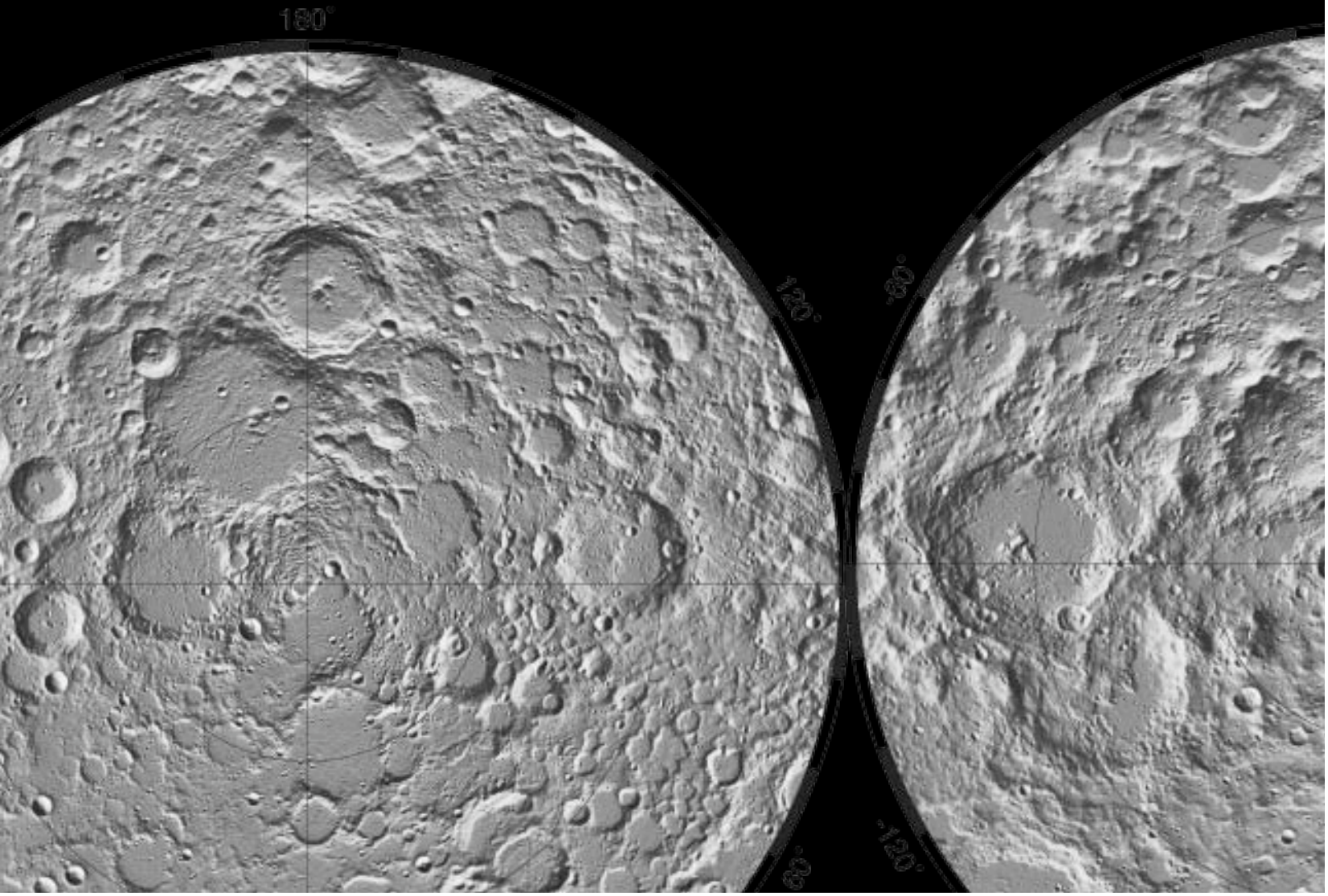
Surface slopes

hin a 100-m x 50-m along-track
there are:
10 5-m-diameter spots
slopes with baselines ranging from
5 m to 50 m
another 23 slopes with baselines of
50 to <100 m

slopes < ± 3° in a 5-m spot, height
sion will be < ± 10 cm and slope
racies will be ± 0.3° to 0.15°

~100 m

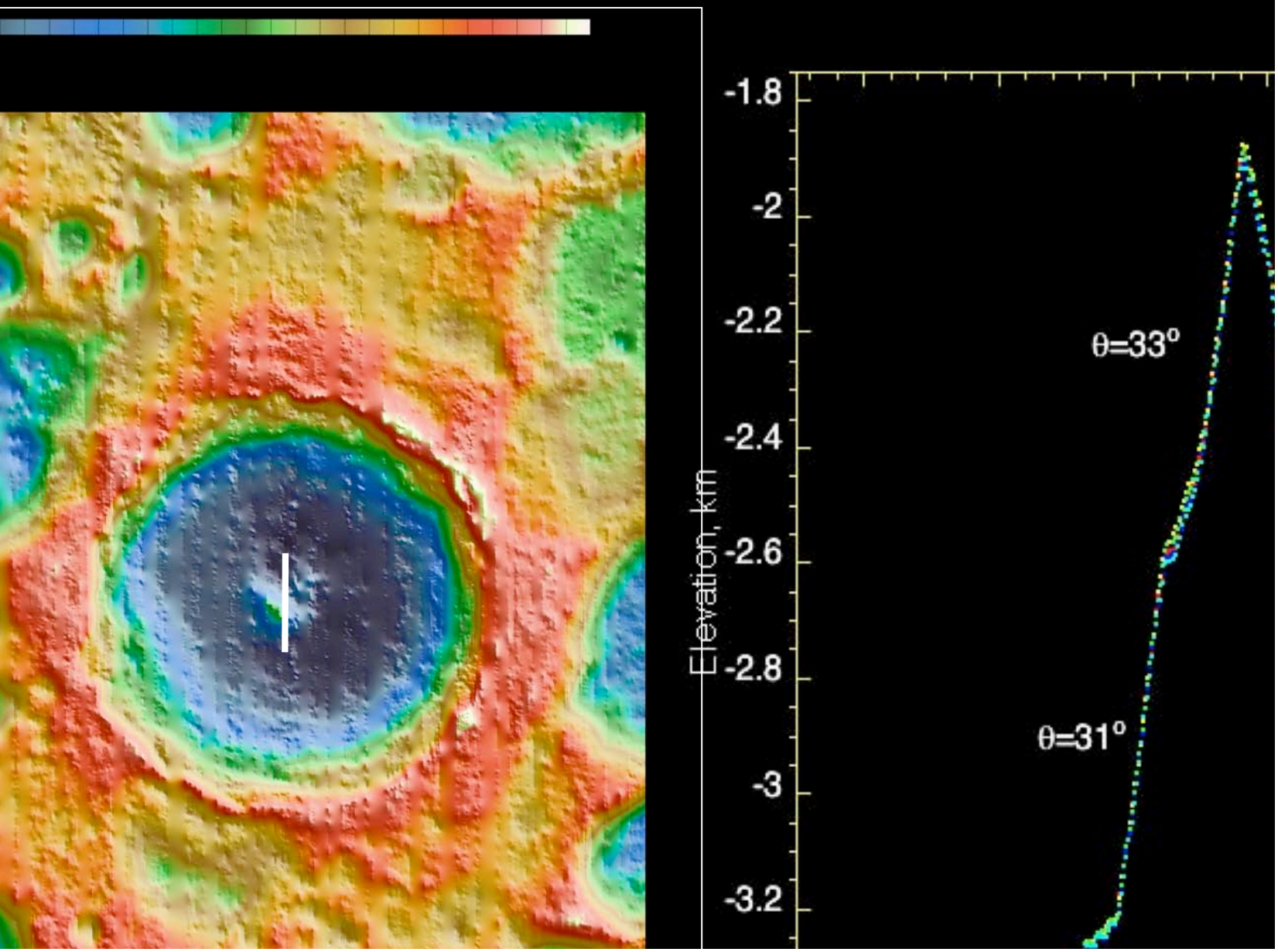
40-m resolution shaded relief;
uminated from equator



ownload LOLA polar shaded relief in

tp://imbrium.mit.edu/LOLA

ference:

ith, D.E., M.T. Zuber, G.A. Neumann, F.G. Lemo
H. Torrence, J.F. McGarry, D.D. Rowlands, J.W.
H. Duxbury, O. Aharonson, P.G. Lucey, M.S. Ro
S. Barnouin, J.F. Cavanaugh, X. Sun, P. Liiva, D.-d
l A.E. Bartels, Initial observations from the Luna
er Altimeter, *Geophys. Res. Lett., 37,* doi:10.1029

central peak