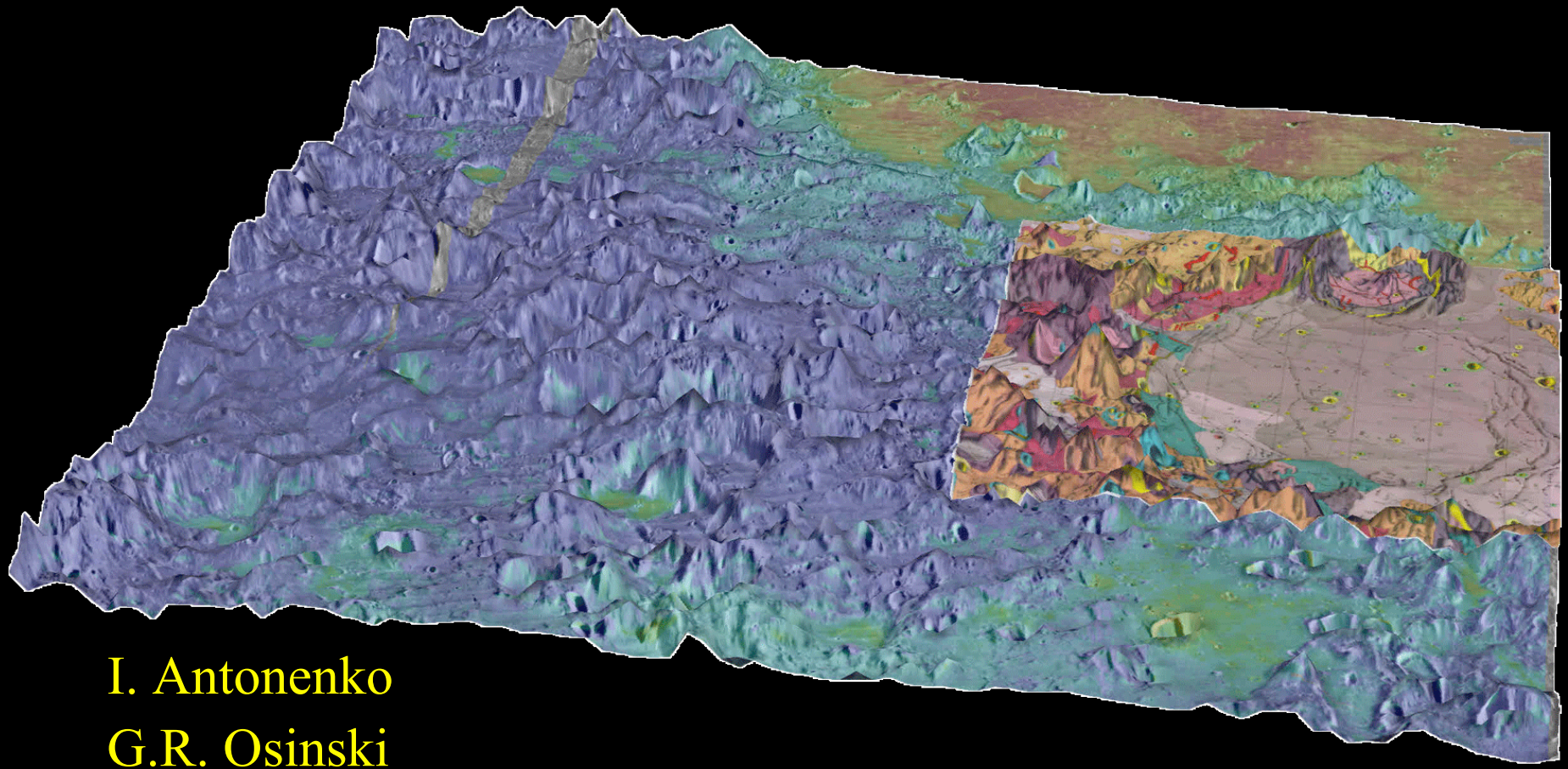
Applications of LOLA and Other Fused Data Sets to Studies of Lunar Geology



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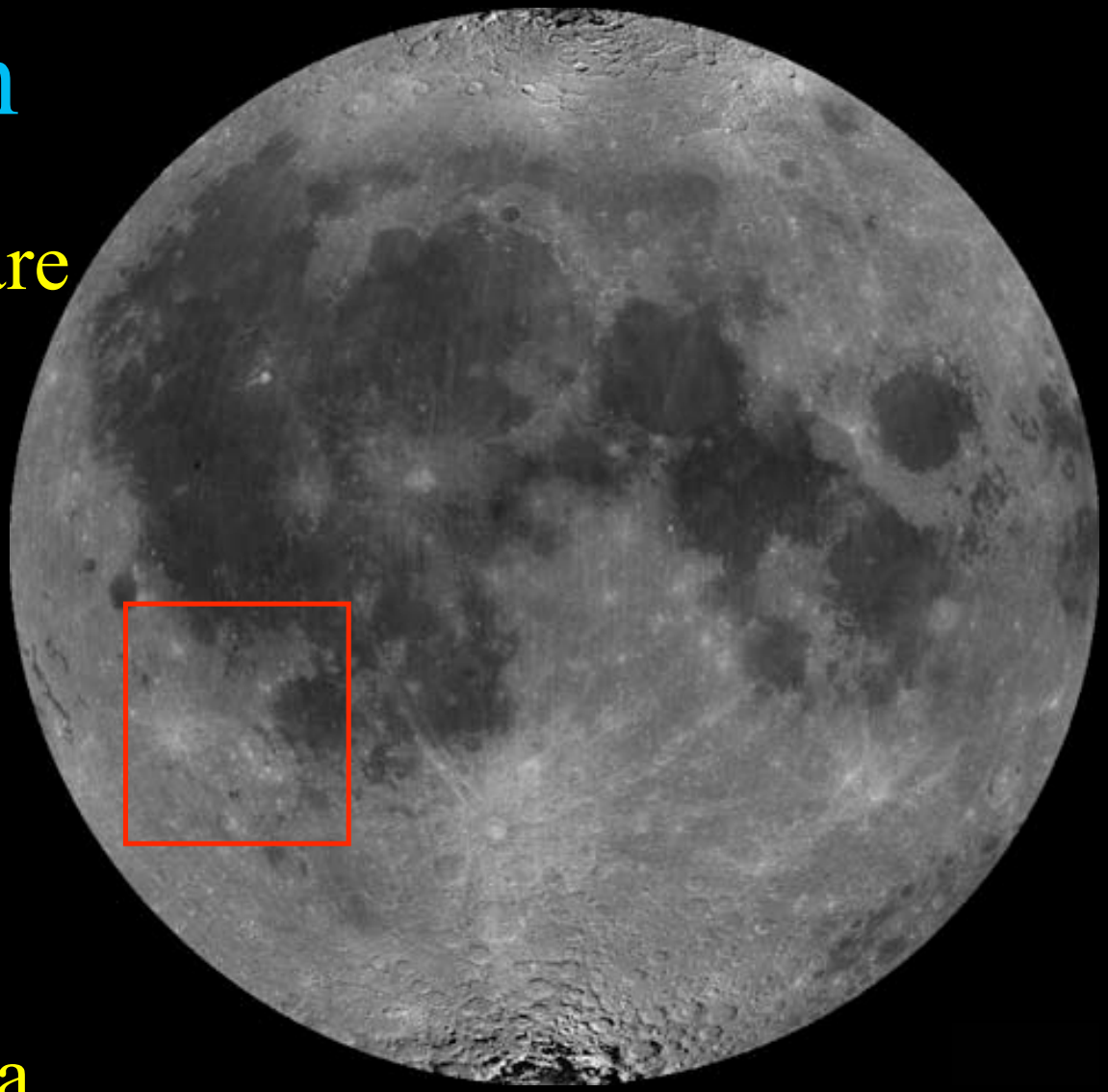
Study Region

- Area west of Mare Humorum
- Mix of highland and mare areas
- Cryptomaria
- Ejecta from Orientale basin

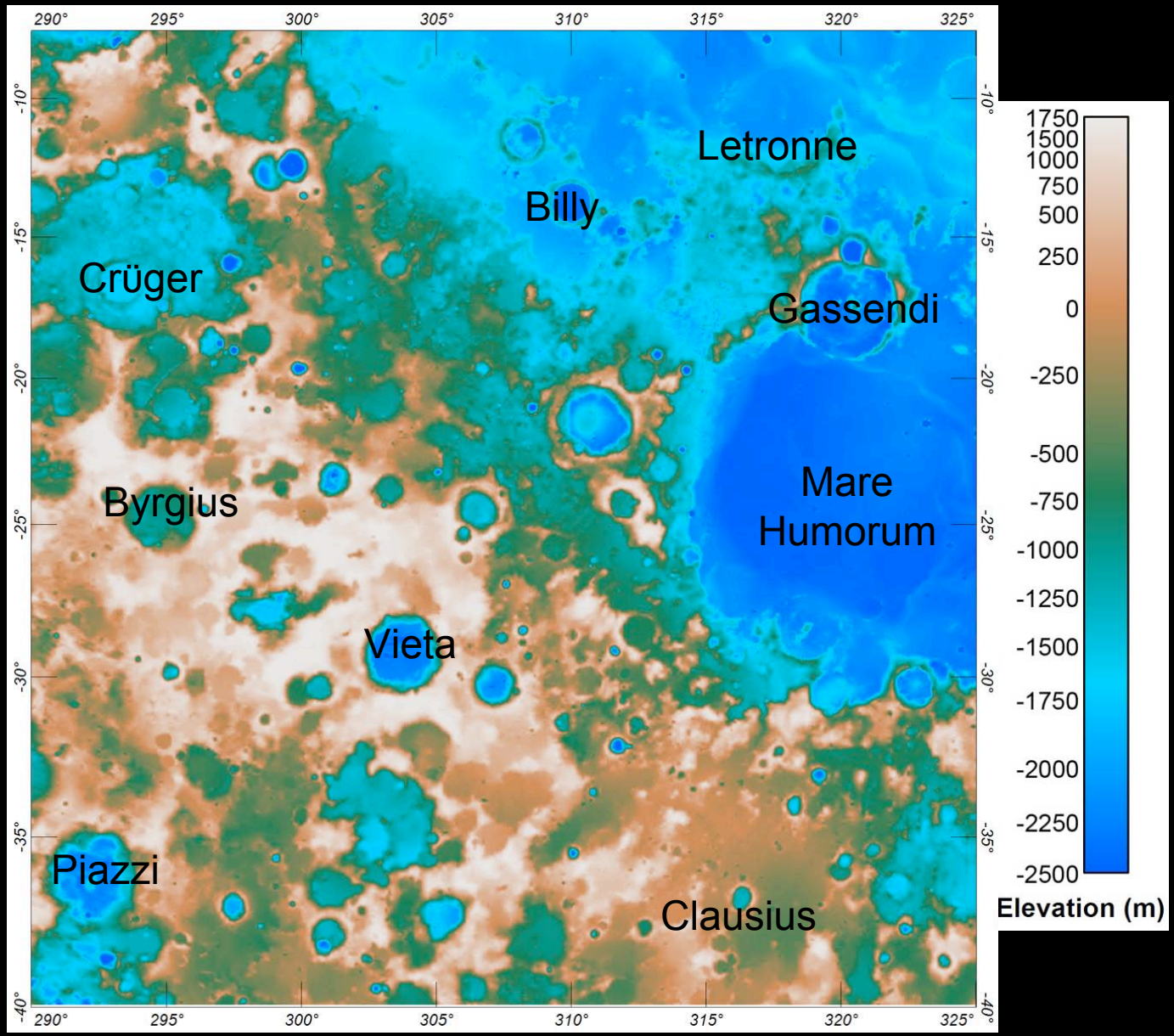
- Well studied area



Clementine Nearside Mosaic

LOLA Data

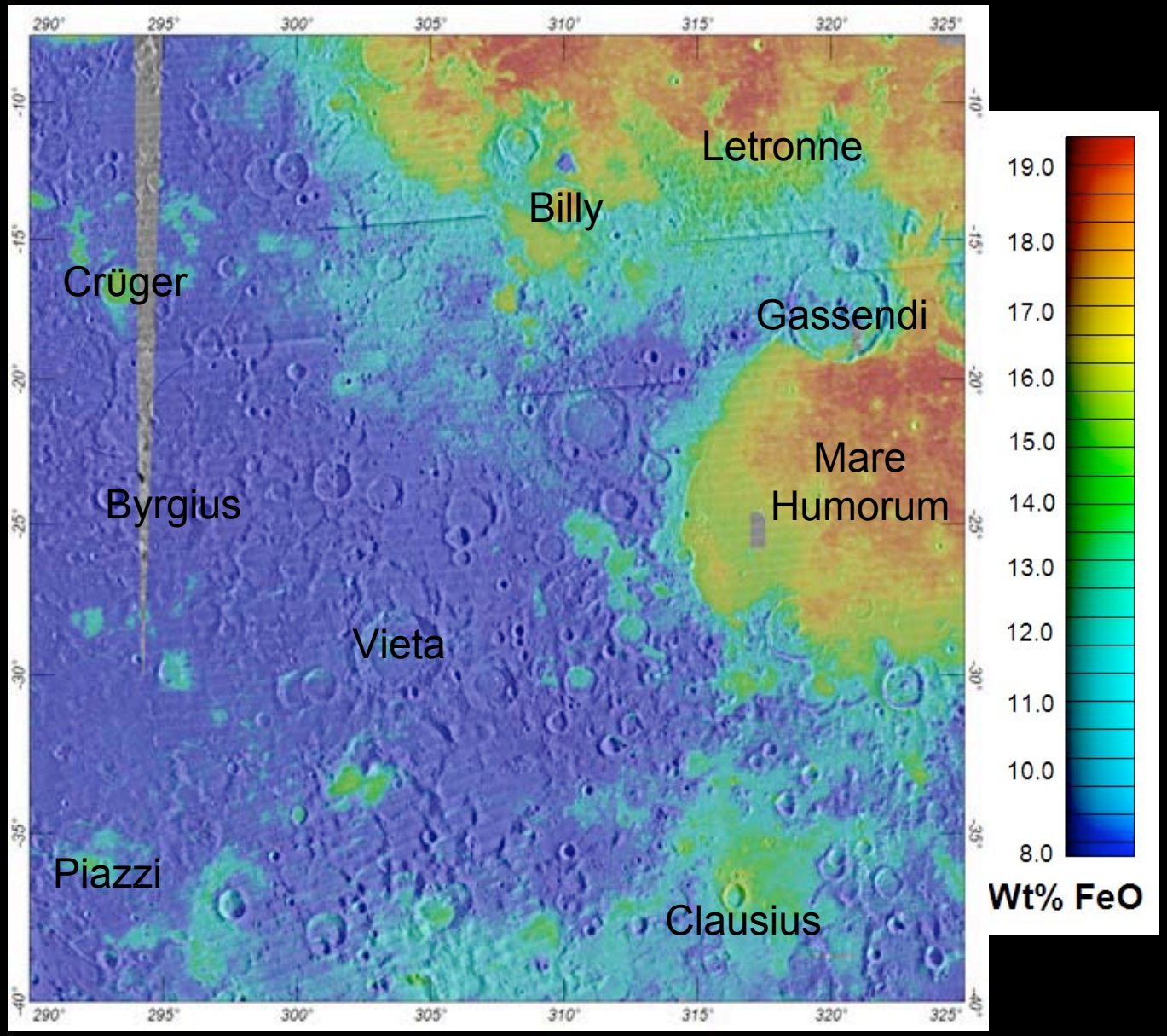
Downloaded from PDS Lunar Orbital Data Explorer
http://ode.rsl.wustl.edu/moon/indexproductsearch.aspx



- LDEM_64
- 500 m/pix
- Highest resolution available for this area

Heritage Data

Downloaded from USGS Map-A-Planet
http://www.mapaplanet.org/explorer/moon.html

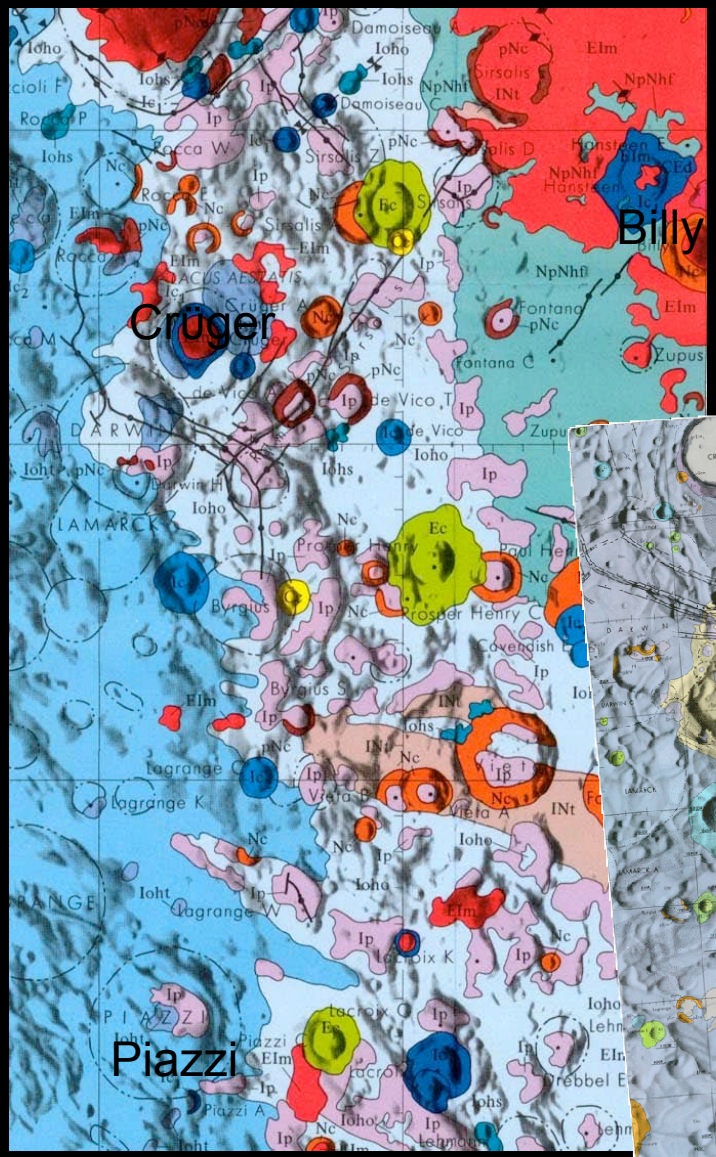


- LO data
  (60 m/pix)
- Clementine
  & derived
  products
  (100 m/pix)

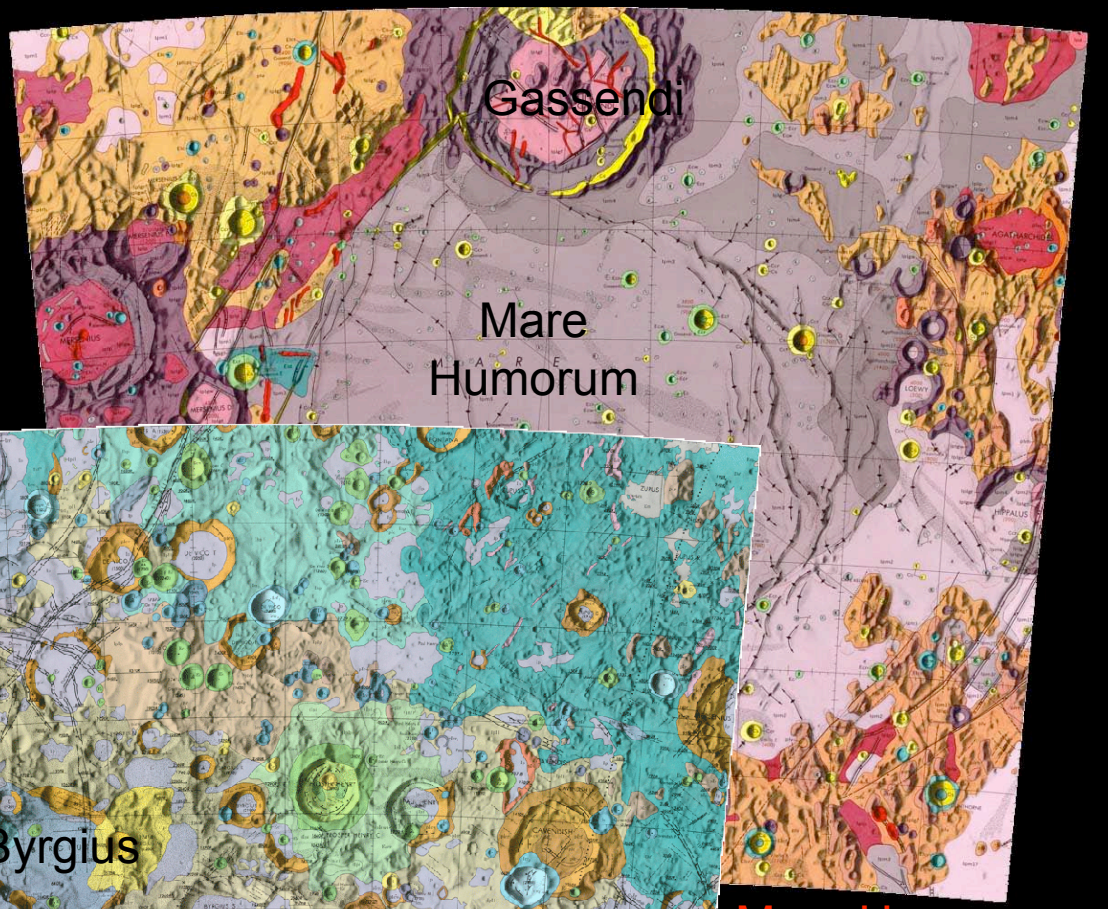
Lunar Orbiter Data with Clementine Iron Data Overlay

Geologic Maps

Downloaded from LPI Lunar Map Catalog
http://www.lpi.usra.edu/resources/mapcatalog/usgs/



Western Limb Area

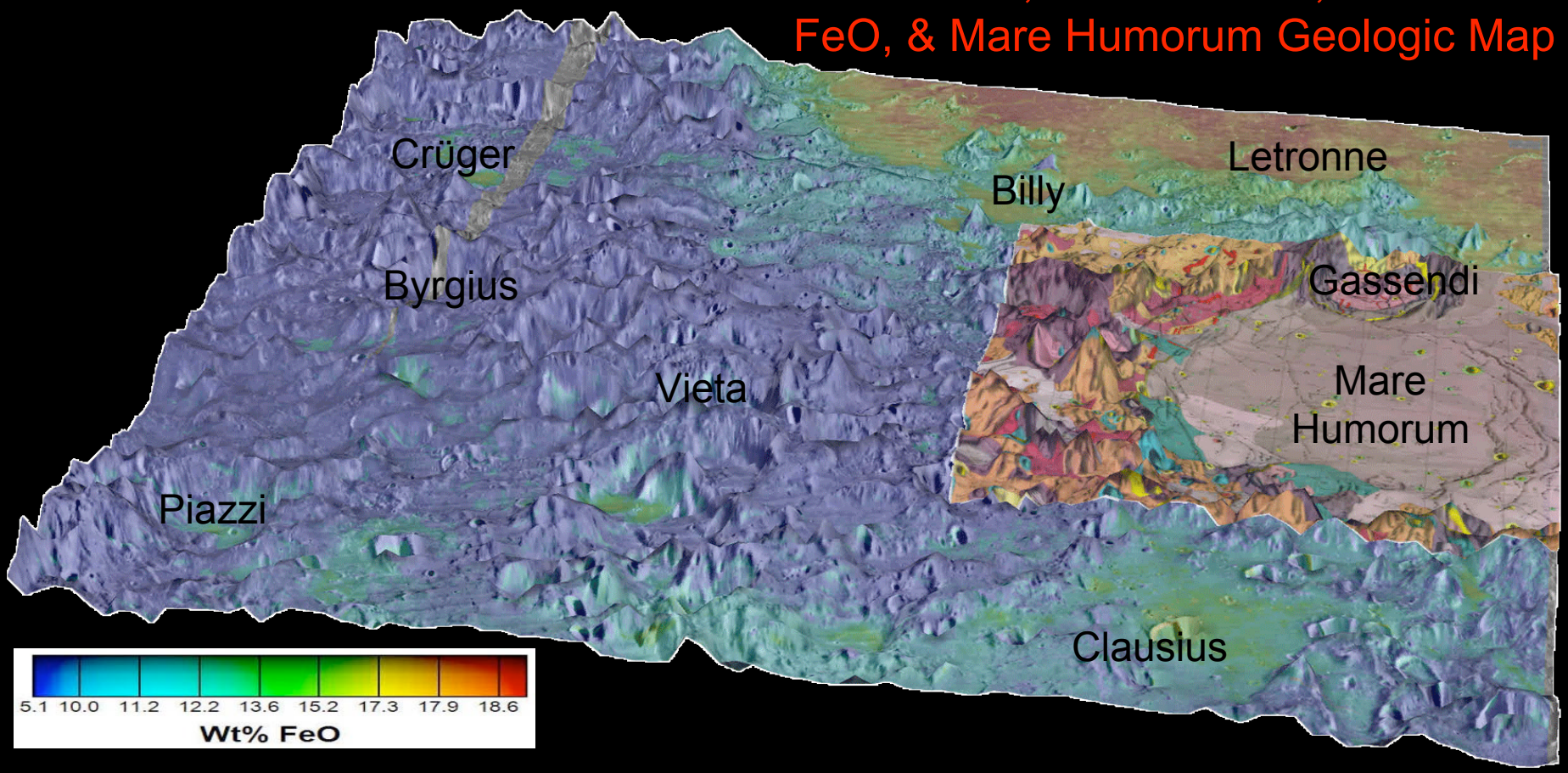


Mare Humorum Quadrangle

Byrgius Quadrangle

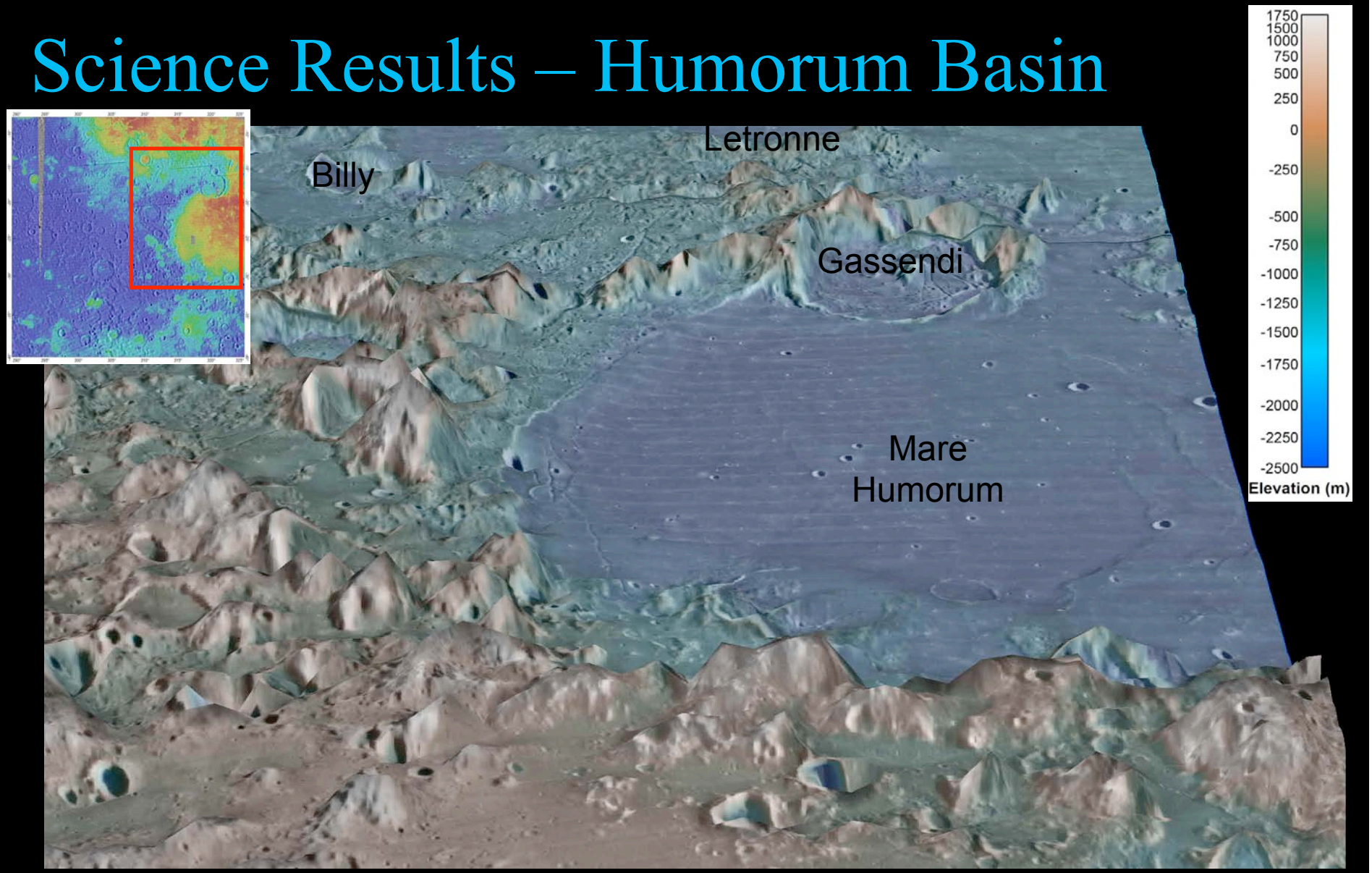
LOLA DEM

LOLA DEM, Lunar Orbiter,Clementine FeO, & Mare Humorum Geologic Map



- LOLA and LO data well co-registered
- Clementine data poorly registered
- Maps required detailed manual registration

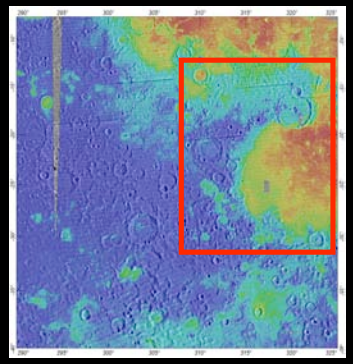
Science Results – Humorum Basin

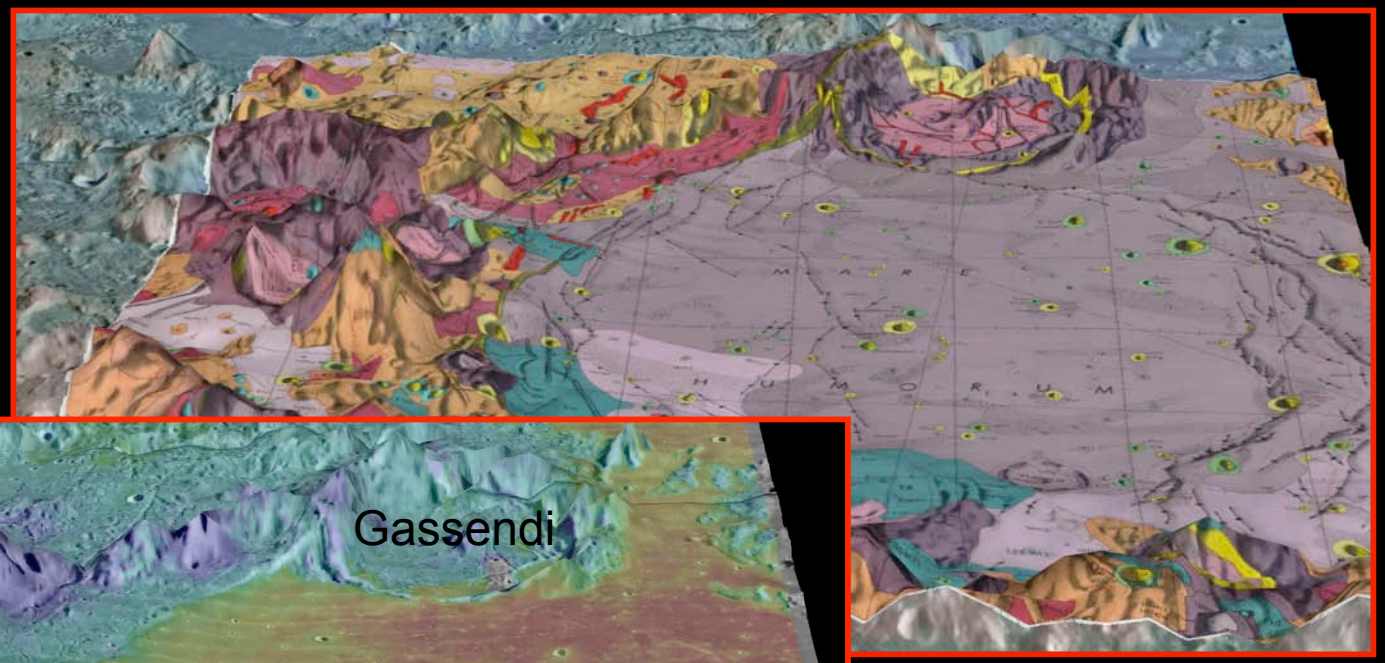


LOLA DEM with LO and LOLA elevation overlay

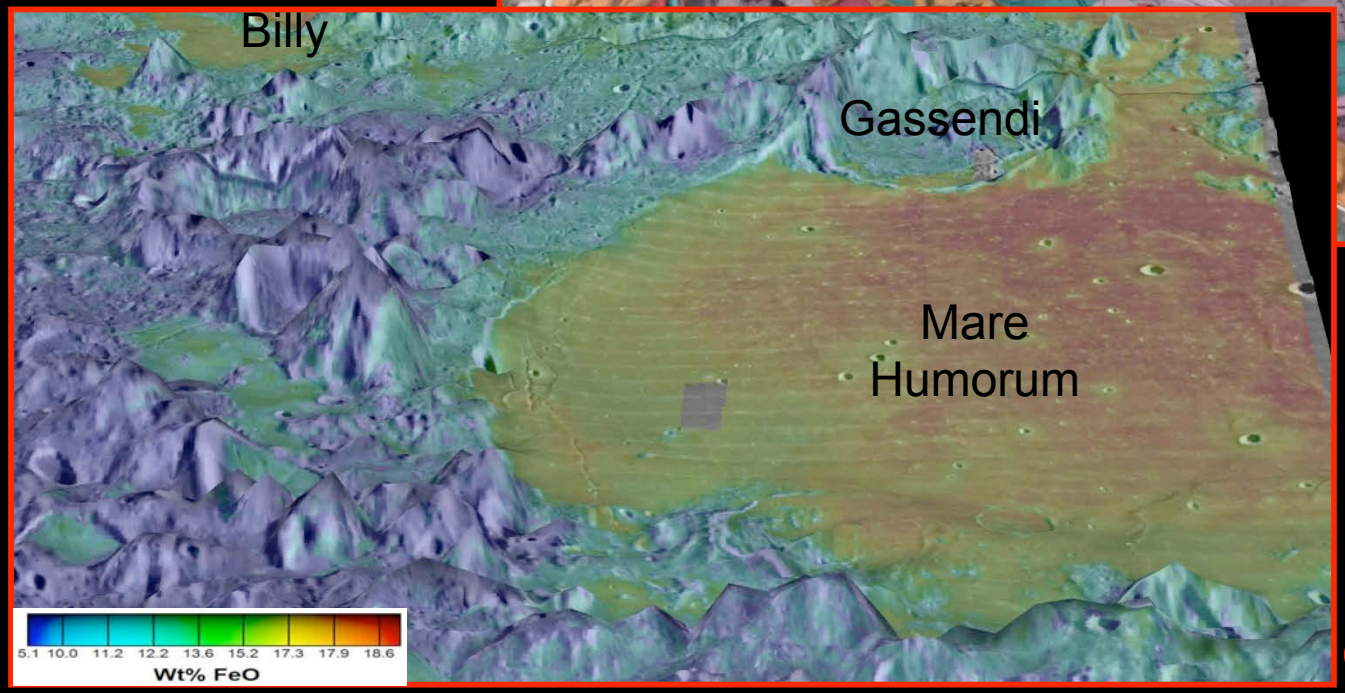
- Humorum basin rim clearly identified - degraded

Science Results – Humorum Basin





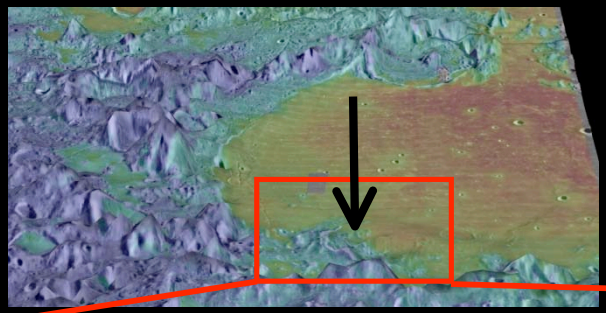
LOLA DEM, LO,
LOLA elevation,
Humorum Map



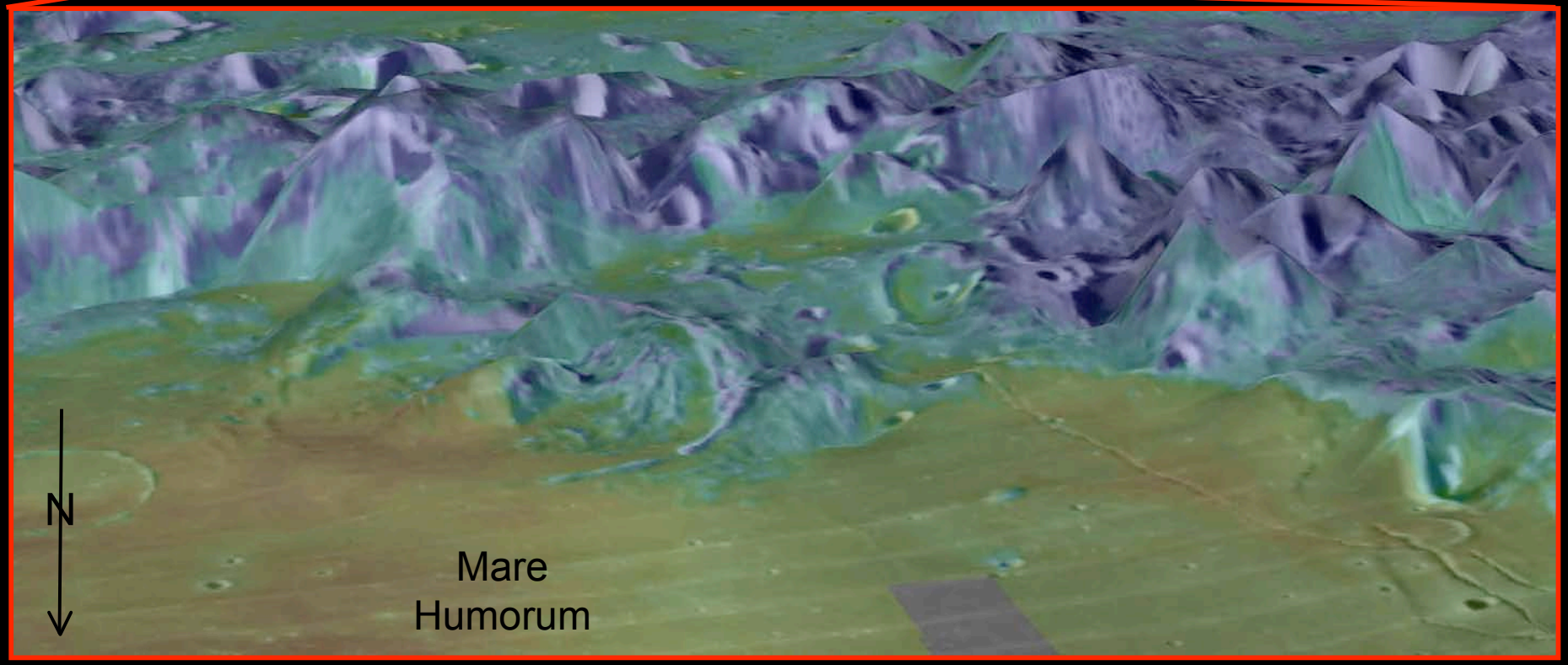
LOLA DEM, LO,
Clementine FeO

- Topography confines volcanism
  - mapped mare and cryptomare found mainly within basin
  - flooding beyond related to breaches of degraded sections

Science Results – Humorum Basin

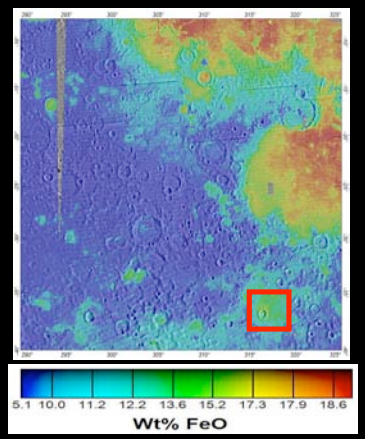


LOLA DEM, LO, Clementine FeO



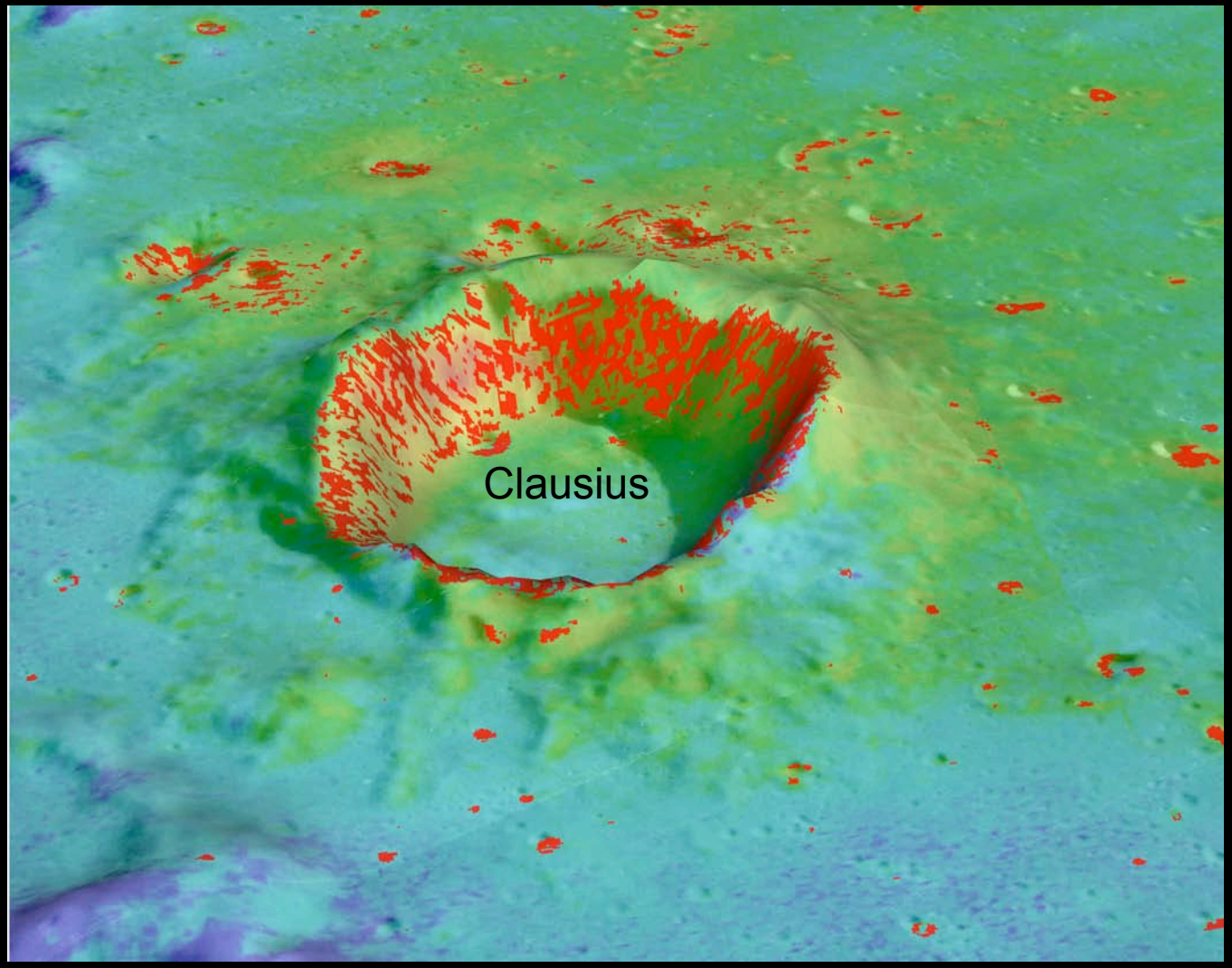
- Topography confines volcanism

Science Results – Clausius Crater



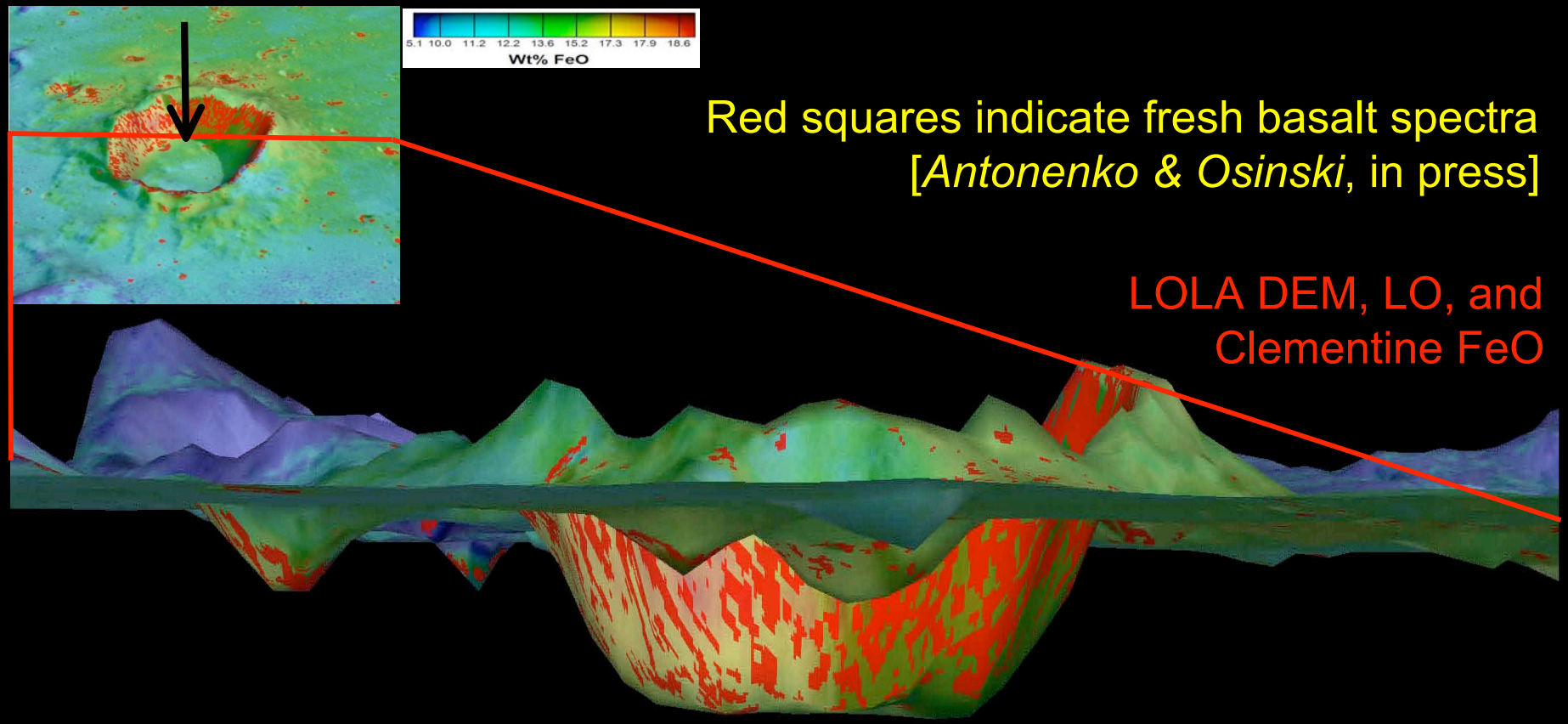
Red squares indicate fresh basalt spectra [*Antonenko & Osinski*, in press]

LOLA DEM, LO, and Clementine FeO



- Mare embay crater ejecta
- Basalts present in walls, floor, and ejecta

Science Results – Clausius Crater



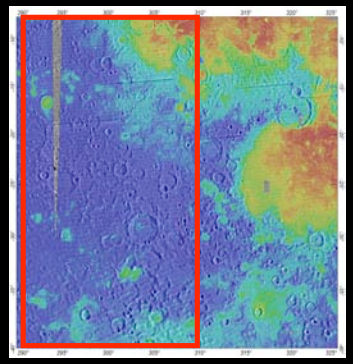
Red squares indicate fresh basalt spectra
[*Antonenko & Osinski*, in press]

LOLA DEM, LO, and
Clementine FeO

- Flat crater floor deeper than surrounding mare
- Three episodes of volcanism:
  - Mare flooding, impact, mare flooding outside/inside

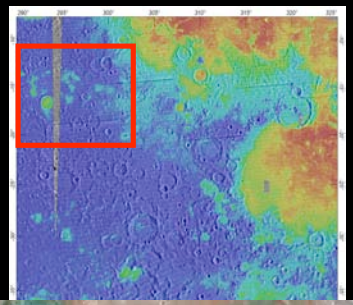
Science Results – Highlands

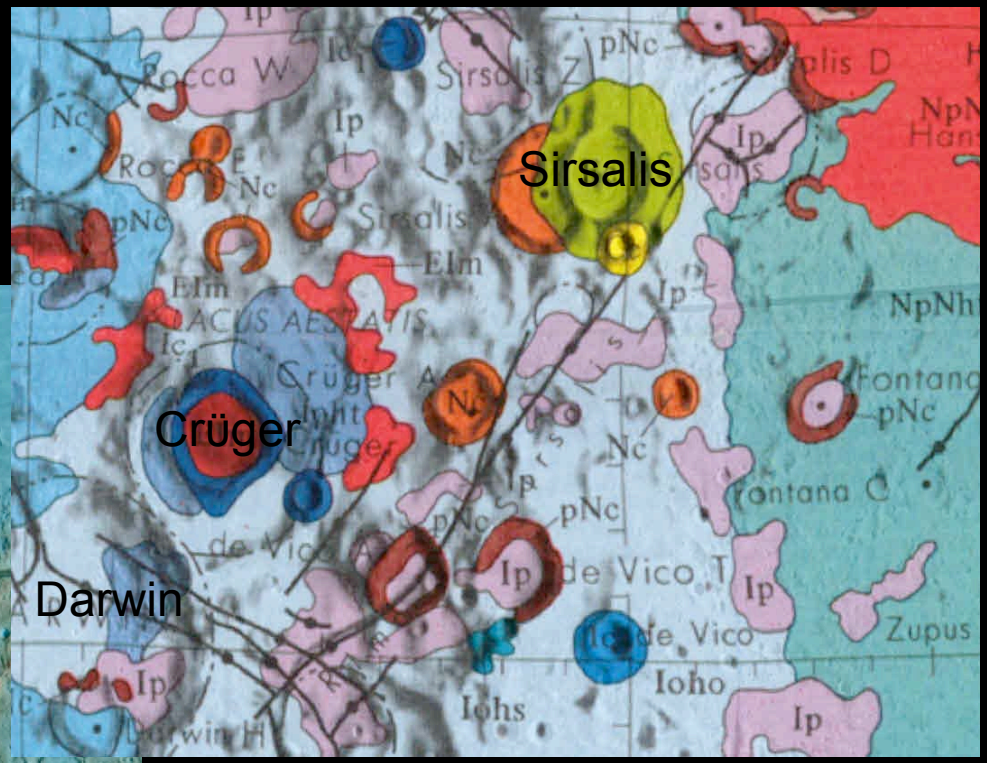
LOLA DEM, LO, and Western Limb Map



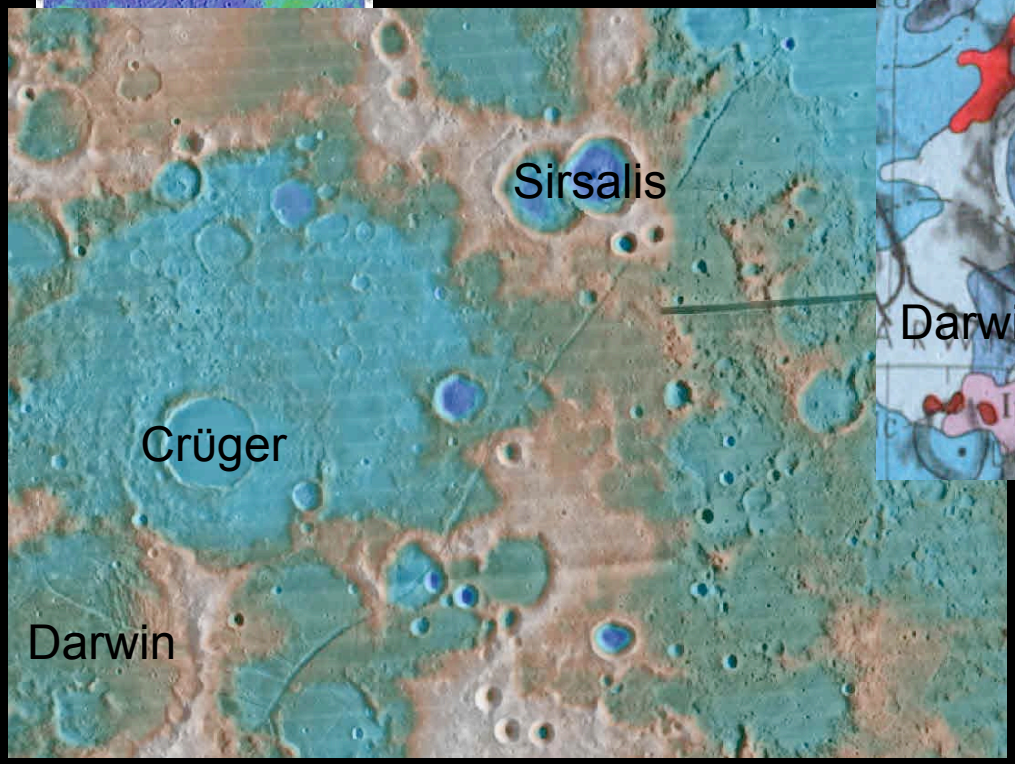
- Very rough highlands – thin Orientale ejecta
- Smoother highlands – continuous Orientale ejecta
- Ejecta behaviour is variable

Science Results – New Basin?





Western Limb Map



LOLA DEM and LO

- Circular topographic feature (~220 km diameter)
- Not previously identified in lunar maps

Conclusions

- LOLA data combined with heritage data is useful…
  - Topographic features
  - Relation between topography and geology
  - Timing of events
  - Planetary processes
- Future work will continue to add more data sets:
  - LROC
  - Mini-RF (LRO)