Luna – Resource / Glob Missions: Starting list of potential landing sites

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Landing Site Selection for LUNA-GLOB mission

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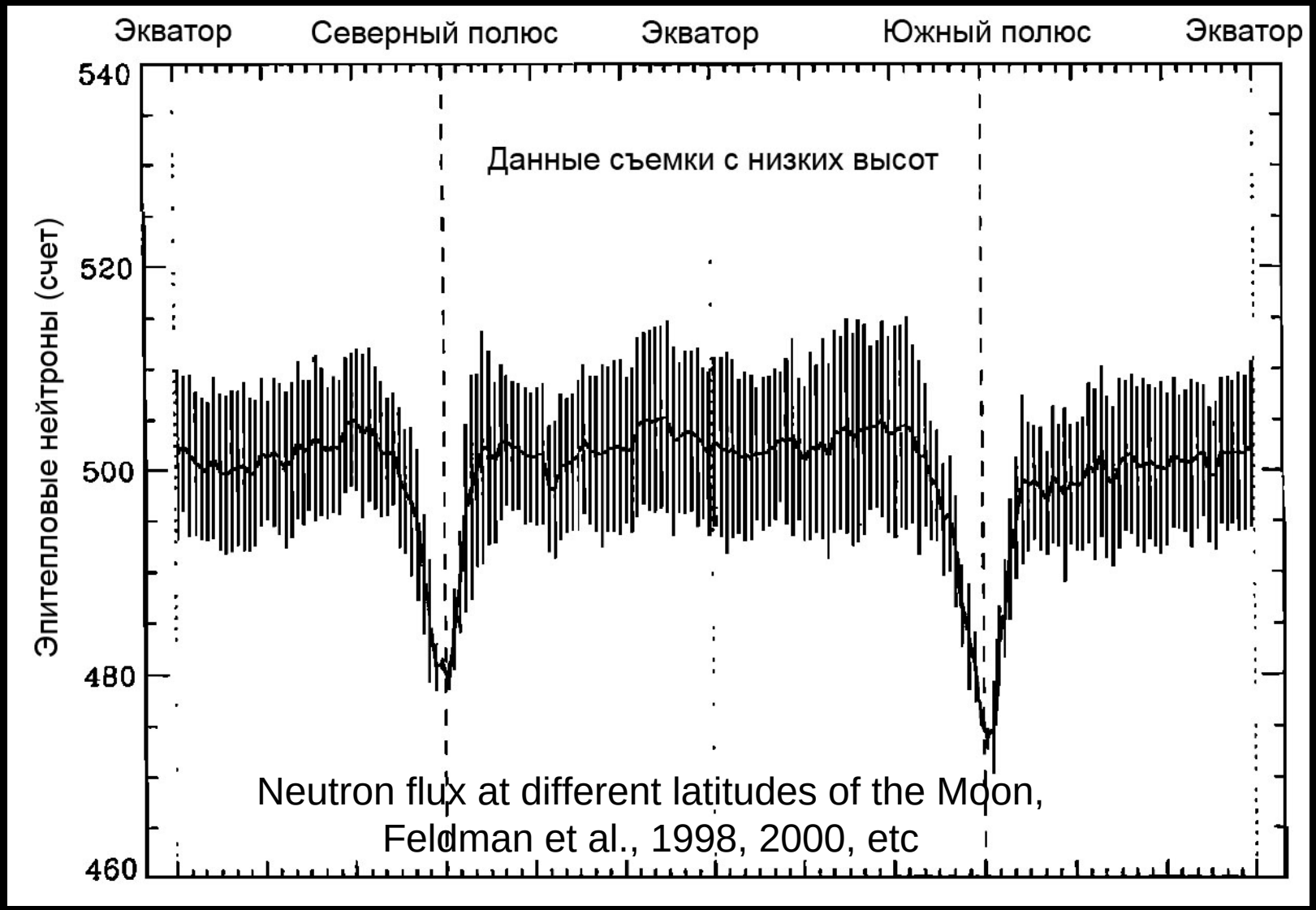
Scientific tasks of the

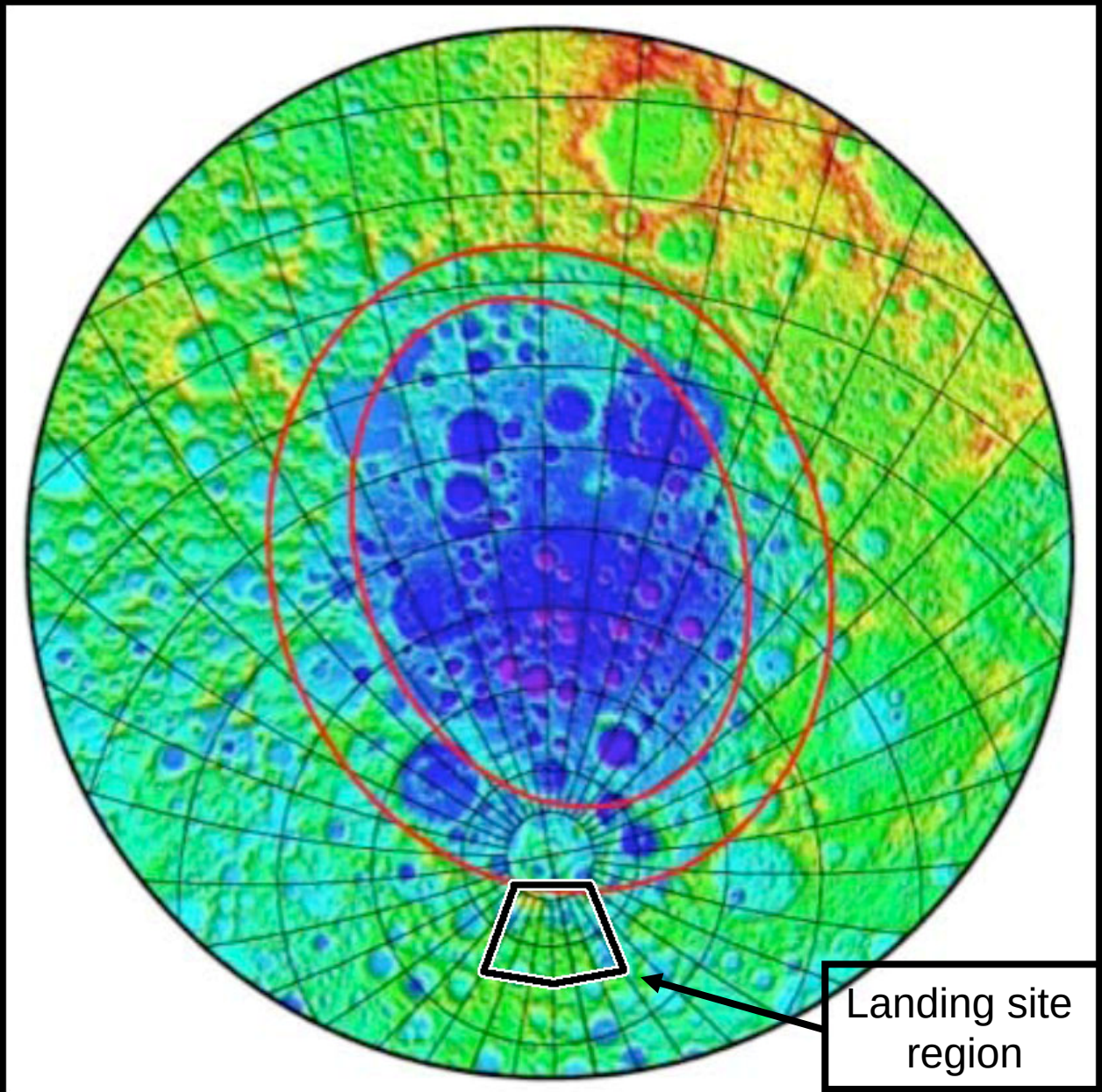
Luna Resource / Glob missions:

Task 1. Study of volatiles in polar areas of the Moon and understanding of mechanisms of their accumulation. This is the major task of the mission(s).

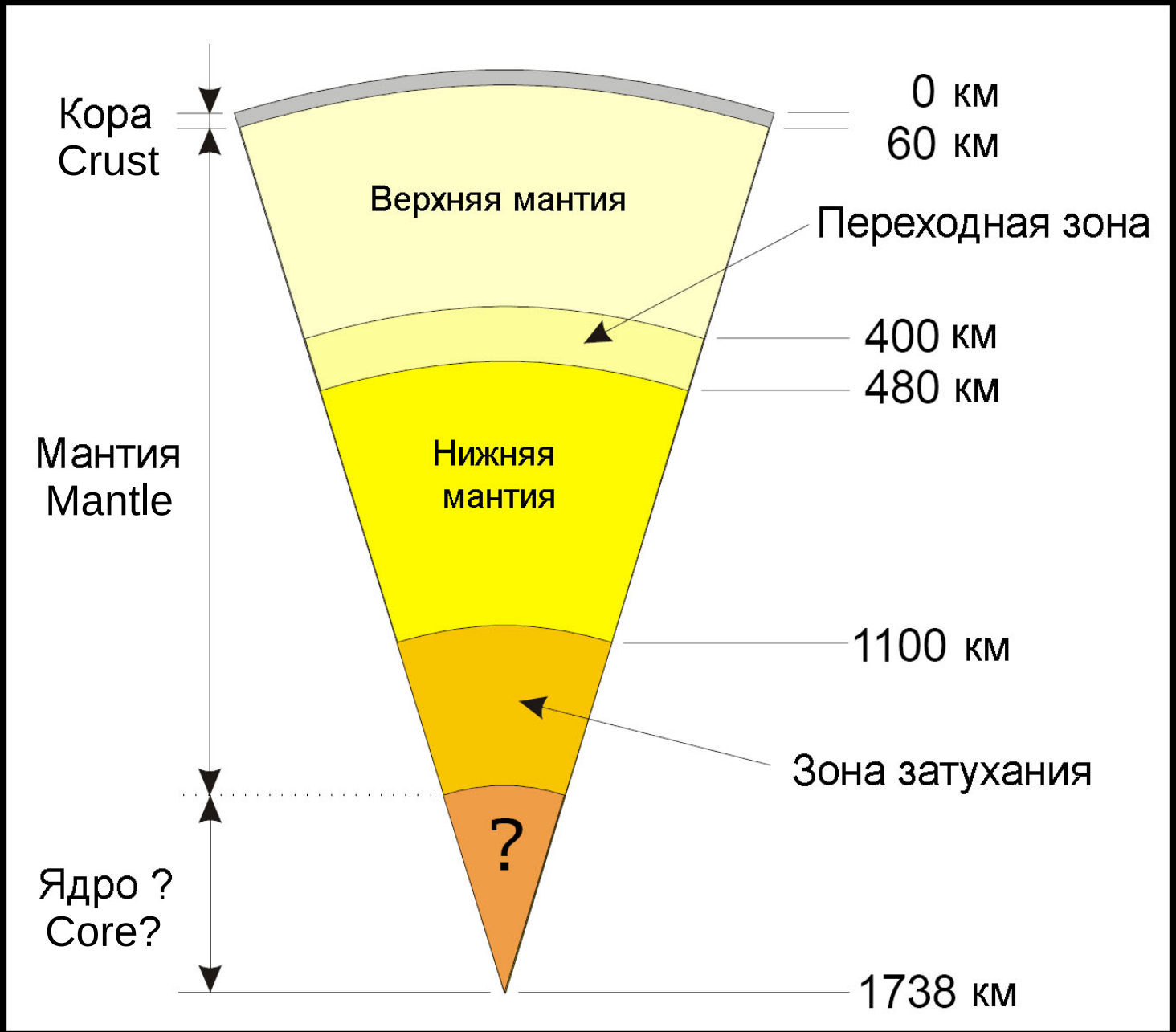


Neutron flux at different latitudes of the Moon,
Feldman et al., 1998, 2000, etc

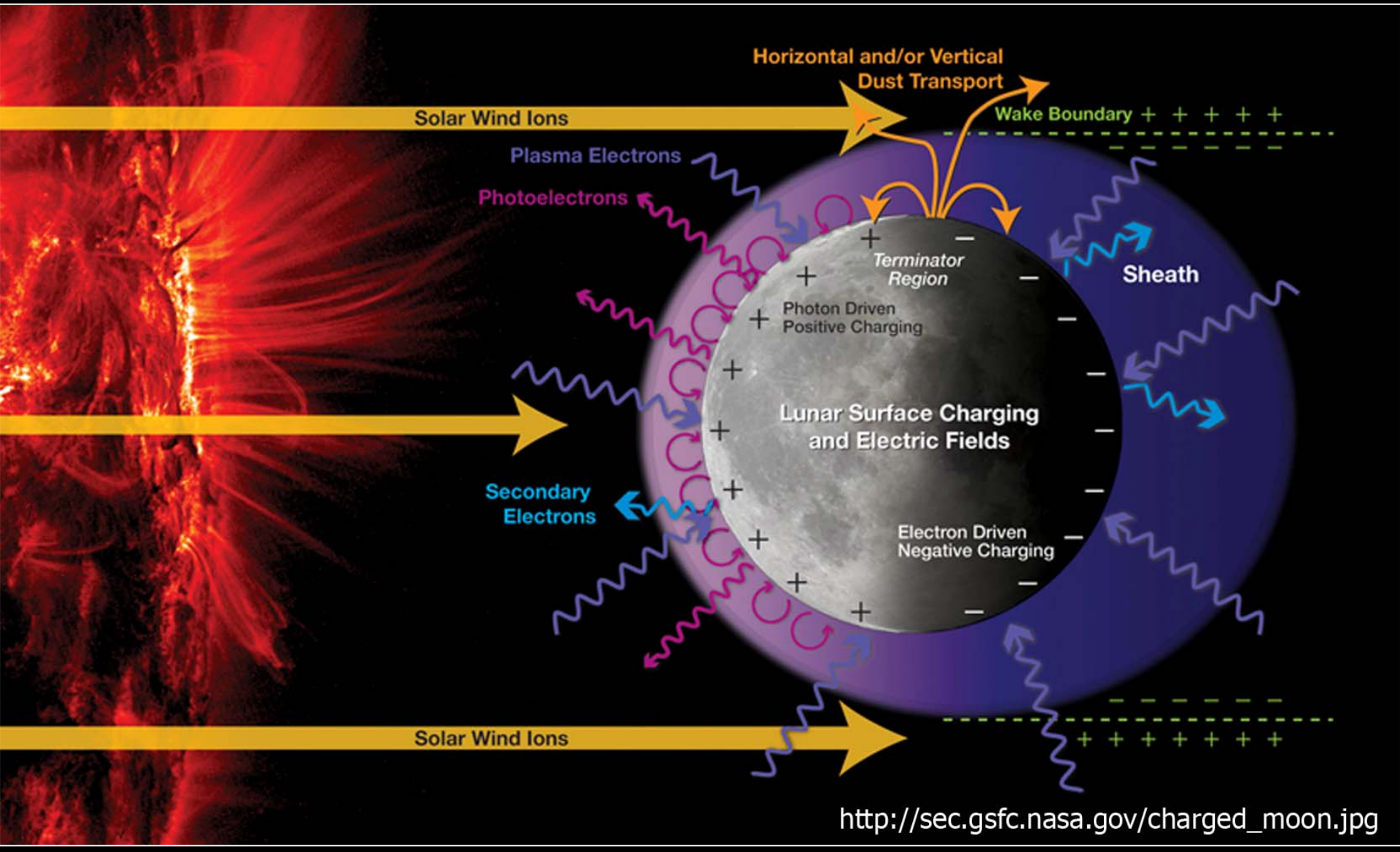
Task 2. Compositional studies of ejecta from the South Pole-Aitken basin



Task 3. Study of internal structure of the Moon



Task 4. Study of interaction of interplanetary plasma with lunar surface

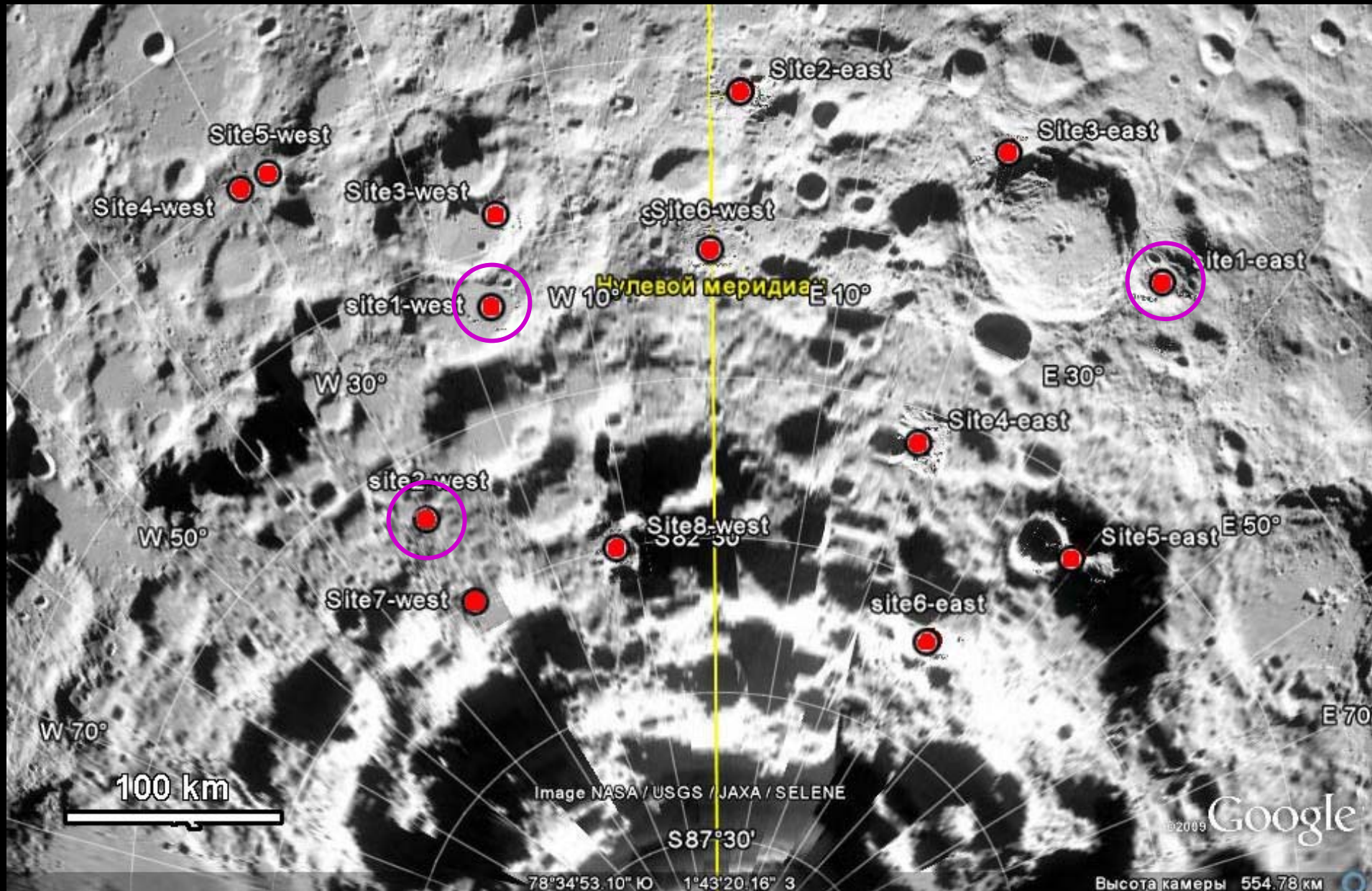


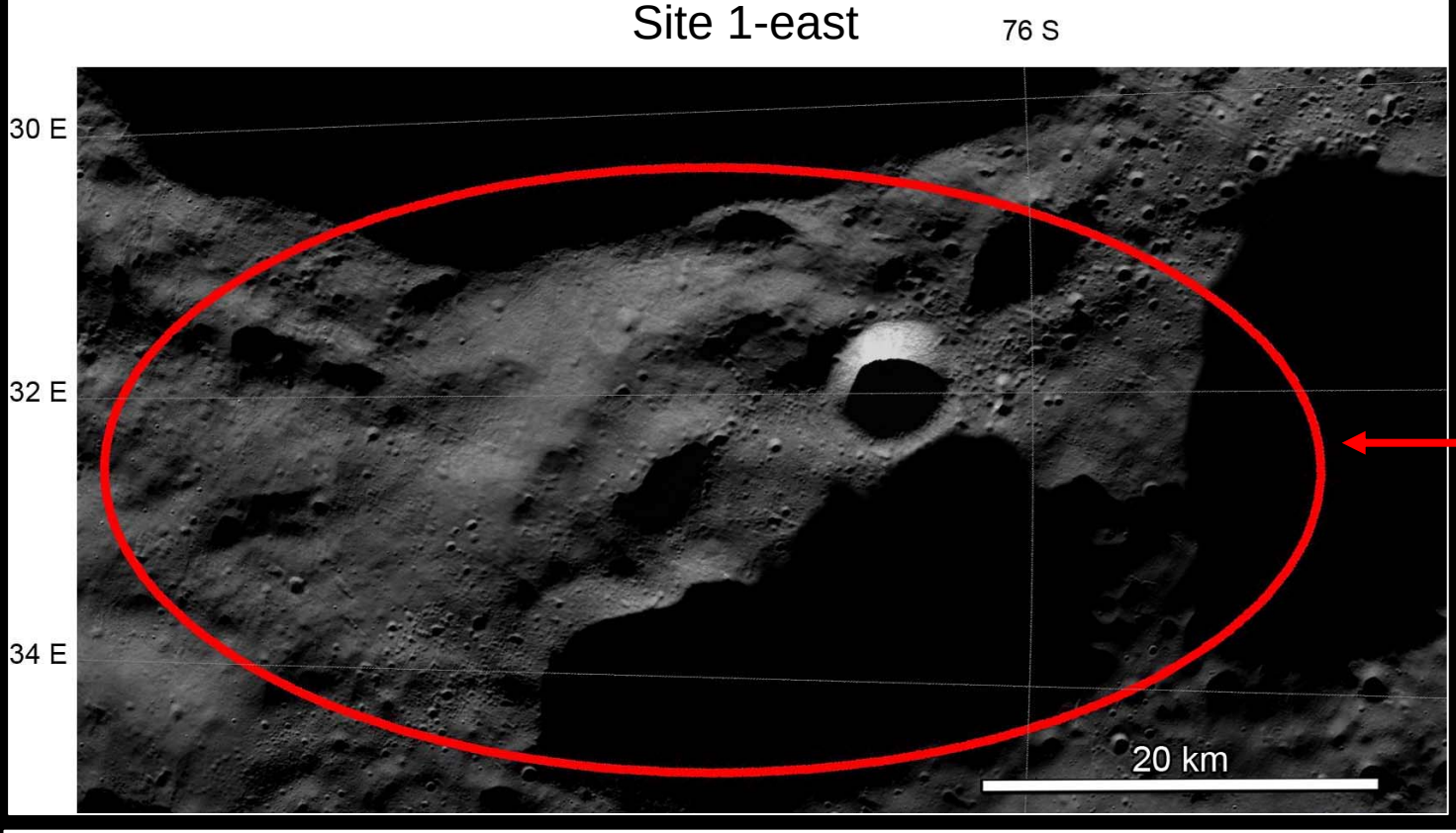
http://sec.gsfc.nasa.gov/charged_moon.jpg

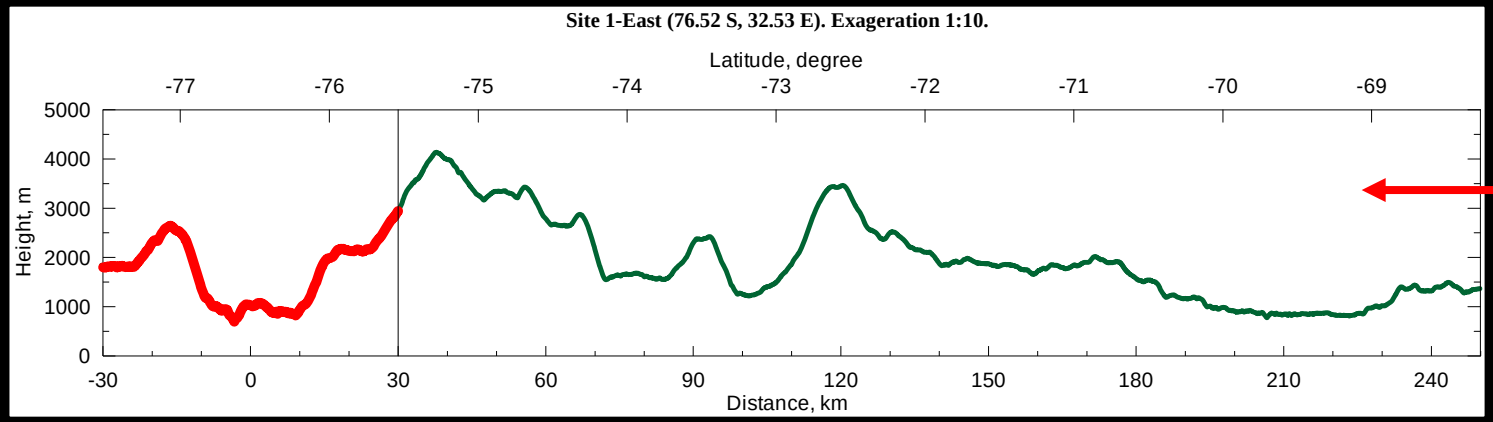
The procedure and examples

of the landing site selection:

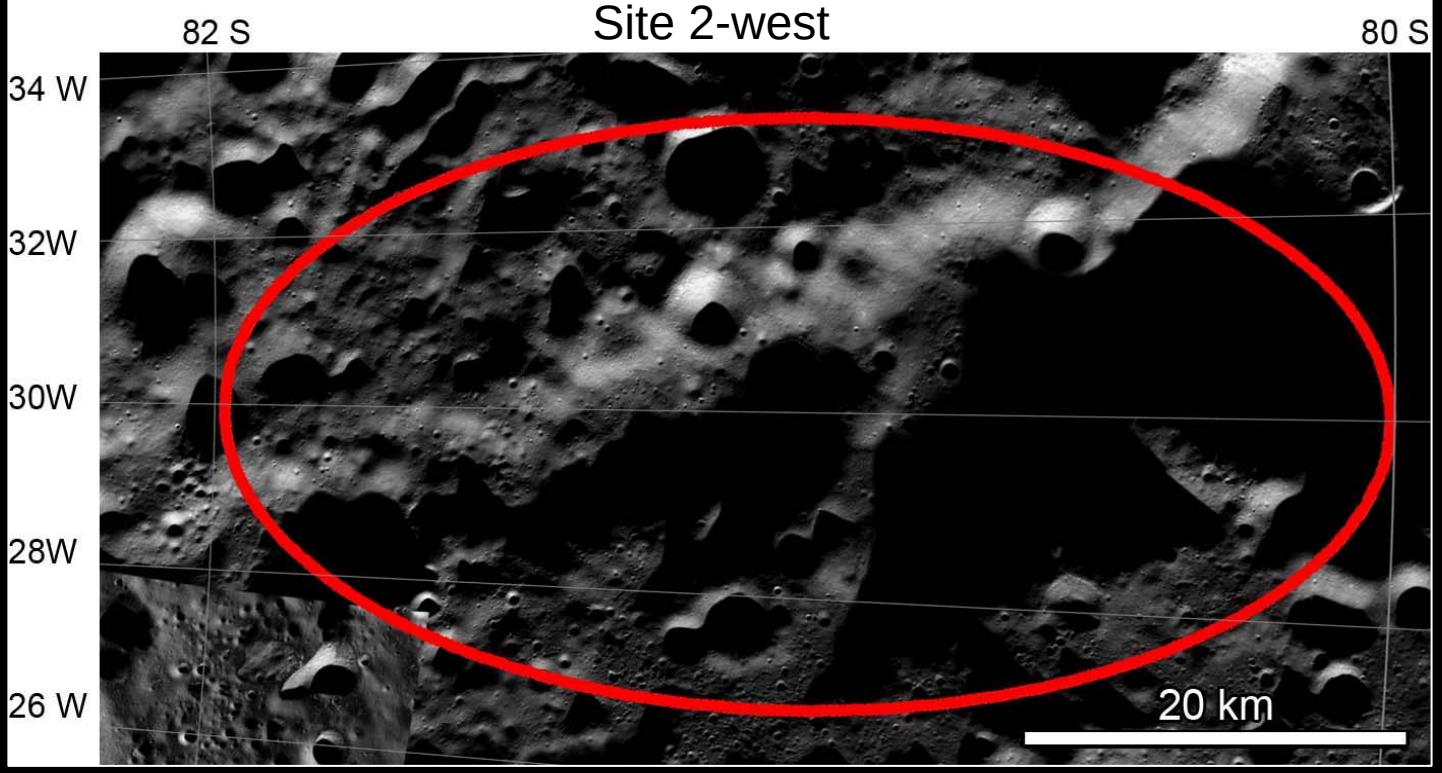
The LEND team, IKI, suggested 14 candidate sites: Lower neutron flux / higher H_2O content; not in permanent shadow

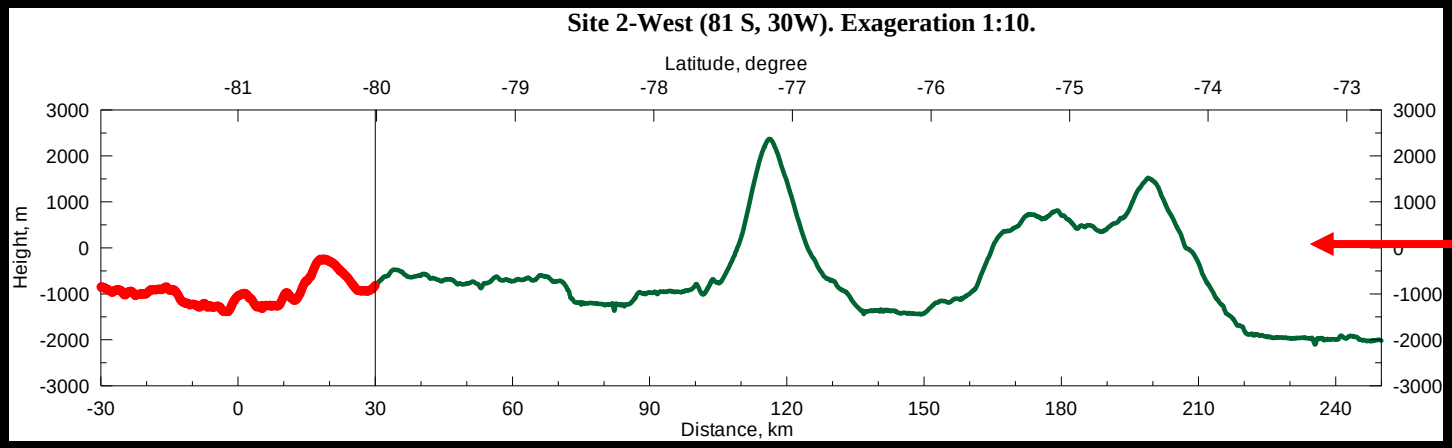




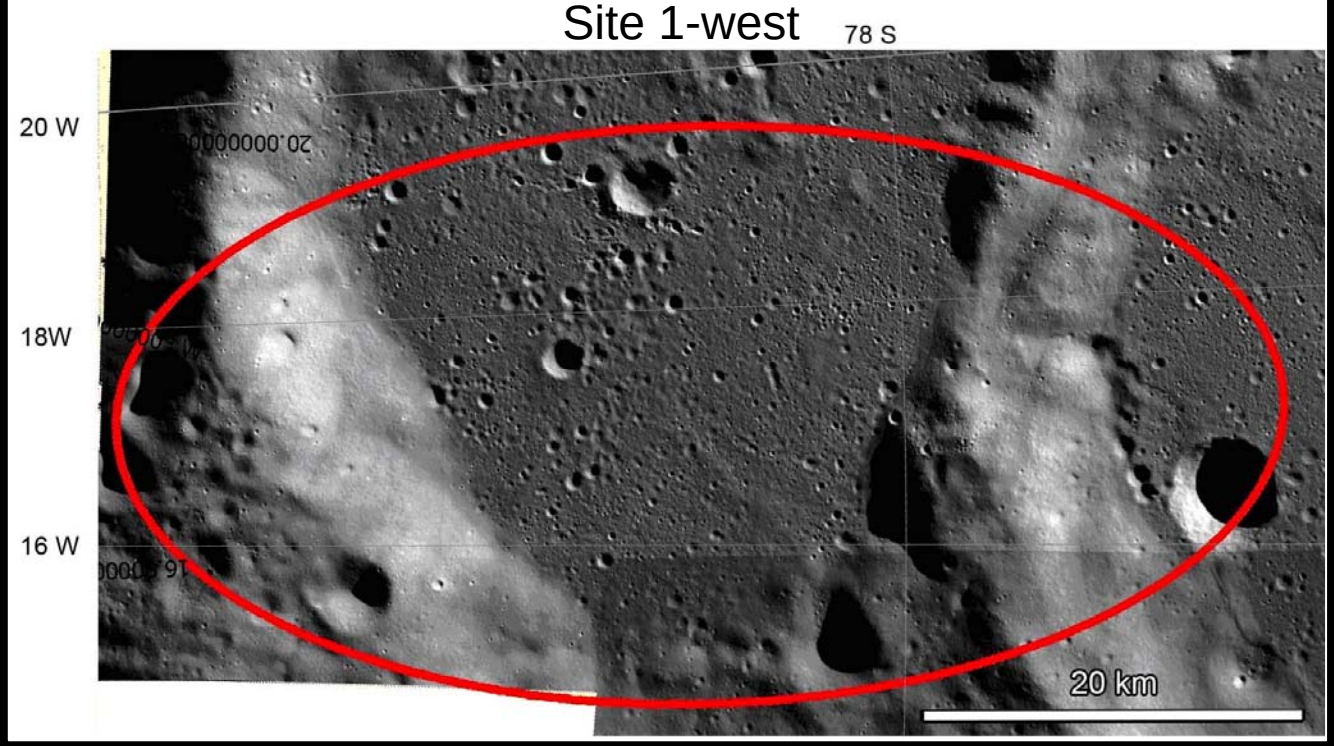


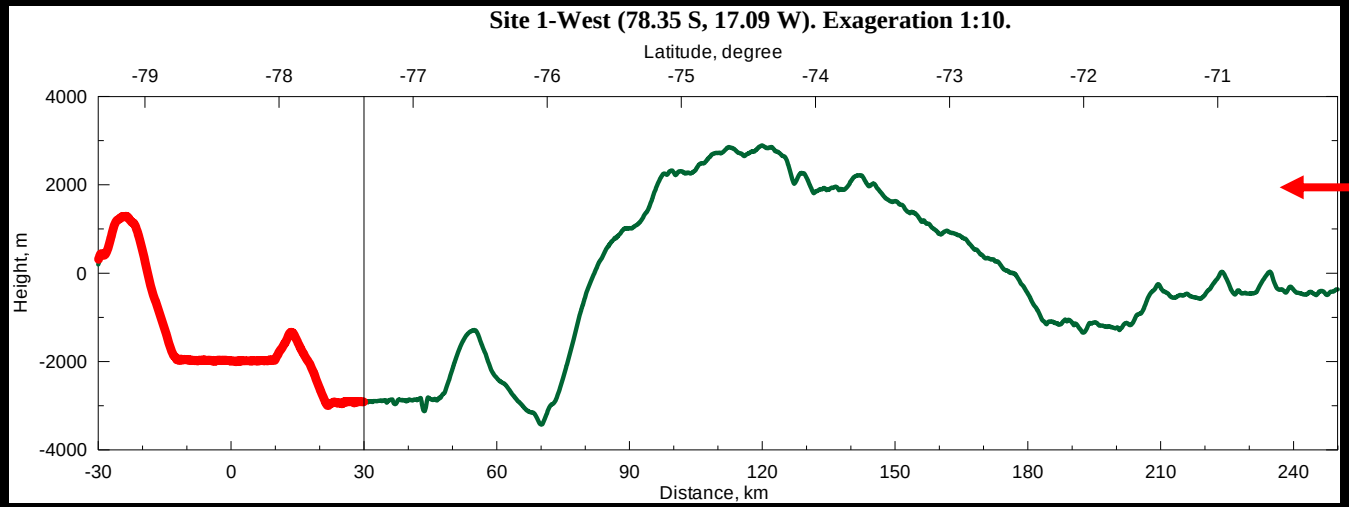
The approach track goes along very rough highland terrain with altitude range ~3.5 km. Slopes >15° on the 60 m base occupy more than 4% of the track and more than 7% in the landing ellipse. Altitude range in the landing ellipse is ~2.2 km. **Landing is too risky!**





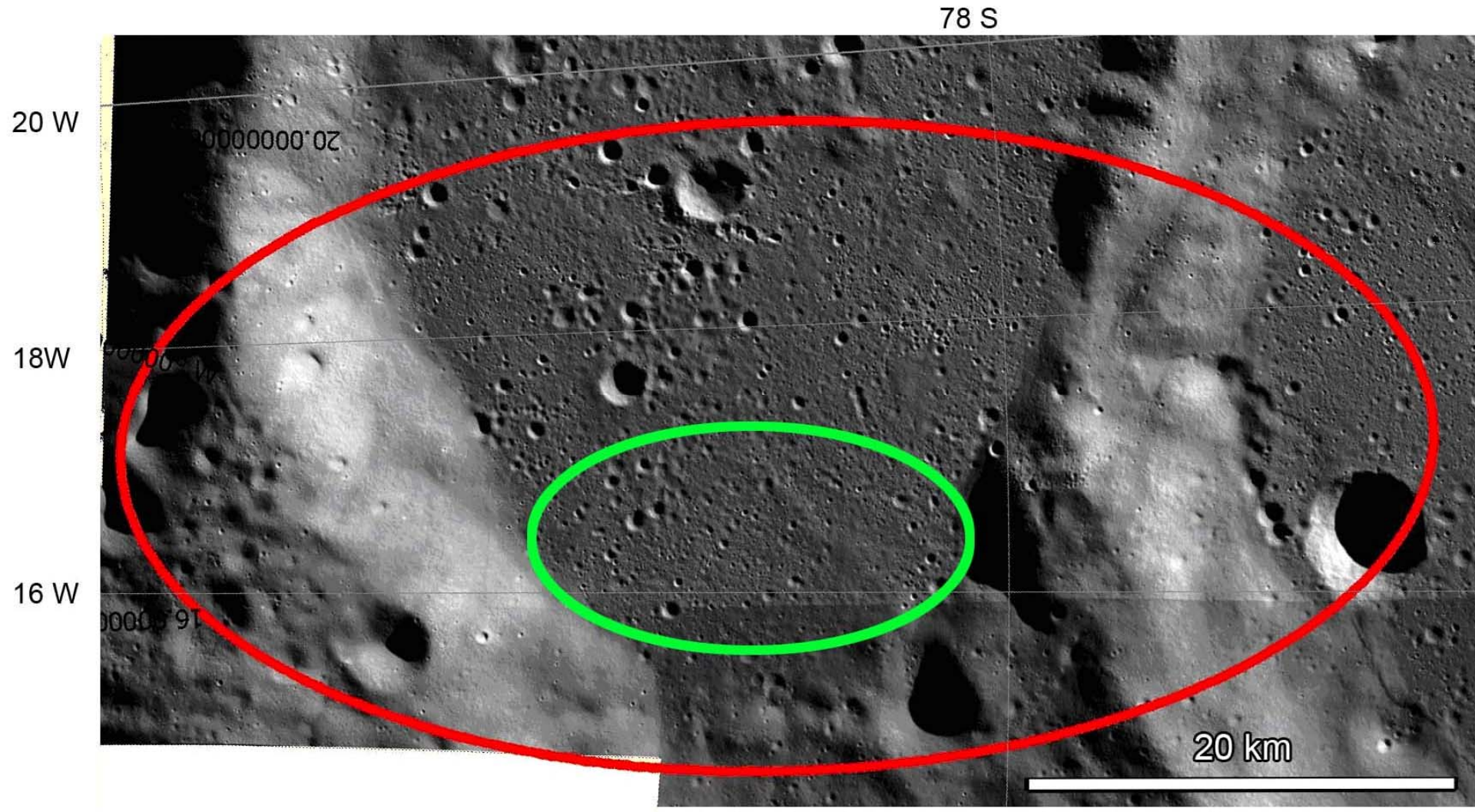
The approach track goes along rough highland terrain with altitude range ~4.5 km. Slopes >15° on the 60 m base occupy more than 7% of the track and more than 2% in the landing ellipse. Altitude range in the landing ellipse is ~1.1 km. **Landing is less risky!**





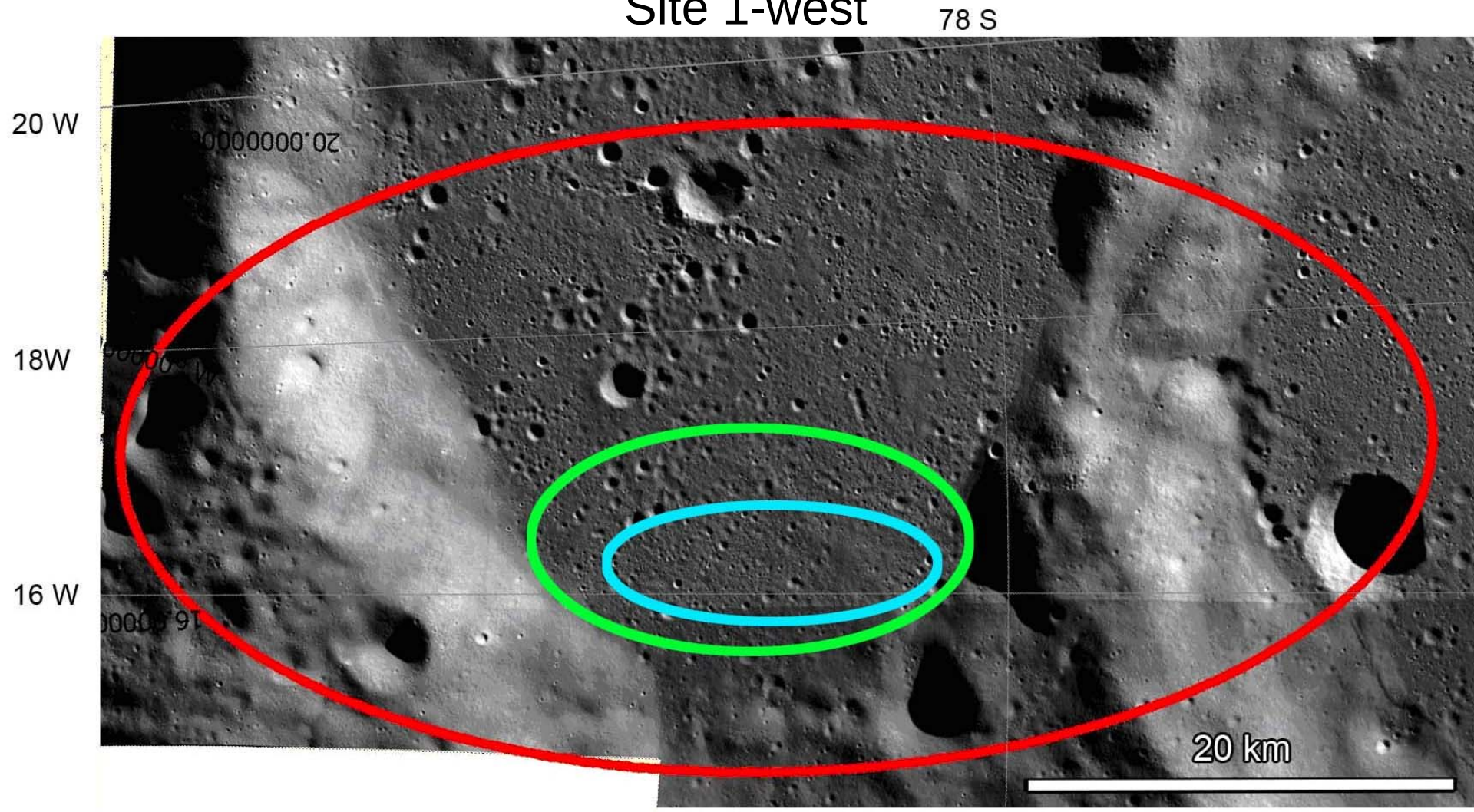
The approach track goes along highland and mare terrains with altitude range ~6.3 km. Slopes >15° on the 60 m base occupy more than 10% of the track and more than 17% in the landing ellipse. Altitude range in the landing ellipse is ~4.3 km. **Landing is too risky!**

Site 1-west



But if for the case of the site 1-west the ellipse size is **20 x 10 km**, the landing ellipse may be selected to be less risky for landing.

Site 1-west



And if for the case of the site 1-west the ellipse size is **15 x 5 km**, the landing ellipse may be selected to be even less risky for landing.

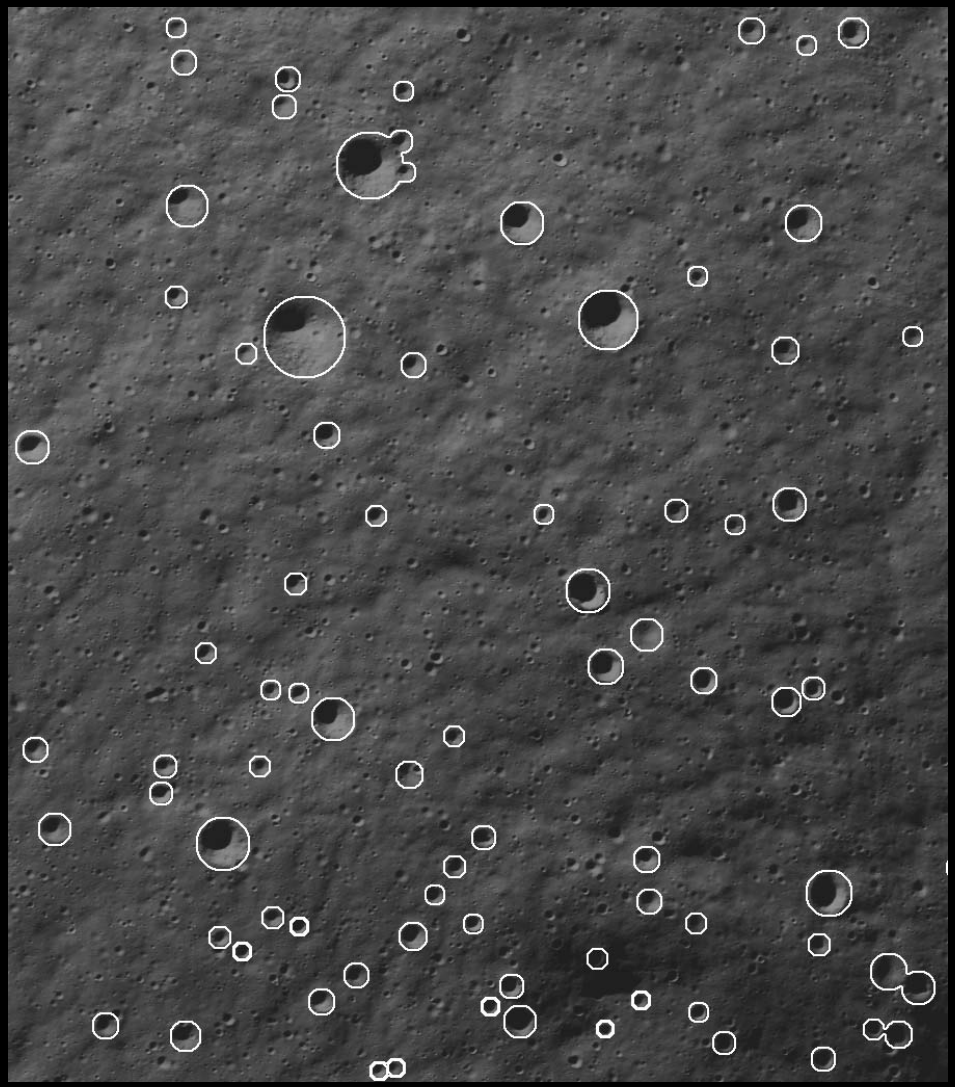
Decreasing landing ellipse is crucial for successful landing!

An example

of possible photogeologic studies

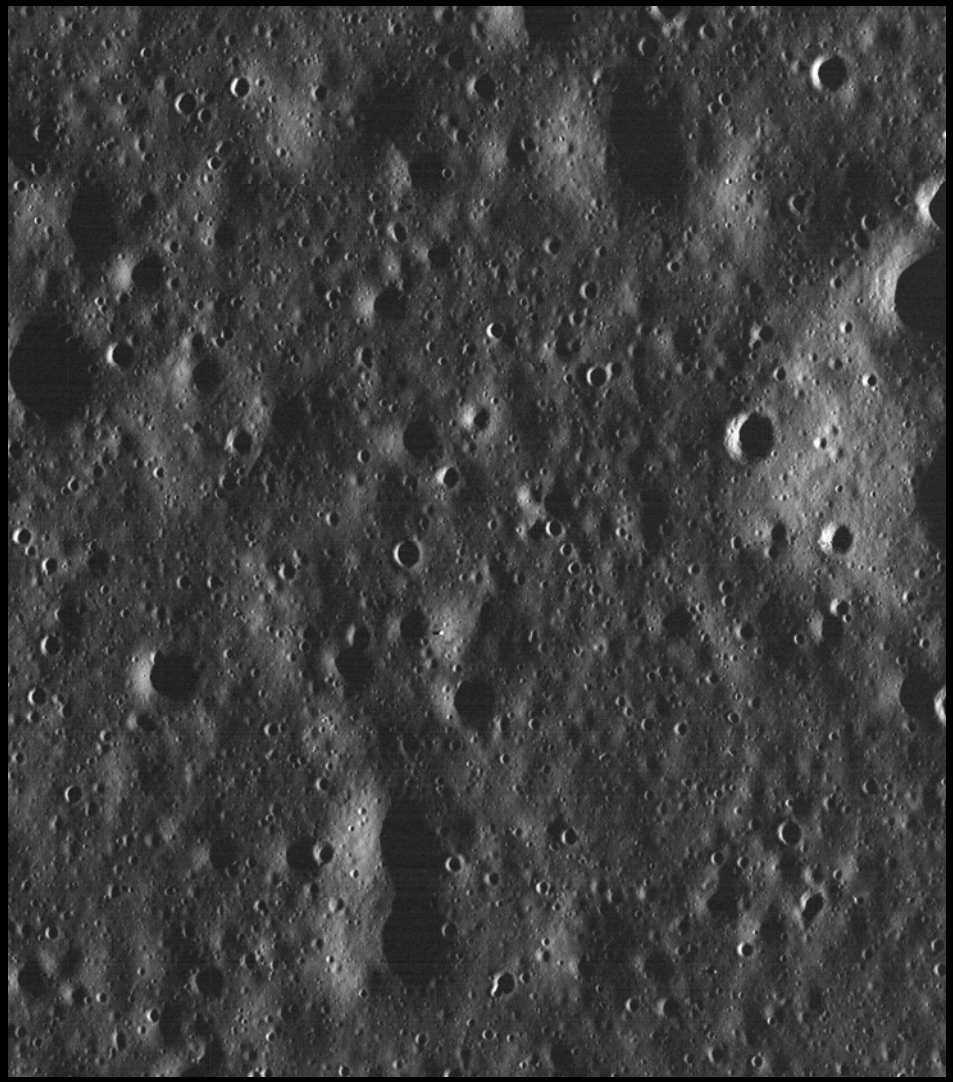
in the landing areas:

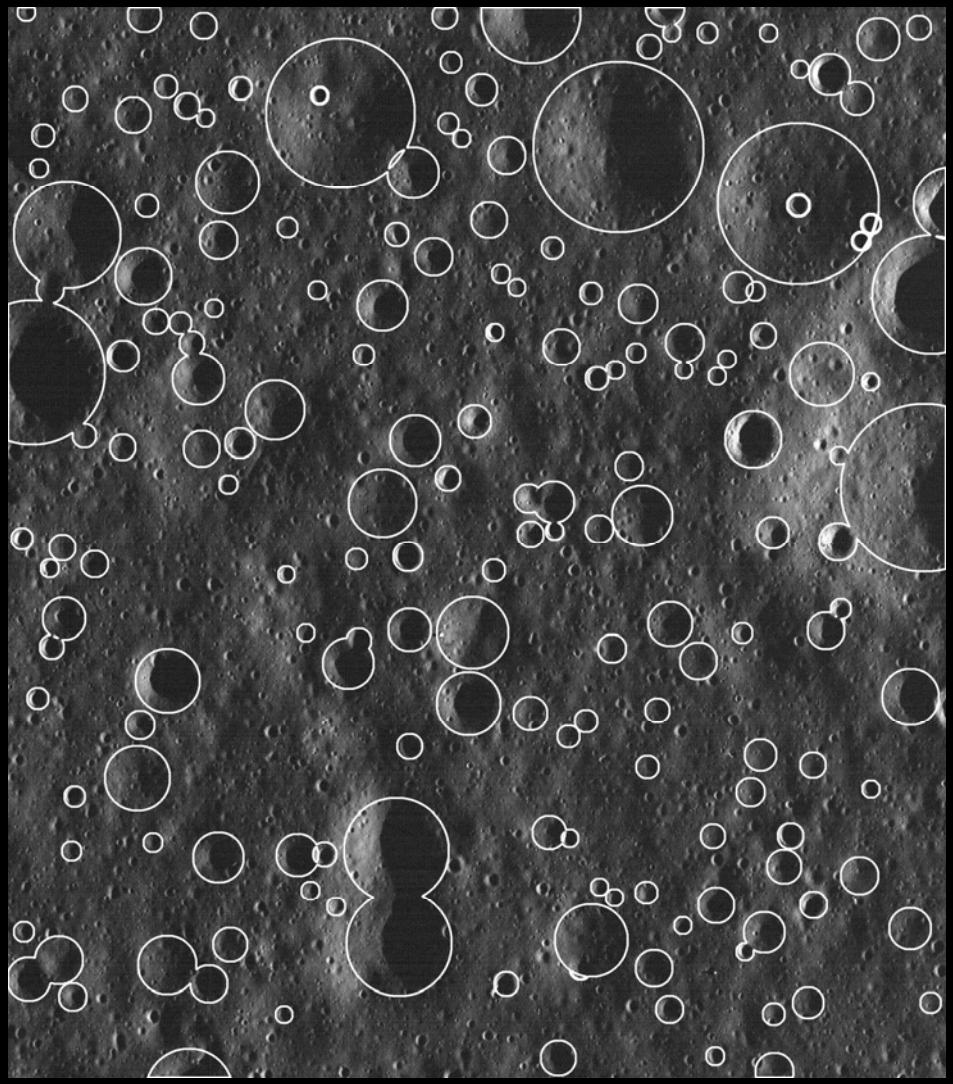
Fragment of LROC image M105824863LR of ~1 x 1 km area near of crater Shackleton, South Pole



Crater density (D 15 to 80 m) is well below the equilibrium one

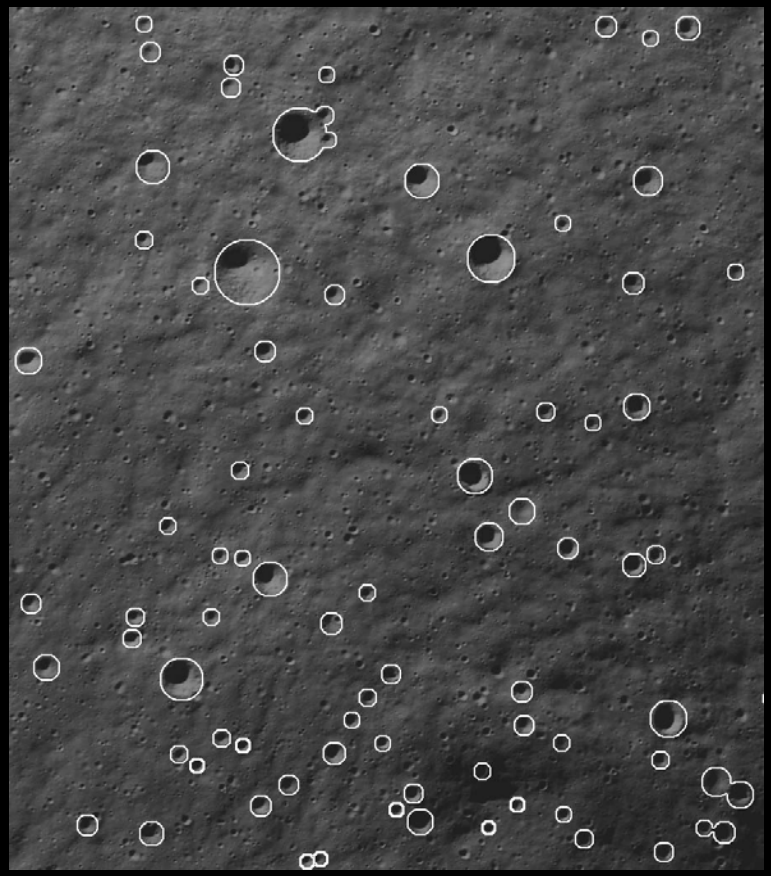
Fragment of LROC image M131881859LC of ~1 x 1 km area at the landing site of Lunokhod 1, NW part of Mare Imbrium



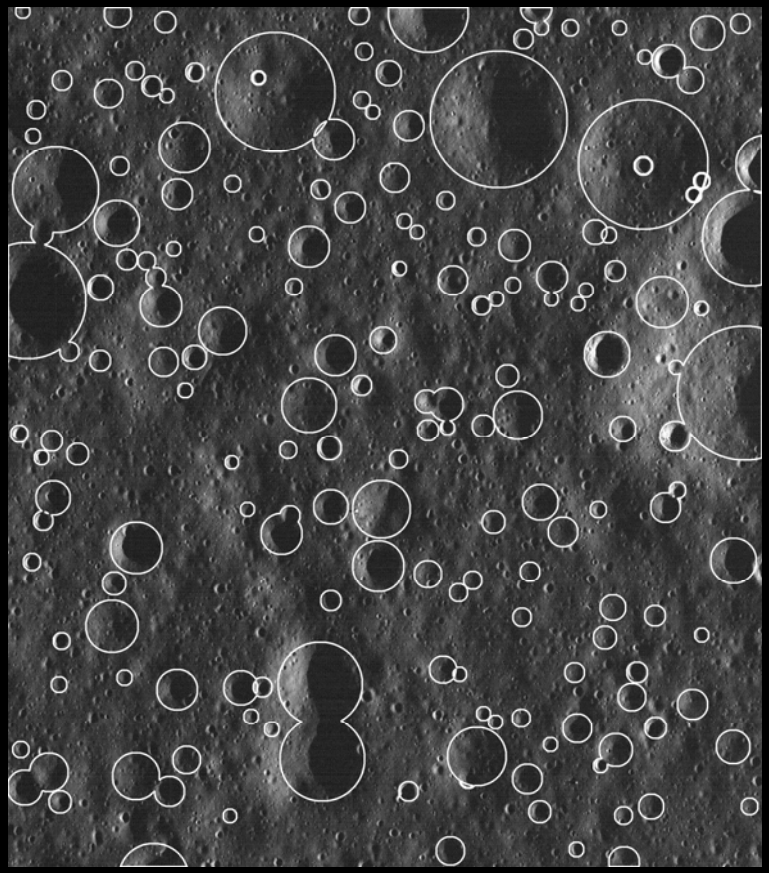


Crater density (D 15 to 150 m) is close to the equilibrium one

SE of crater Shackleton



Landing site of Lunokhod 1



Prominent deficit of small craters in the South Pole area suggests:

1) This area was recently resurfaced, e.g. by Shackleton formation
2) This area is being resurfaced by the “dry” downslope mass wasting (see Basilevsky, LPSC-7, 1976);
3) This area is being resurfaced by the “volatile-involved” downslope mass wasting?

Conclusions:

- Starting list of the potential landing sites for the Luna-Resource mission has been made based on analysis of the Kaguya (images) and LRO (LOLA profiles) data;
- The Luna-Glob / Resource landing regions are mostly highlands whose surface is more rough and thus more risky for landing than that in the Luna-16 through 24 sites;
- Sites less risky for landing may be selected even here if the landing ellipse size is significantly decreased;
- For more reliable selection / characterization of the landing sites the quantitative engineering requirements provided by NPOL are needed;
- For more reliable selection / characterization of the sites involvement of LRO LOLA & LROC data is crucial.