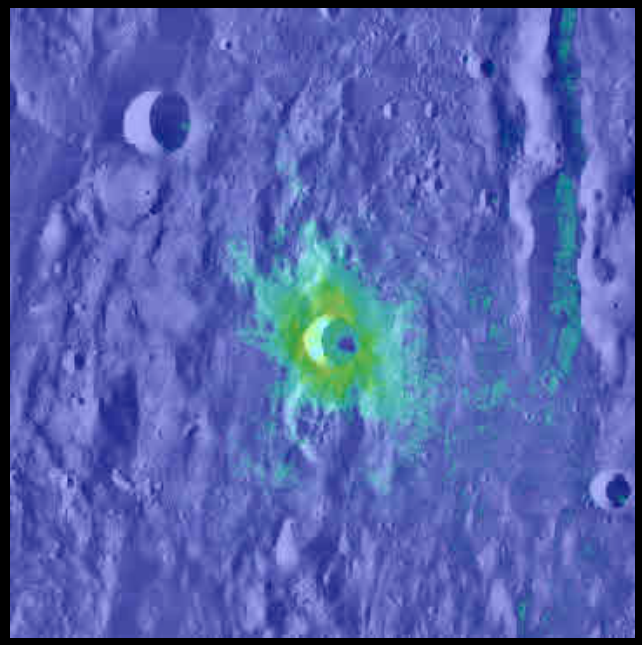
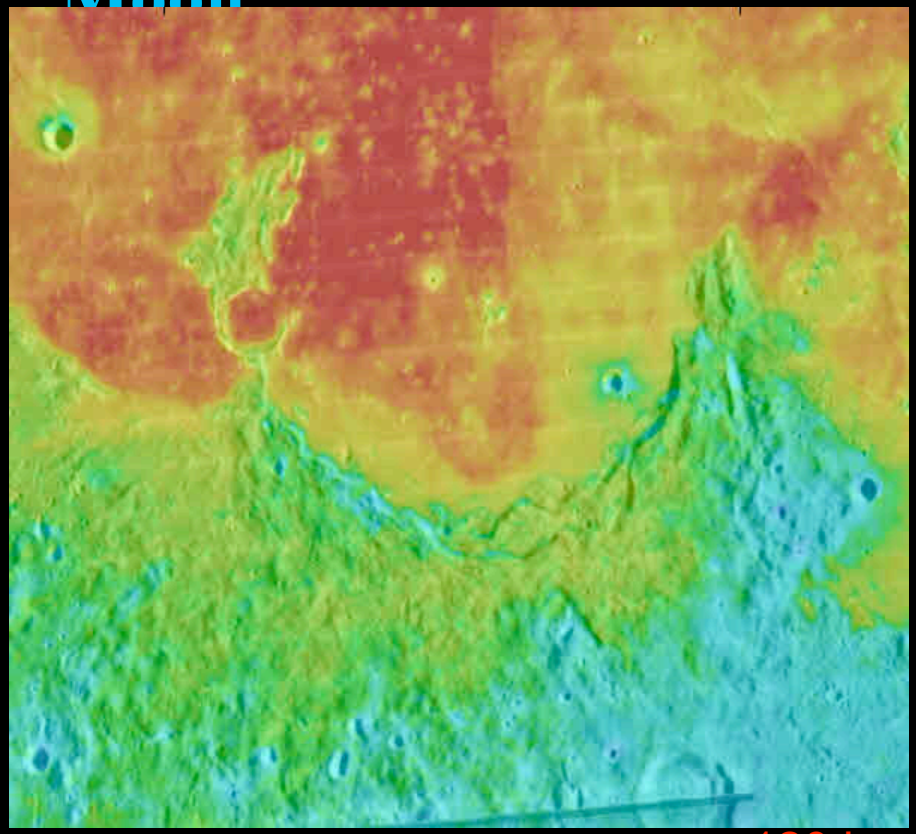
Identifying Dark-Haloed and Non-Dark-Haloed Craters from Fused Lunar Data Sets:

A New Look at the Mare Humorum Region of the Moon



10 km



120 km

I. Antonenko

G.R. Osinski

University of Western Ontario

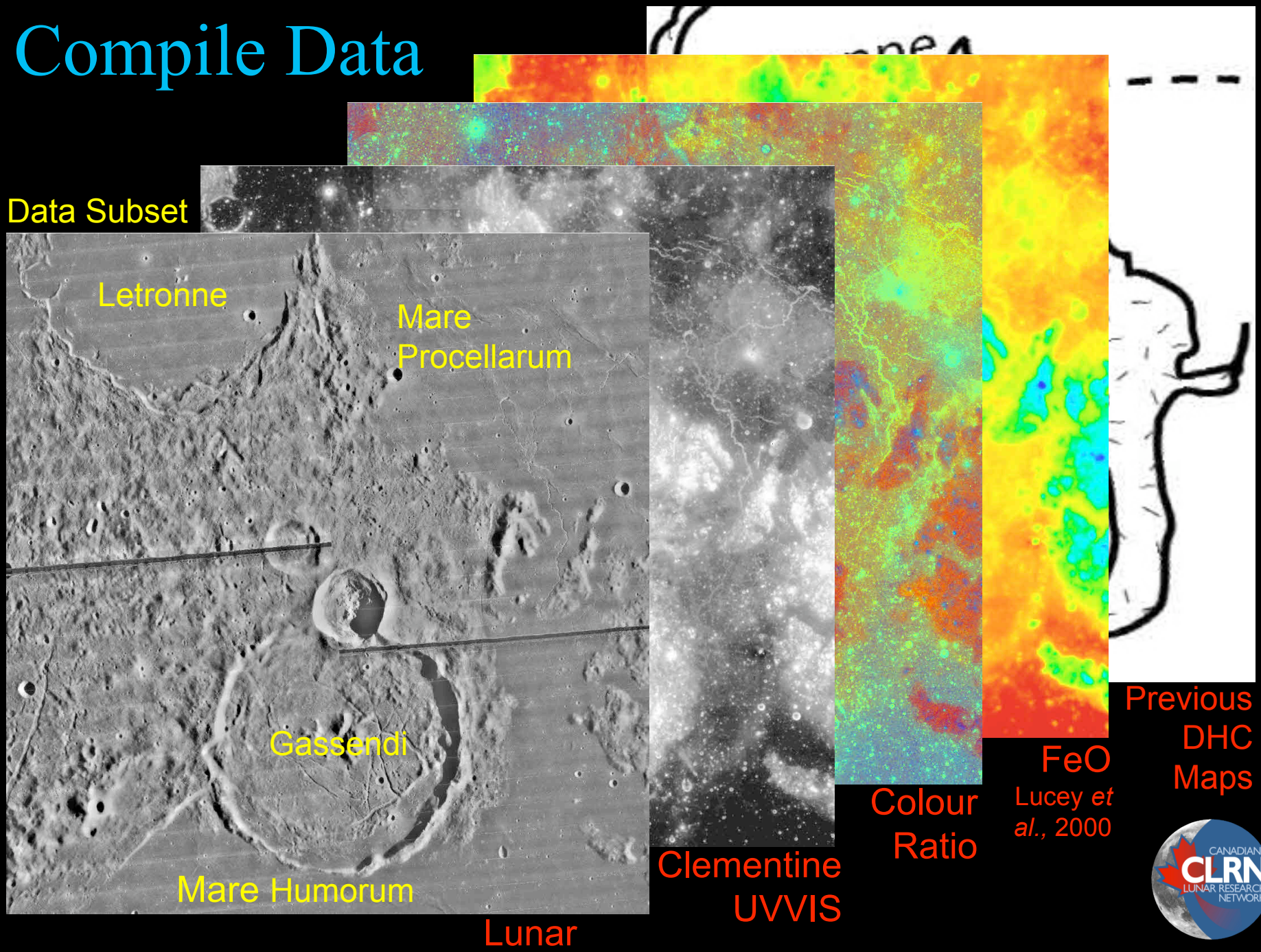
Canadian Lunar Research Network

Mare Humorum Region

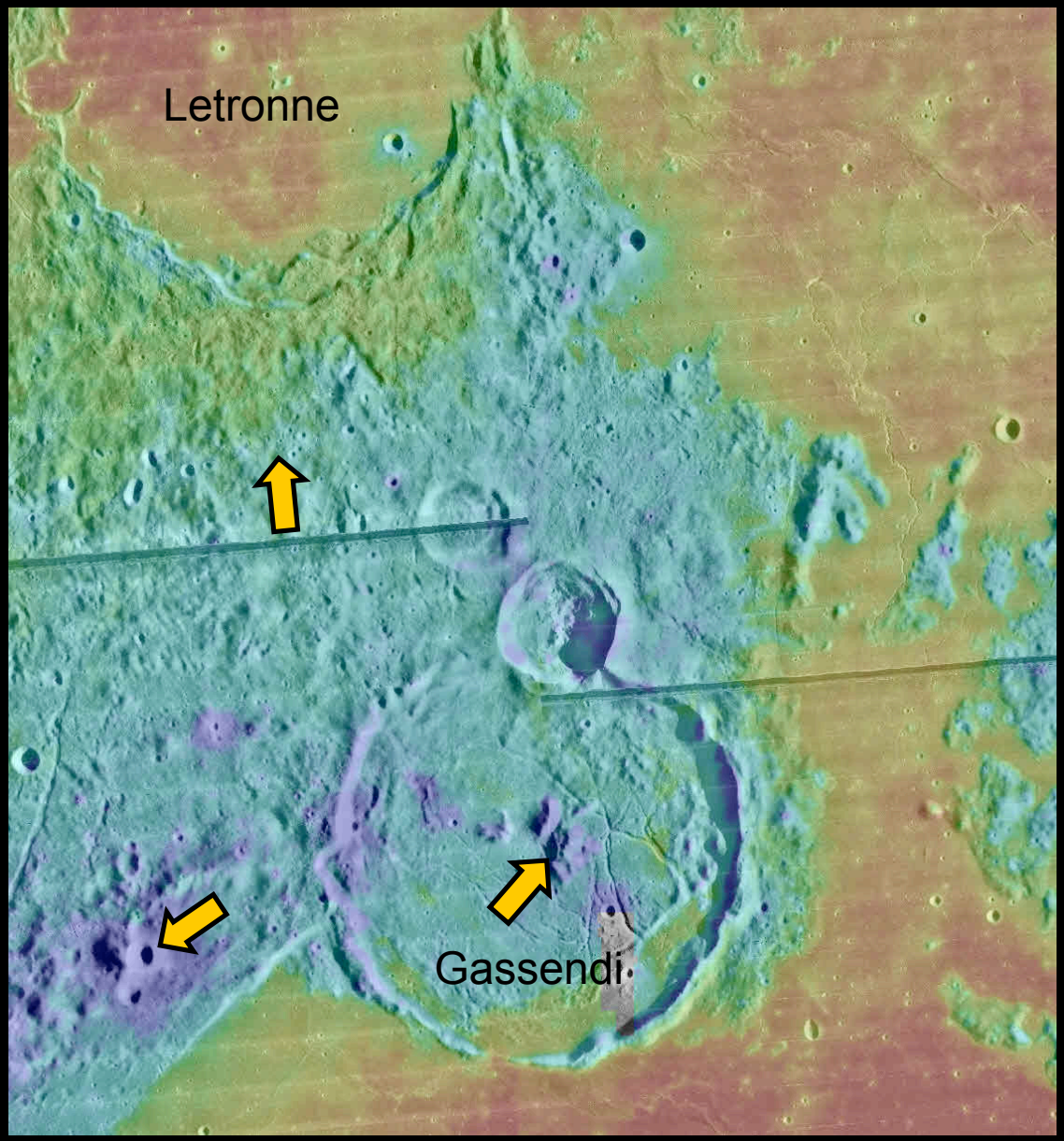
- Mix of highland and mare materials
- Dark-haloed craters (DHC) identified
- Previous Work done by Antonenko, Hawke, Lucey, Head, Giguere, and others

Clementine Nearside Mosaic

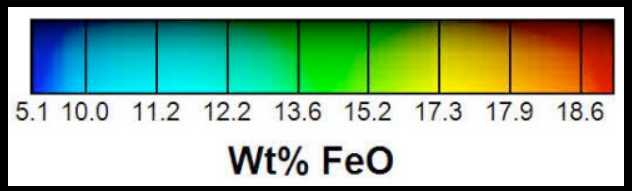
Compile Data



Fuse Data



Features emphasized when compositional data is combined with topographic information



Clementine FeO & Lunar Orbiter

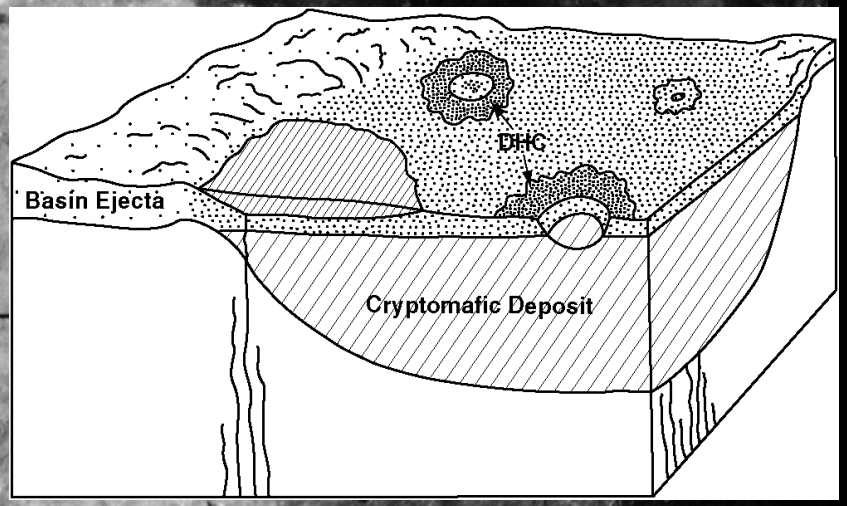
Identifying DHC's: Historical Context

Zond 8

- High-sun angle
  - Albedo difference
- Circular feature
- Around impact crater
- Mature material

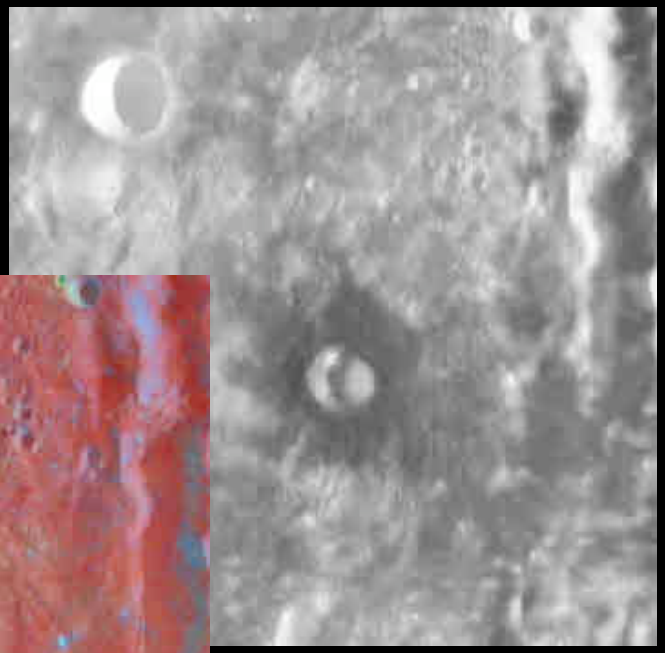
Problems

- Melt, Mare, Shading
- No topo information
- Swamped by bright, fresh material
- Ejecta not always symmetrical

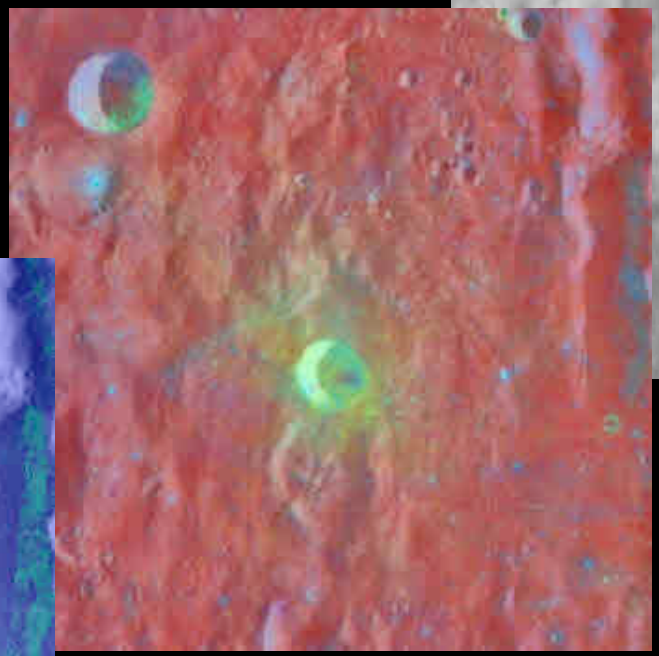


Identifying DHC's: Fused Data

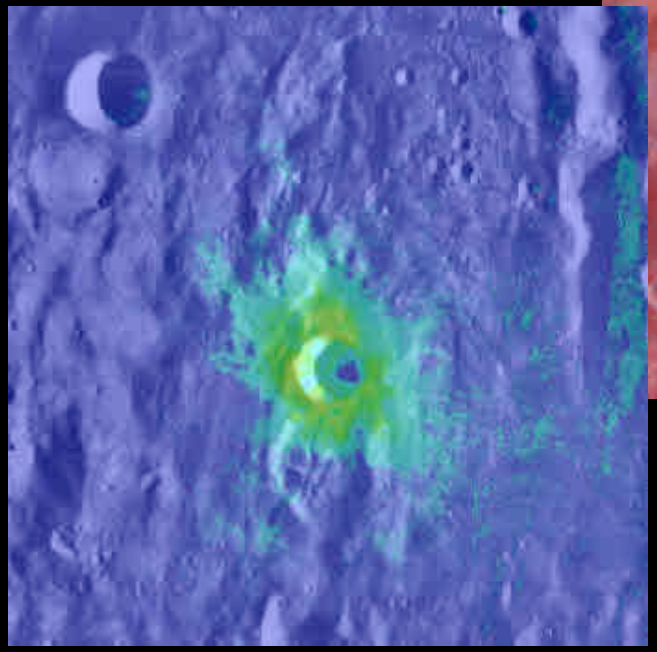
- Low albedo
- Impact topography
- Mature material
- High Iron



Clementine 750
& Lunar Orbiter



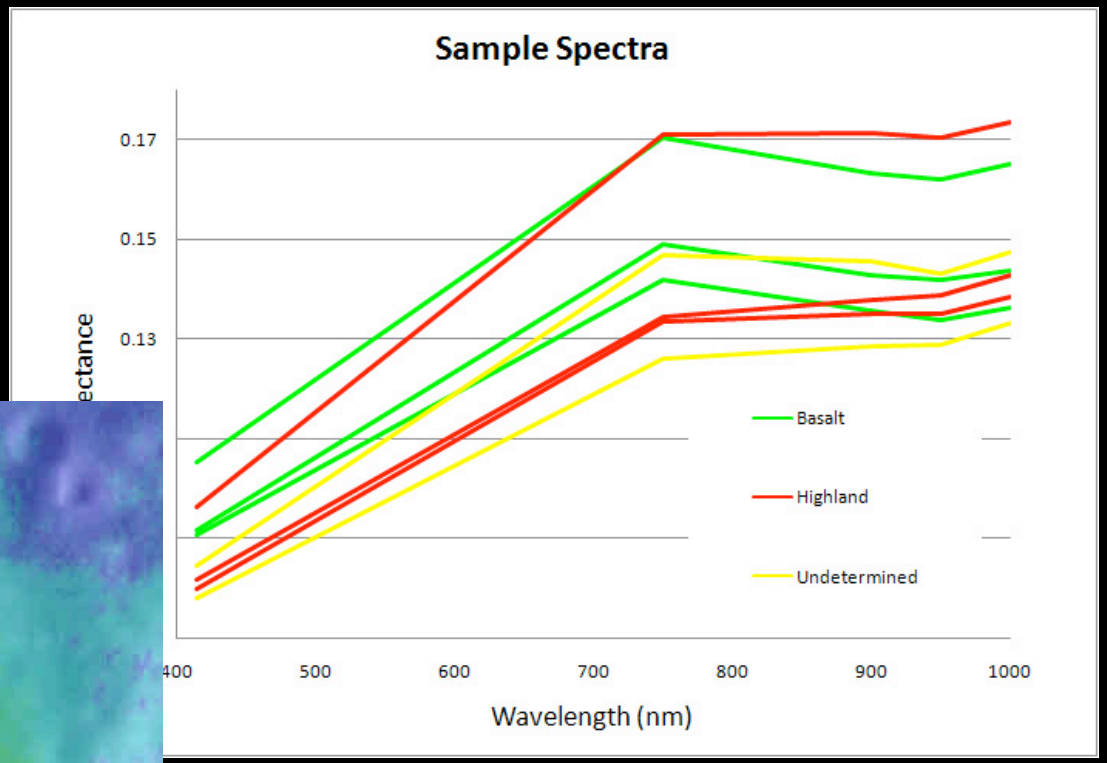
Clementine Colour Ratio
& Lunar Orbiter

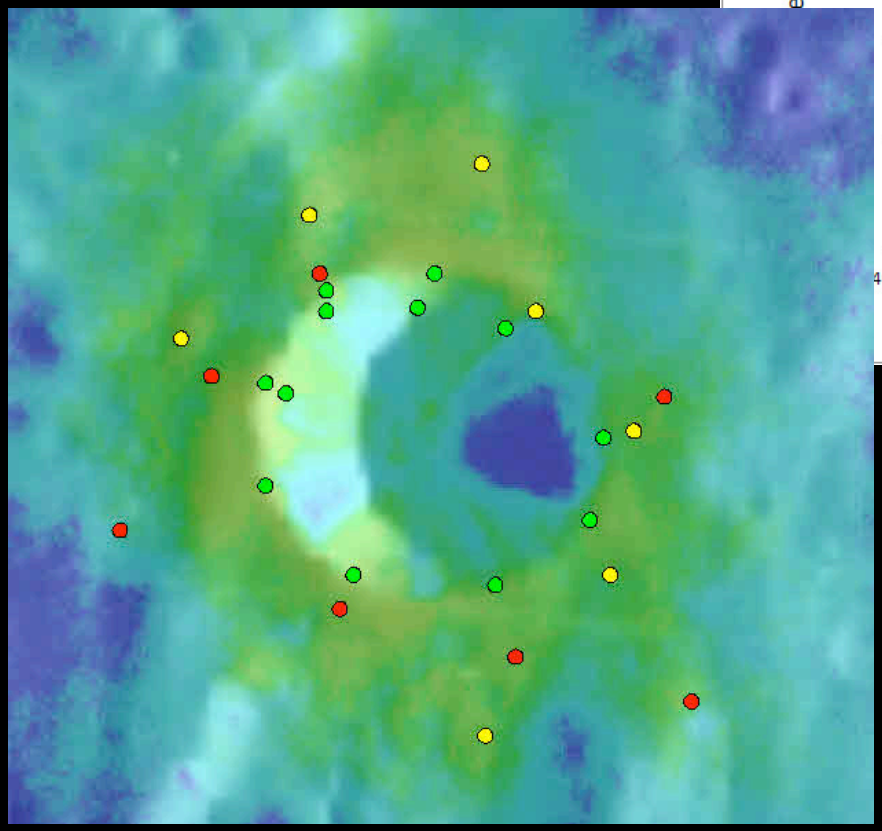


Clementine FeO & Lunar Orbiter

Identifying DHC's: Spectra

- Ejecta is mature
  - Hard to id basalts
  - Need Spectral Mixture Analysis



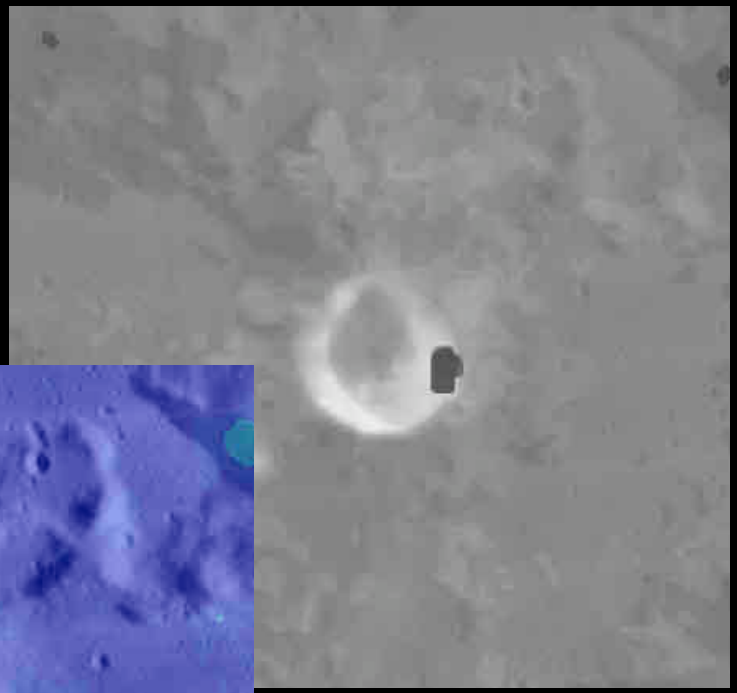


- Rims and Walls are fresh
  - Decent basalt spectra

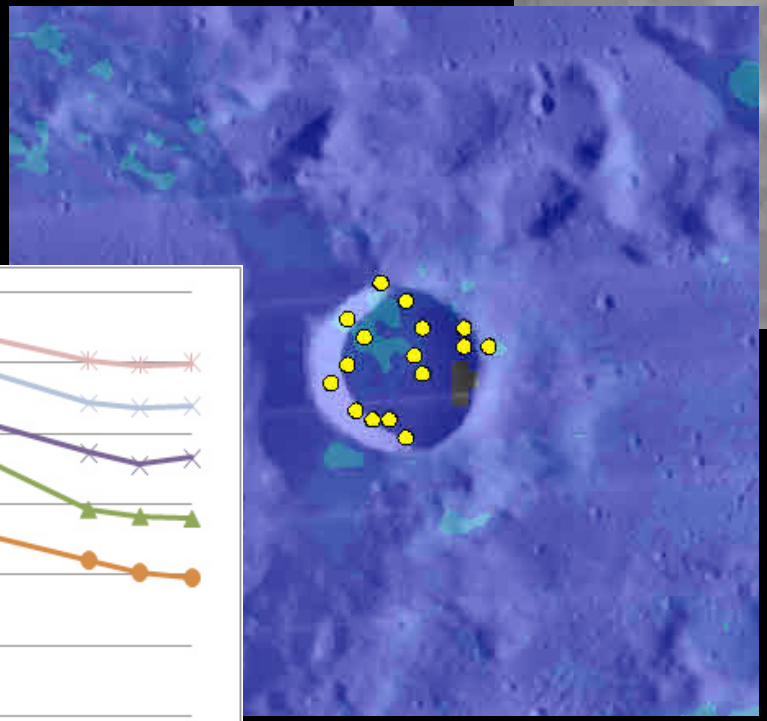
Clementine FeO &
Lunar Orbiter

Identifying Basalt Excavation

- Incipient DHC
  - Just beginning to excavate basalts
  - No dark halo
  - No FeO halo

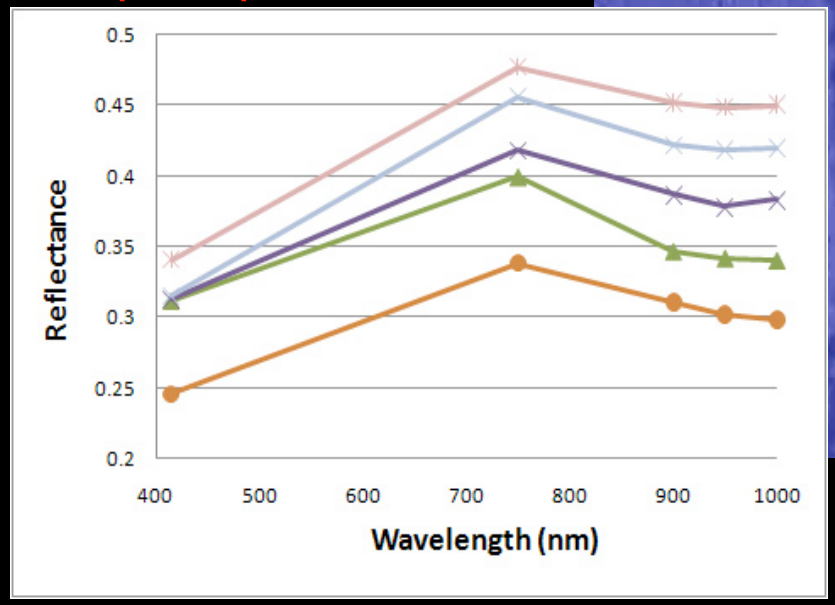


Clementine 750 & Lunar Orbiter

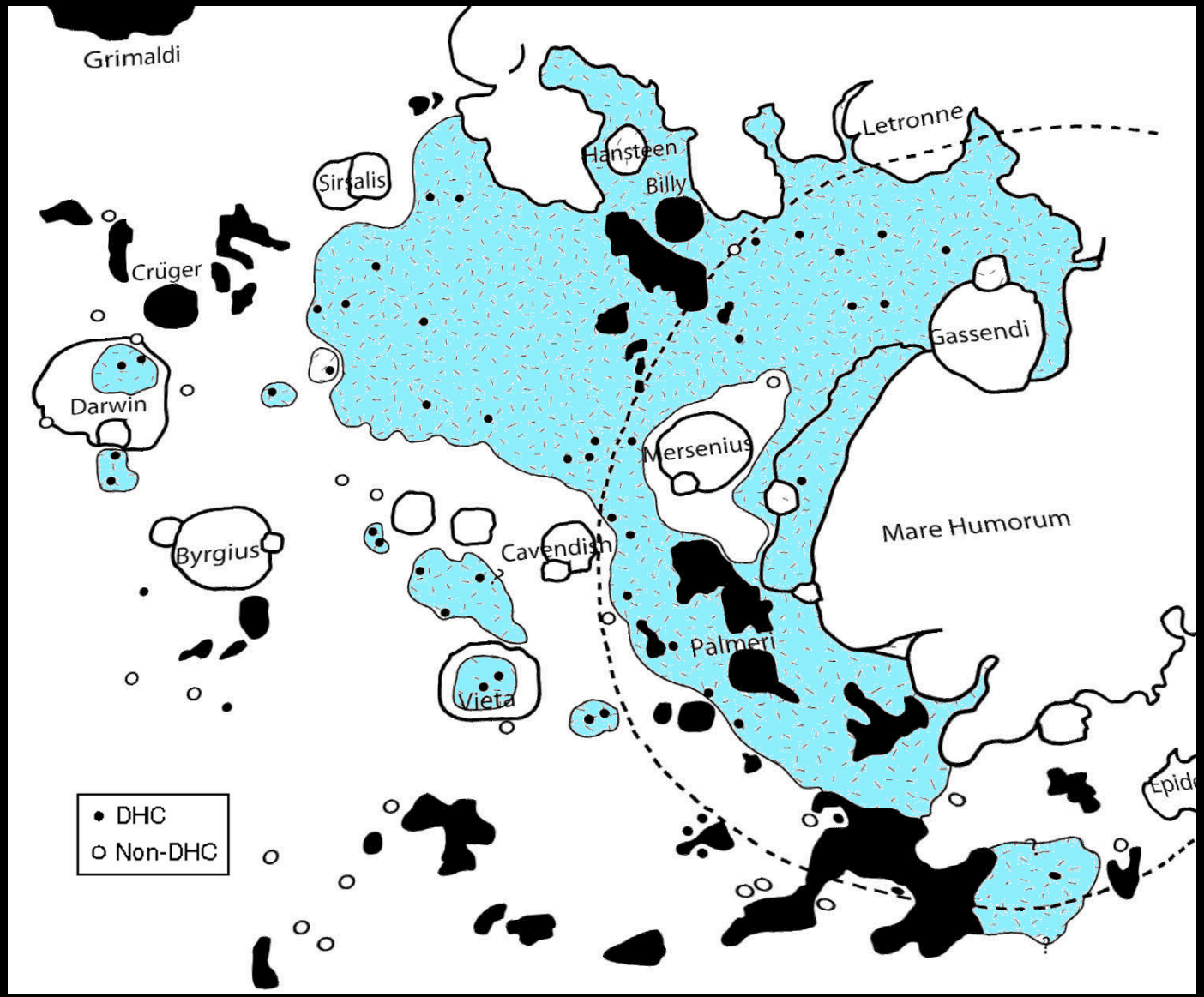


Clementine FeO & Lunar Orbiter

Sample Spectra



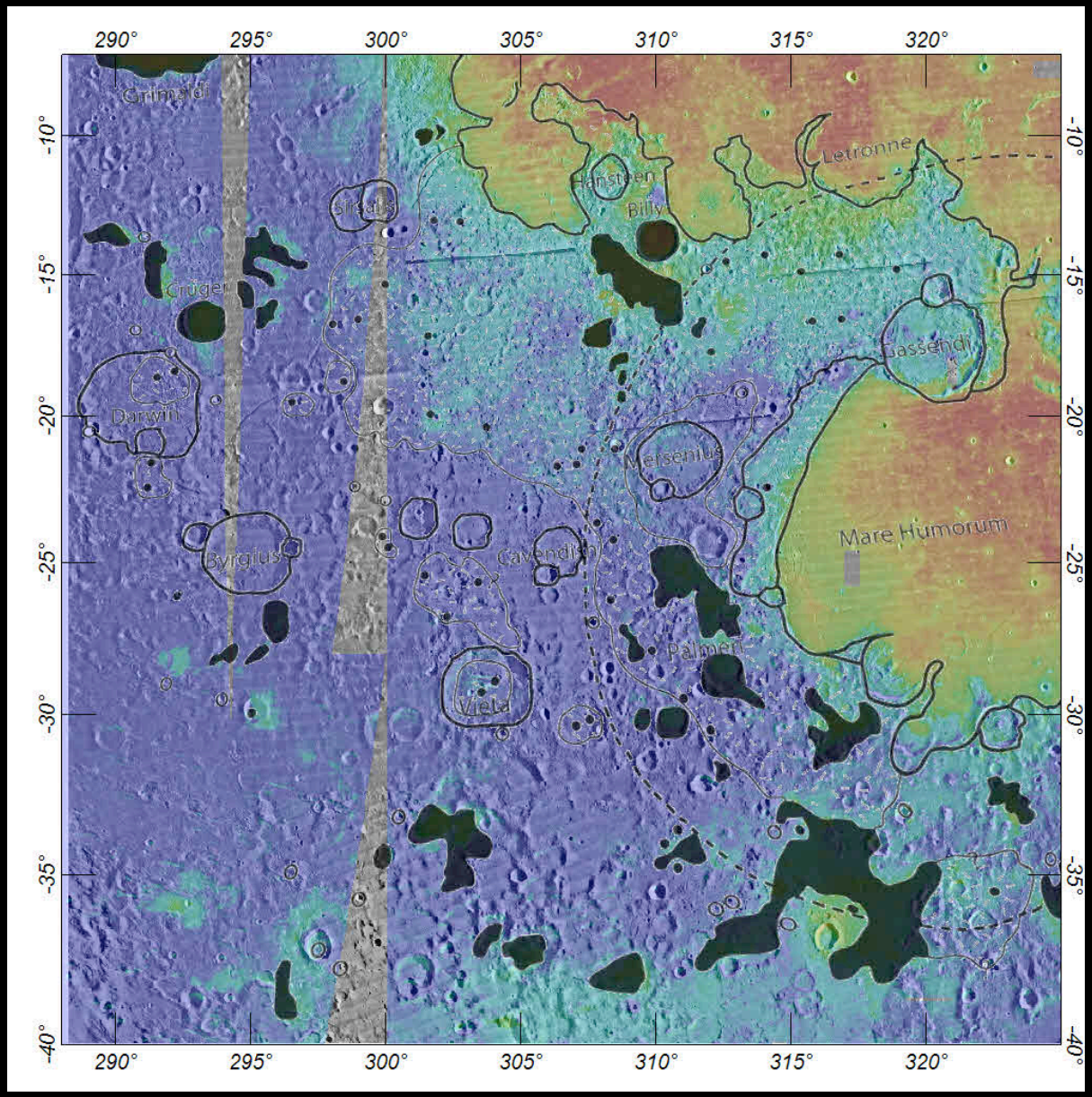
Previous Work



DHC Map

- Surveyed DHC's & Non-DHC's
- Identify hidden maria; estimate extent, depth, and volume

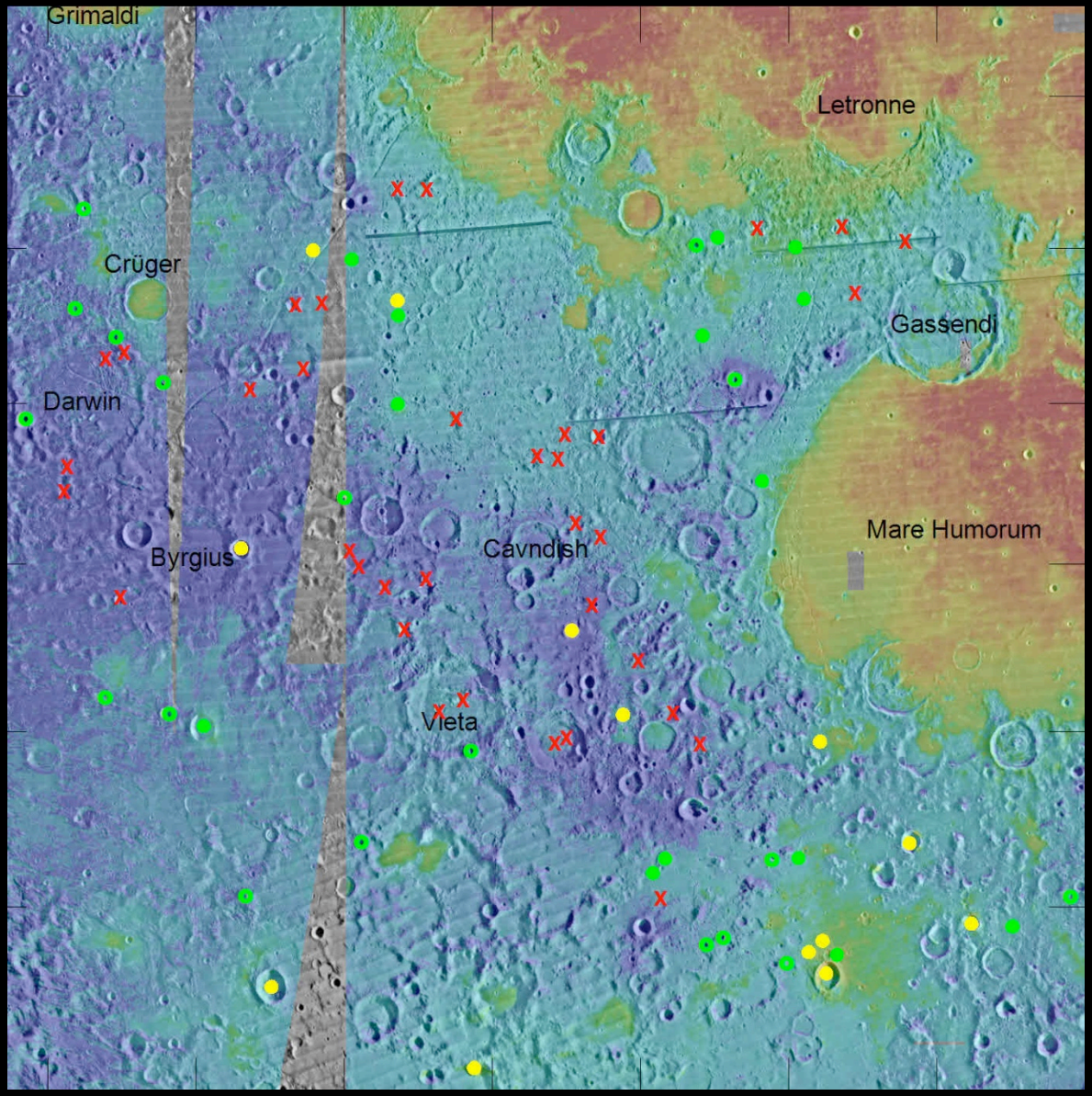
Revisit using Fused Data



- Fused map
  - Locate previously identified craters
  - DHC's
  - Non-DHC's
- Re-evaluate using fused data

Clementine FeO, Lunar Orbiter & Old DHC Map

Preliminary Results



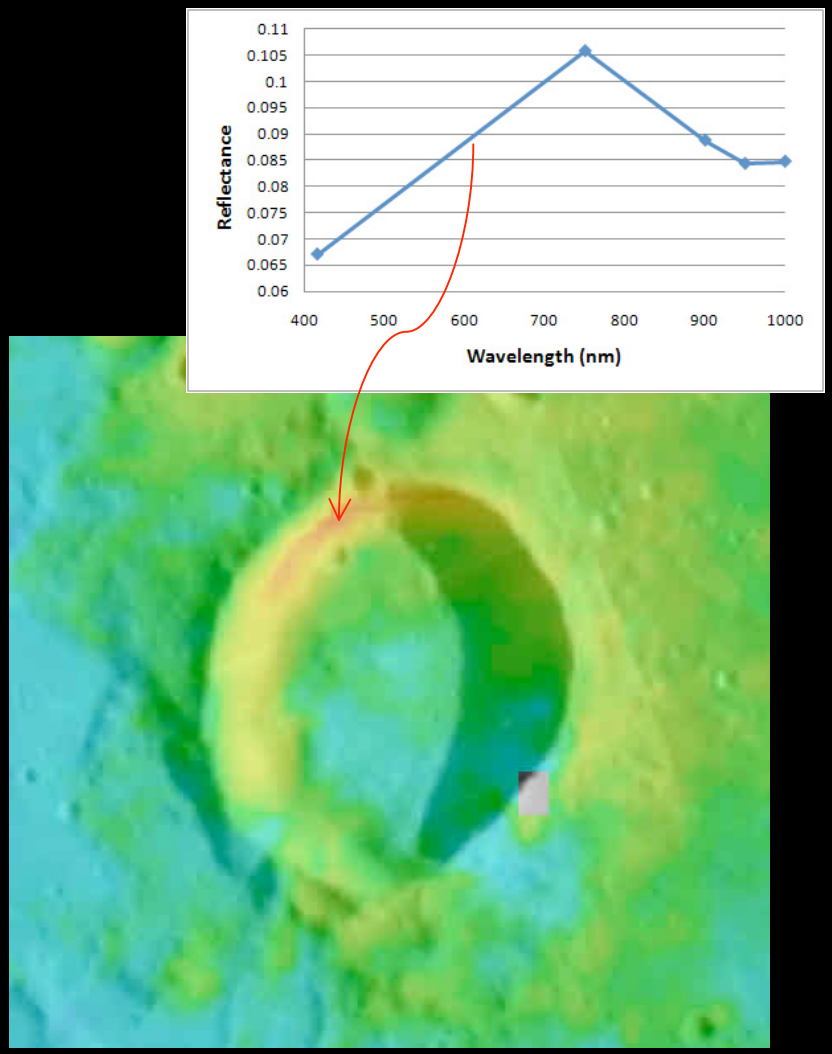
Clementine FeO & Lunar Orbiter

- Match poorly with previous work
- Will affect cryptomare volume estimates
- Further work and recalculation required

- • Correct DHC
- o Correct Non-DHC
- X Incorrect DHC
- • New DHC

Conclusions

- Fused data sets can highlight features in novel ways
- Provide more reliable identification of DHC's
- Identify basalt excavation in absence of dark halo
- Re-evaluation of past DHC's and recalculation of past cryptomare estimates required
- New data sets (M3, LRO, etc.) are eagerly awaited



Clementine FeO
& Lunar Orbiter