# Geological Setting of the Luna-Resource Candidate Landing Site Region: Characterization from LRO and Related Data

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1-Vernadsky Institute, Russia; 2-Brown University; USA, 3-MIT, USA; 4-GSFC, USA; 5-JHUAPL, USA

# Study area: Regional context
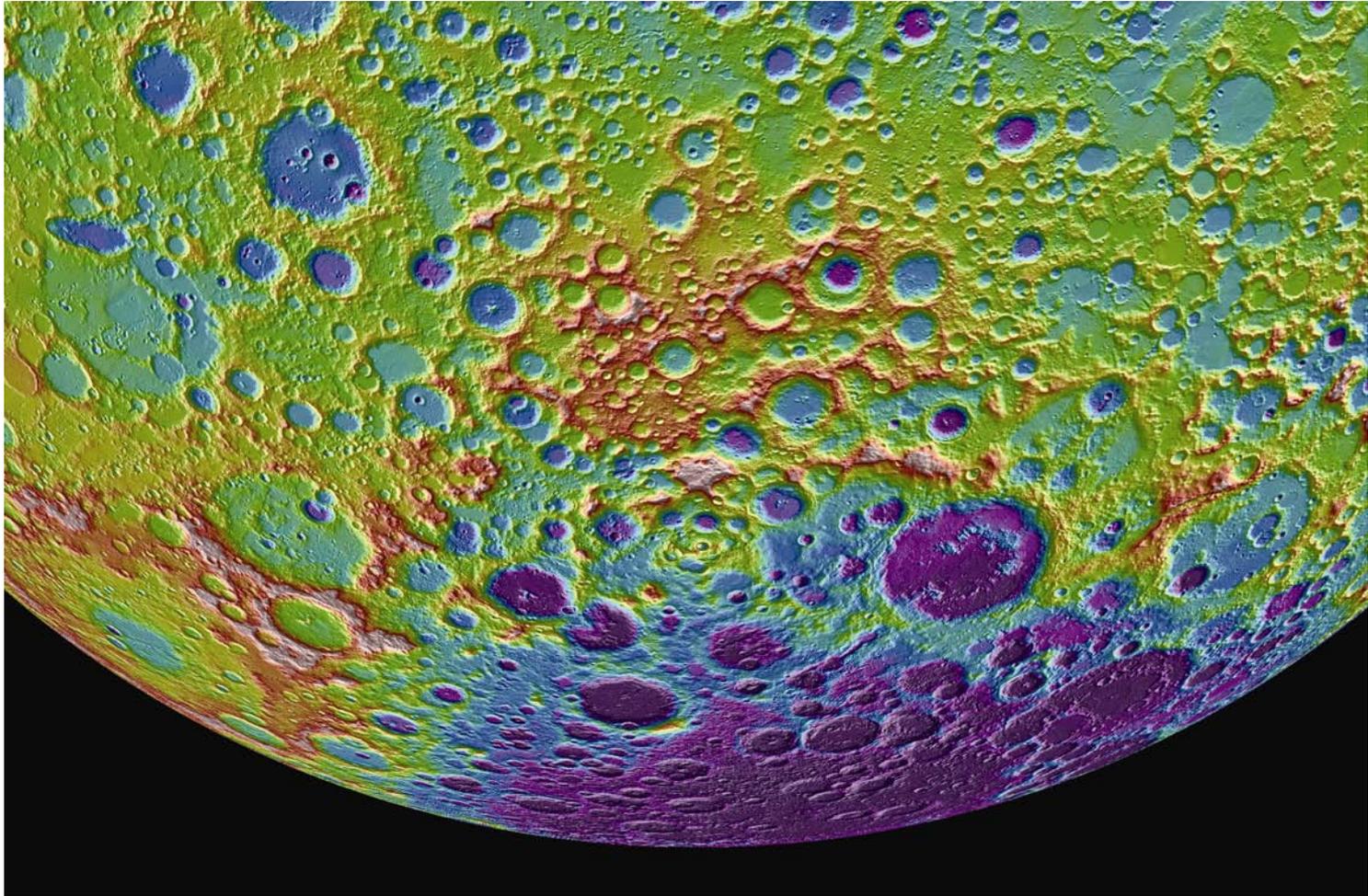
# Study area: Regional context
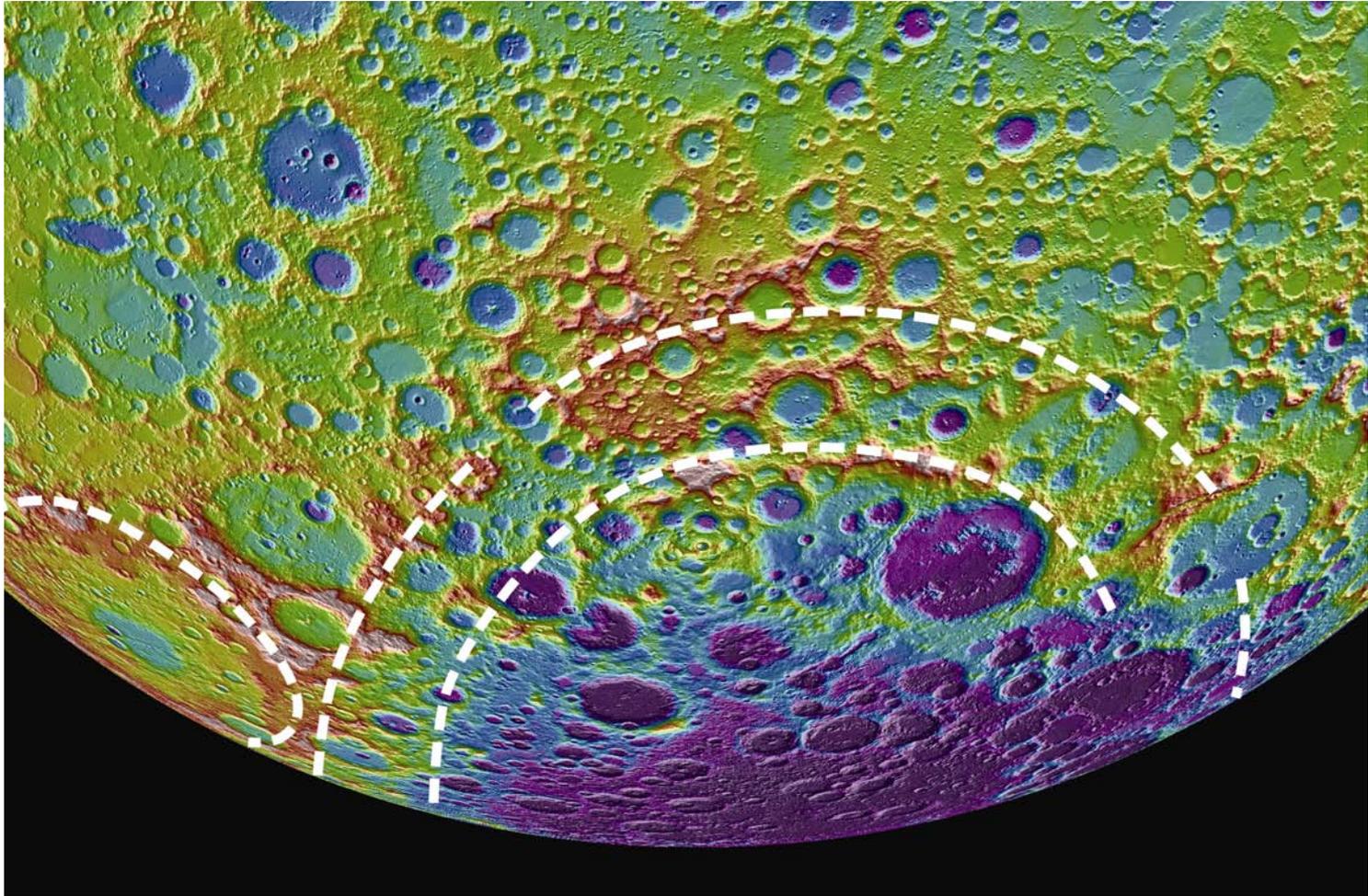
# Study area: Regional context
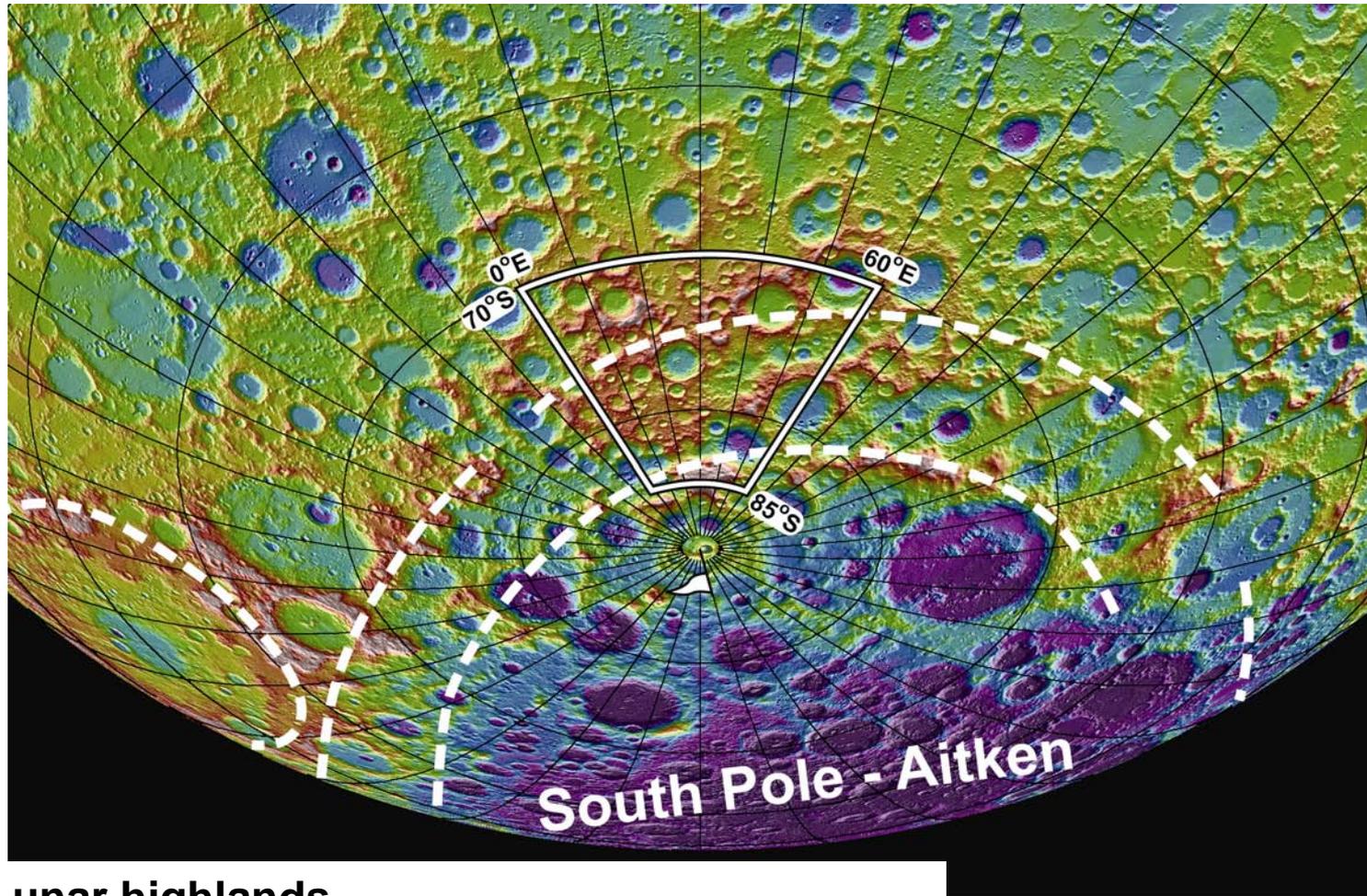


- Lunar highlands
- Southern rim of SPA
- Oldest crustal materials
- Materials ejected/displaced after SPA impact

**Selection of landing sites region:**
- **Ballistic constraints**
- **Low neutron flux**

70°S,0°E

85°S,60°E

50 км (at Pole)

count rate

4.9  5.0  5.1  5.2  5.3  5.4
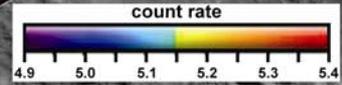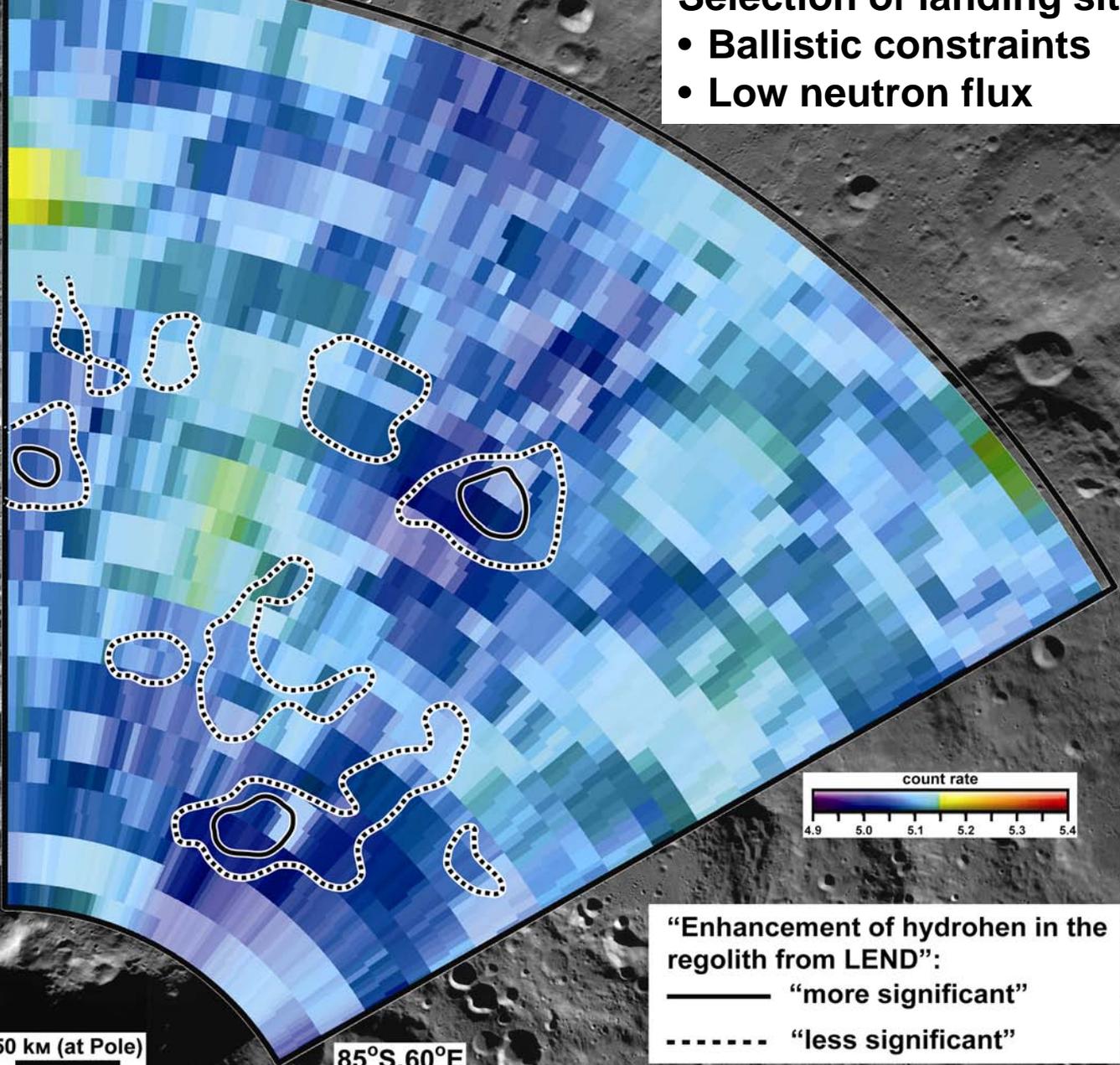
"Enhancement of hydrohen in the
regolith from LEND":

———— "more significant"

------- "less significant"

70°S,0°E

LRO WAC
100 mpp

50 км (at Pole)

85°S,60°E

**Selection of landing sites region:**
- **Ballistic constraints**
- **Low neutron flux**
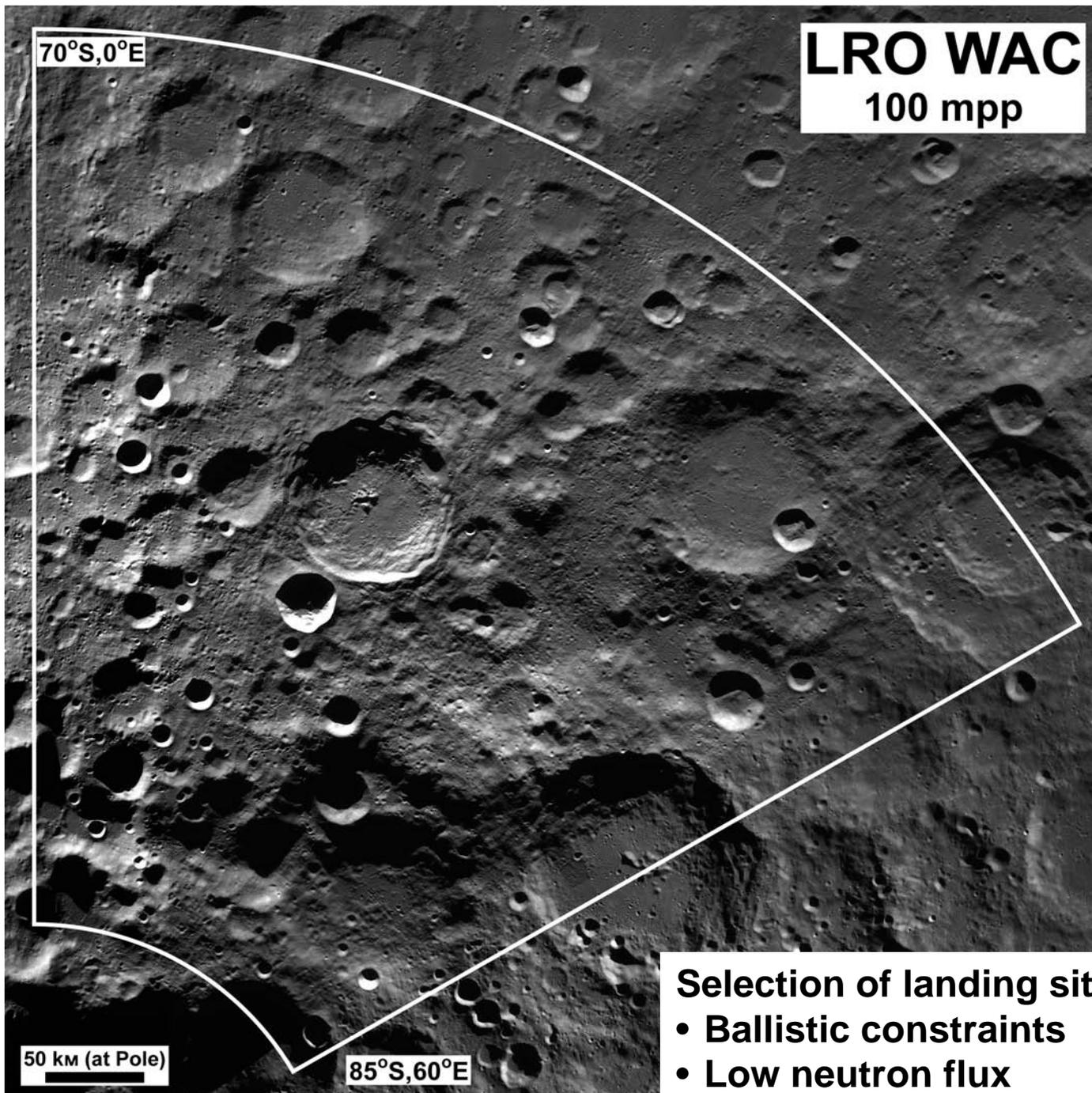
Regional topography:
- NW portion: more flat
- S portion: more contrasting

WAC-LOLA

500 m contour lines

50 км (at Pole)

-5  -4  -3  -2  -1  0  1  2  3  4  5 km
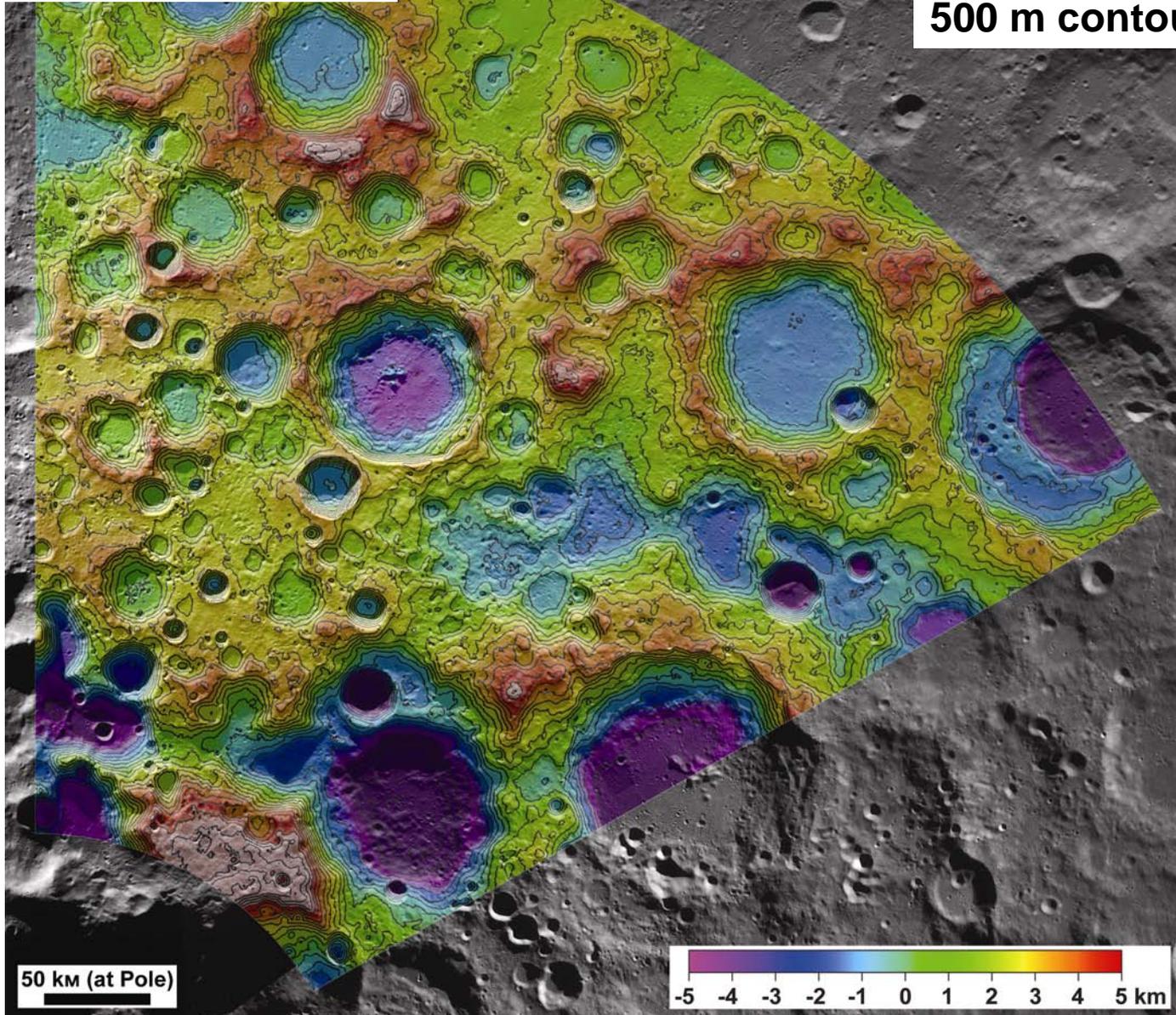
**Regional morphology:**
- **Several terrain types make up the surface**
- **First step: compiling of a morphologic map**

LRO WAC
100 mpp

50 км (at Pole)

85°S,60°E

**Samples of terrain types**

# Terrain types: craters, undivided

# Terrain types: facies of large craters



Ejecta of young crater

Plains on floor of large craters
- smooth
- smooth-hummocky
- hummocky
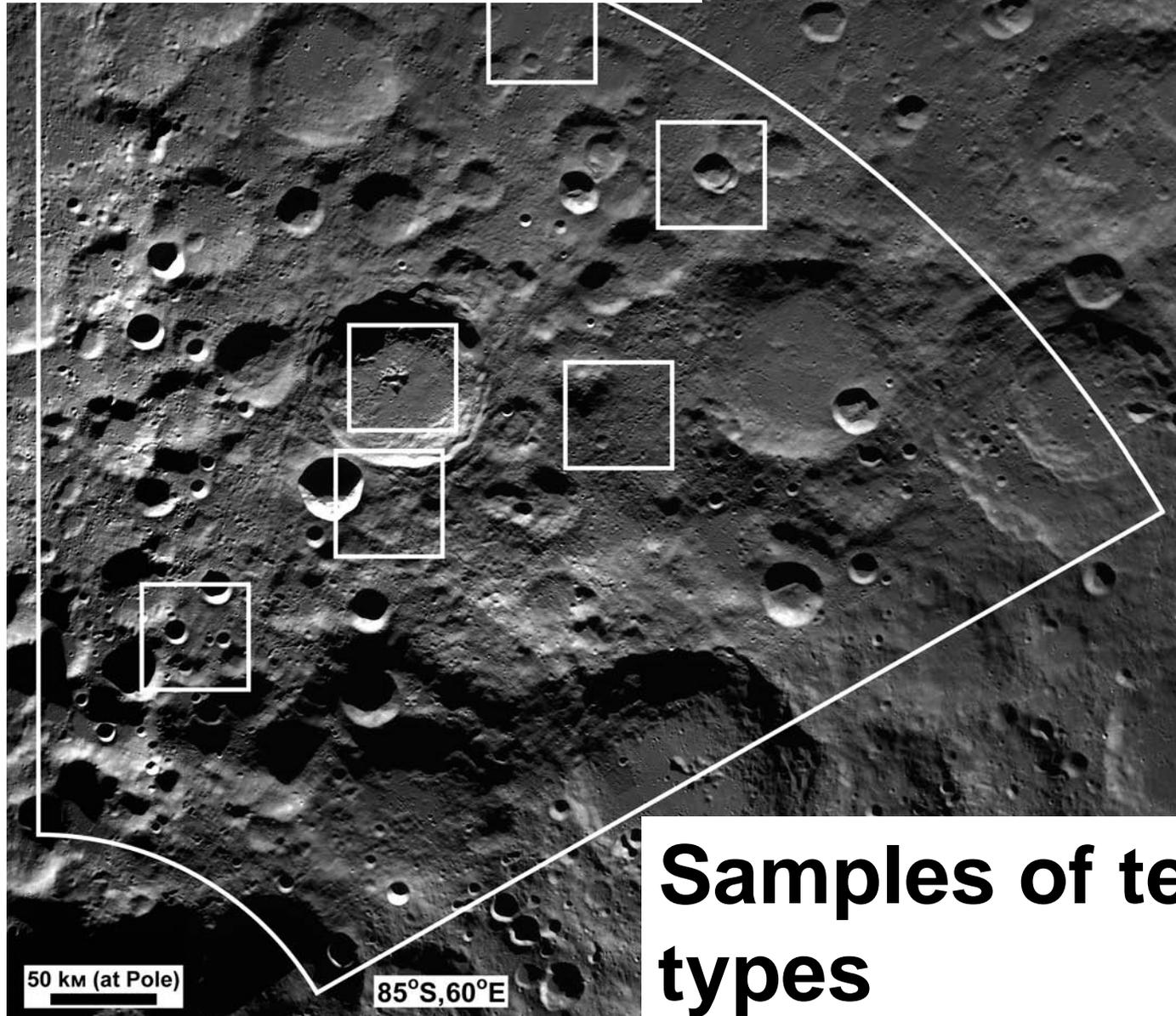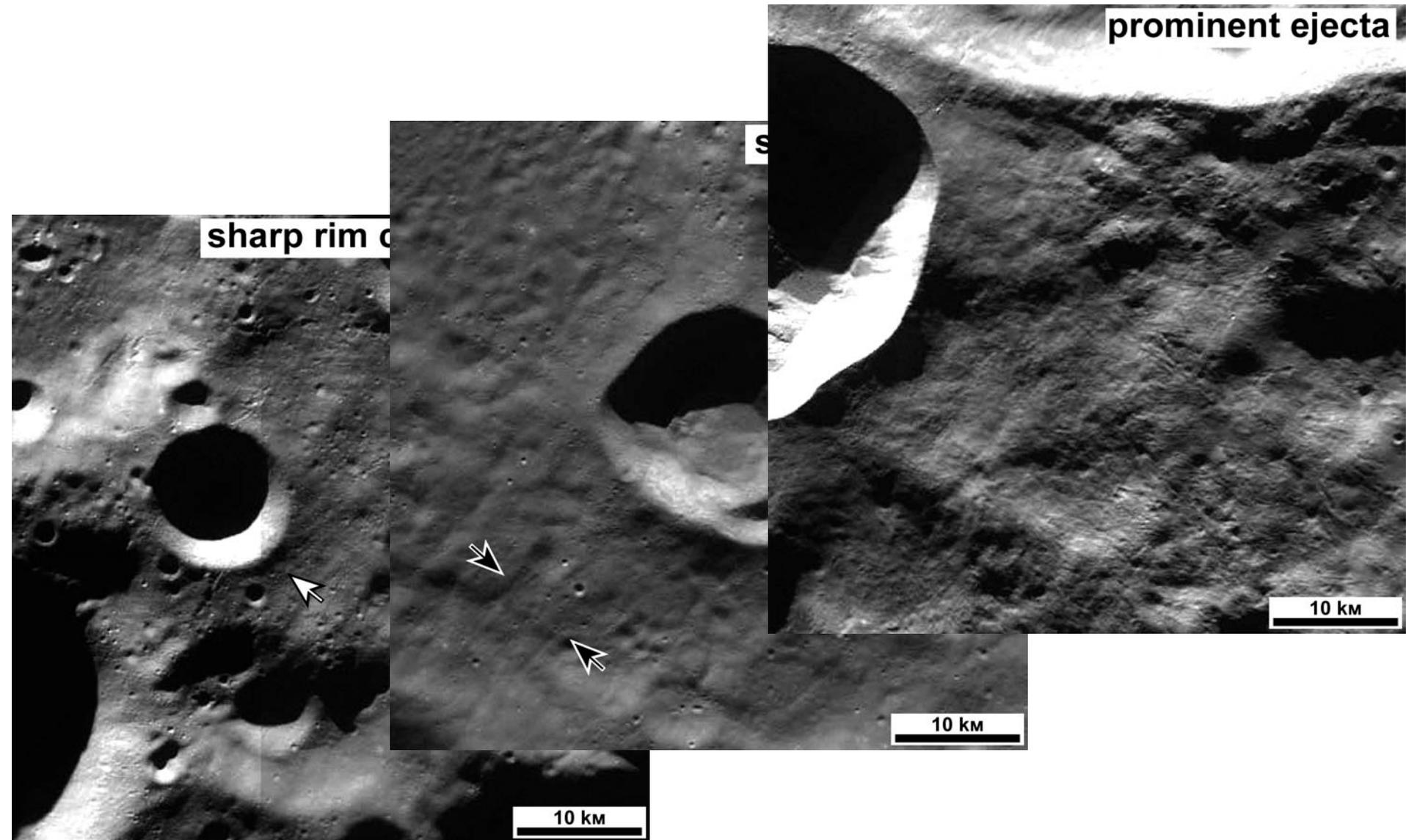
Walls, central massifs of large craters
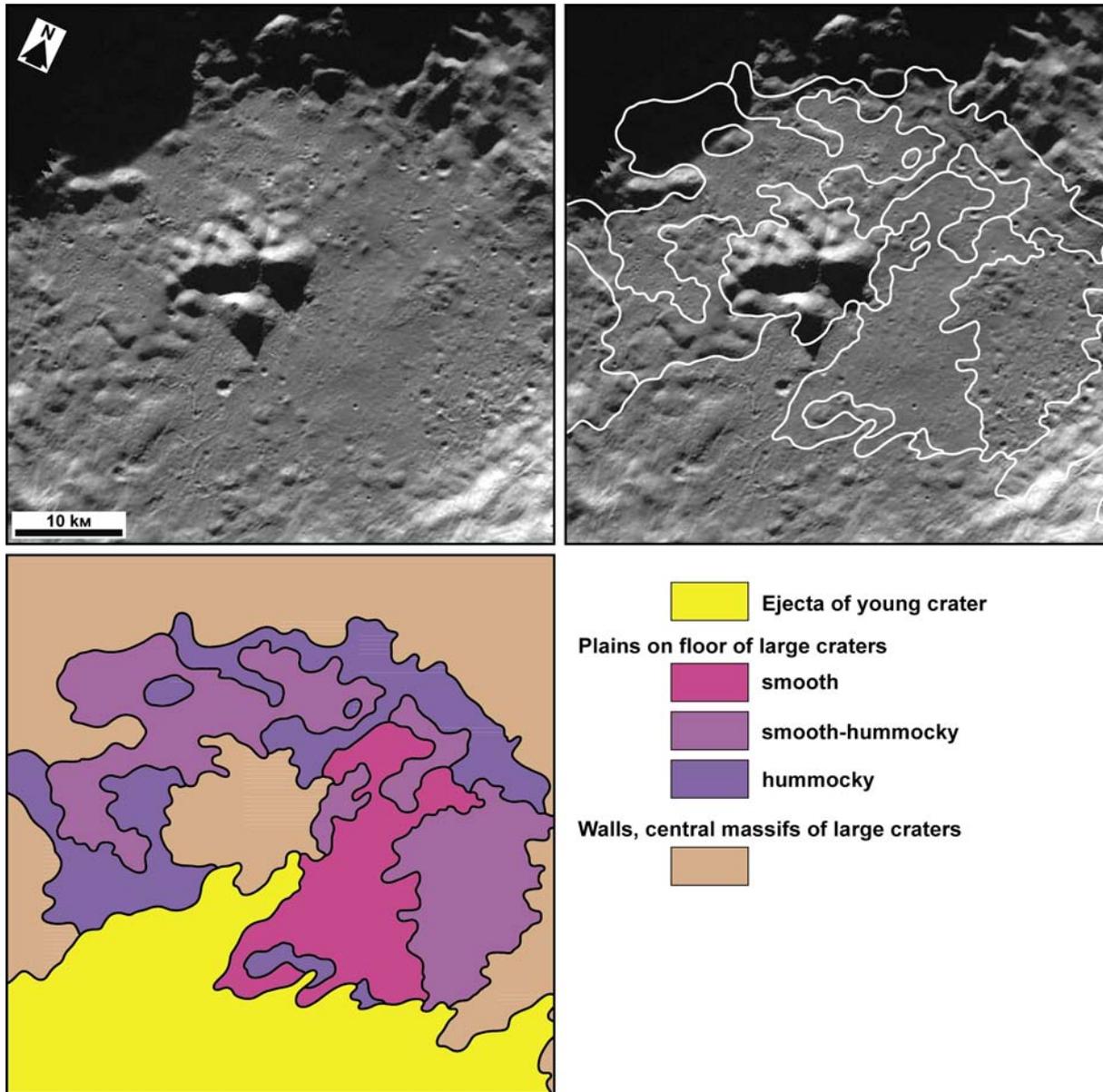
# Terrain types: rims, intercrater plains
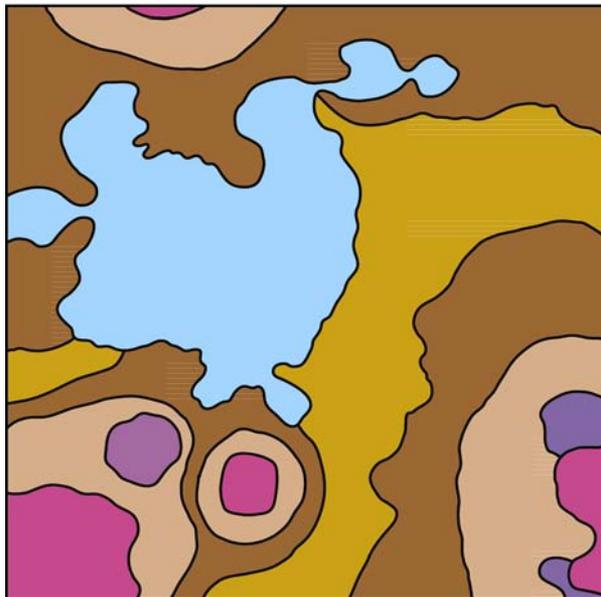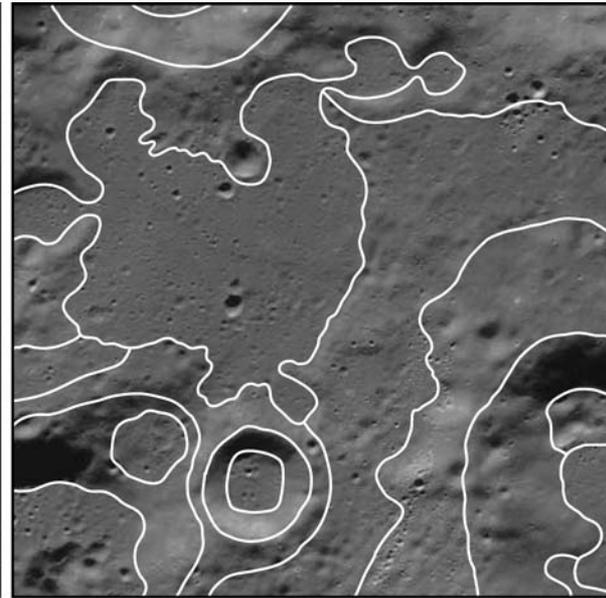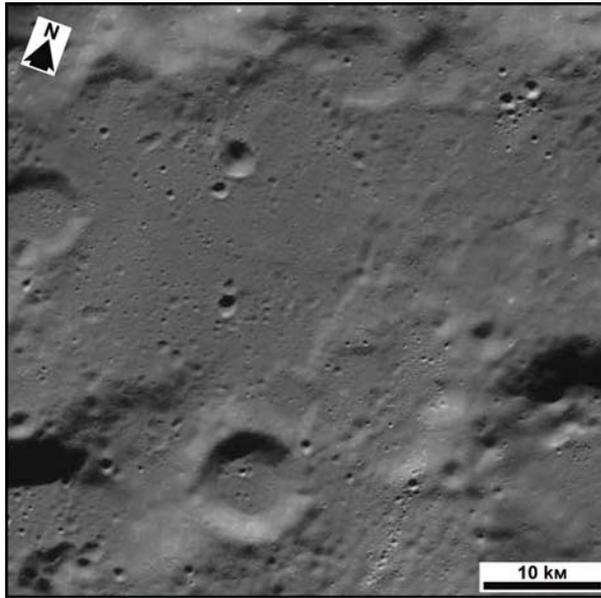


Plains on floor of large craters
- smooth
- smooth-hummocky
- hummocky

Walls, central massifs of large craters

Intercrater plains
- smooth
- hummocky

Rim of large craters

# Terrain types: rugged, elevated terrain



Hummocky intercrater plains

Rim of large craters

Rugged, high-standing intercrater massifs

# Morphologic map of the south sub-polar area



**Terrain types:**

- Craters with prominent ejecta
- Craters with subdued ejecta
- Sharp-crested craters, no ejecta
- Plains on floor of large craters, smooth
- Plains on floor of large craters, smooth-hummocky
- Plains on floor of large craters, hummocky
- Intercrater smooth plains
- Hummocky intercrater plains
- Walls, central massifs of large craters
- Rim of large craters
- Rugged, high-standing intercrater massifs

**Structures:**

- Prominent rim crest
- Subdued rim crest
- Central massif
- Scarp
- Subdued ridge
- Cluster of secondaries

Age assessment: USGS geological map

# Stratigraphy - morphology comparison



USGS geological map

Morphologic map of the south sub-polar area

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# Stratigraphic map of the south sub-polar area

Age assessments from the
geological map of Lunar region below 45°S
by USGS

| SYSTEM | undivided | Crater materials | | | | | | Non-crater and basin materials | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Walls, rim facies | | Floor facies | | | | Intercrater plains | | rugged, elevated terrain |
| | | wall facies | rim facies | smooth | smooth-hummocky | hummocky | | smooth | flat hummocky | |
| COPERNICAN | Cc | | | | | | | | | |
| ERATHOSTHENIAN | fresh Ec2 degraded Ec1 | | | | | | | | | |
| IMBRIAN | | Ici | Ico | Icps | Icphs | Icph | | | | |
| NECTARIAN | | Nci | Nco | Ncps | Ncphs | Ncph | | | | |
| PRE-NECTARIAN | | pNci | pNco | pNcps | pNcphs | pNcph | | pNips | pNiph | pNtr |

# Neutron flux anomalies



Detected at low resolution, do not correlate with background geology:
- Much younger, in shallow regolith.
- No specific target to sample H-"rich" materials.

# Landing sites
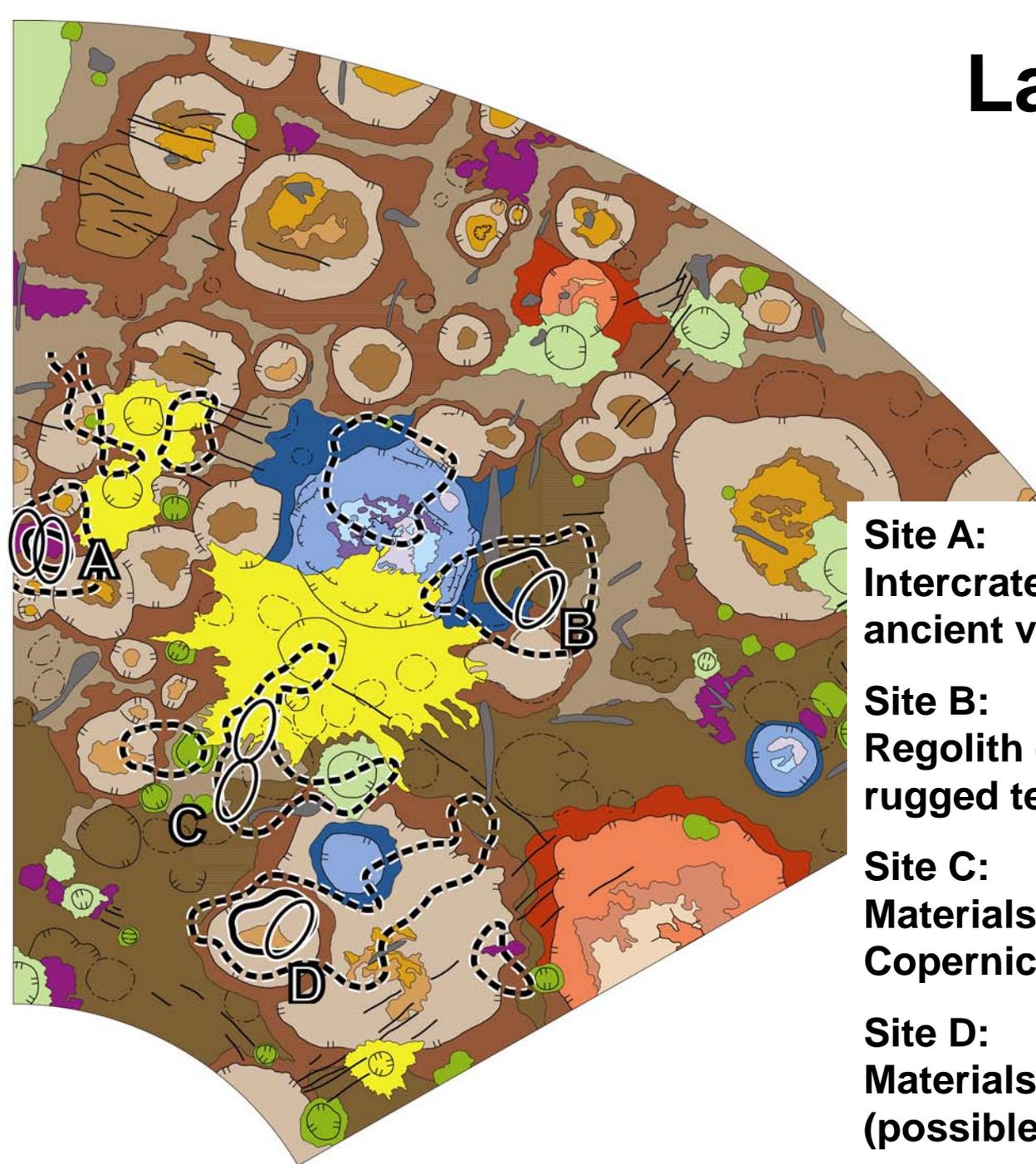


**Site A:**
**Intercrater smooth plains (possible ancient volcanic materials).**

**Site B:**
**Regolith draped over high-standing, rugged terrain (possible SPA rim).**

**Site C:**
**Materials ejected by a "young", Copernican crater (possible SPA rim)**

**Site D:**
**Materials from a pre-Nectarian crater (possible ancient impact melt).**