



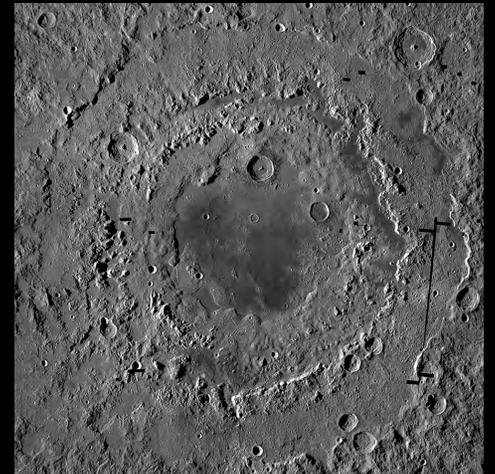
Constraining the end of the basin forming epoch with samples from Orientale Basin

K.M. O'Sullivan

C.R. Neal

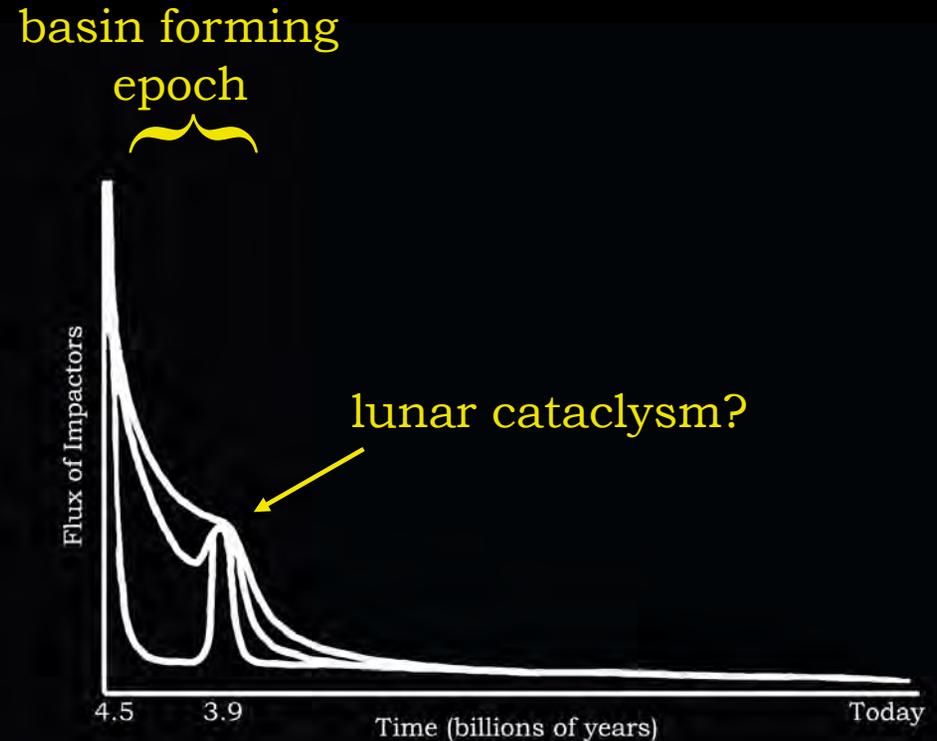
University of Notre Dame

Notre Dame, IN USA



What is the basin forming epoch?

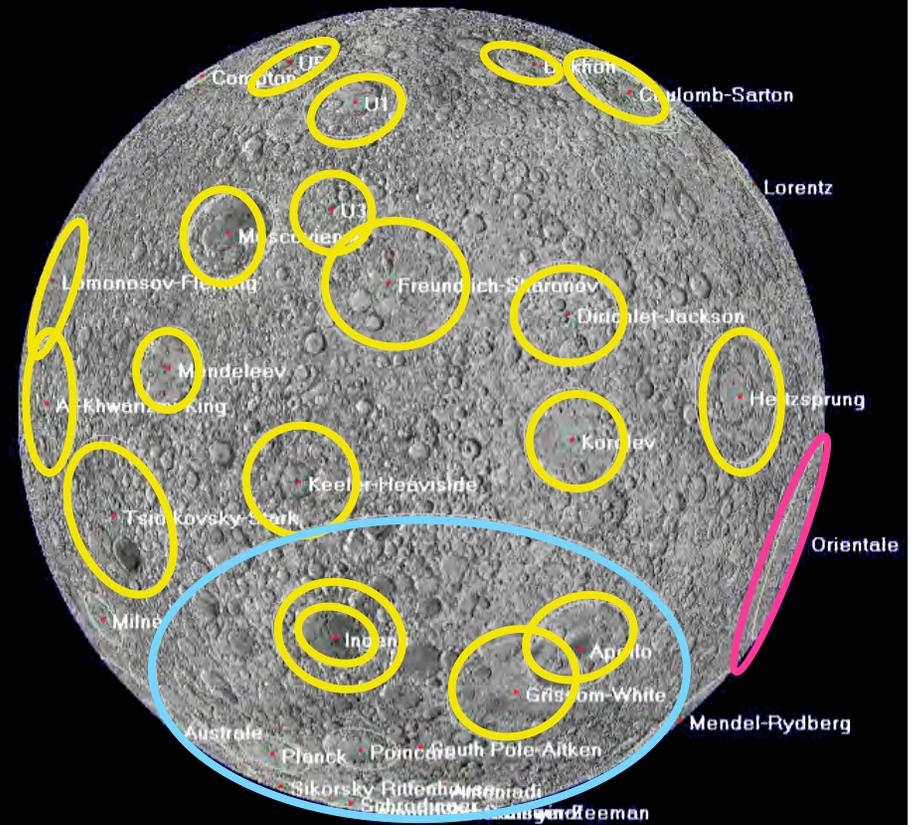
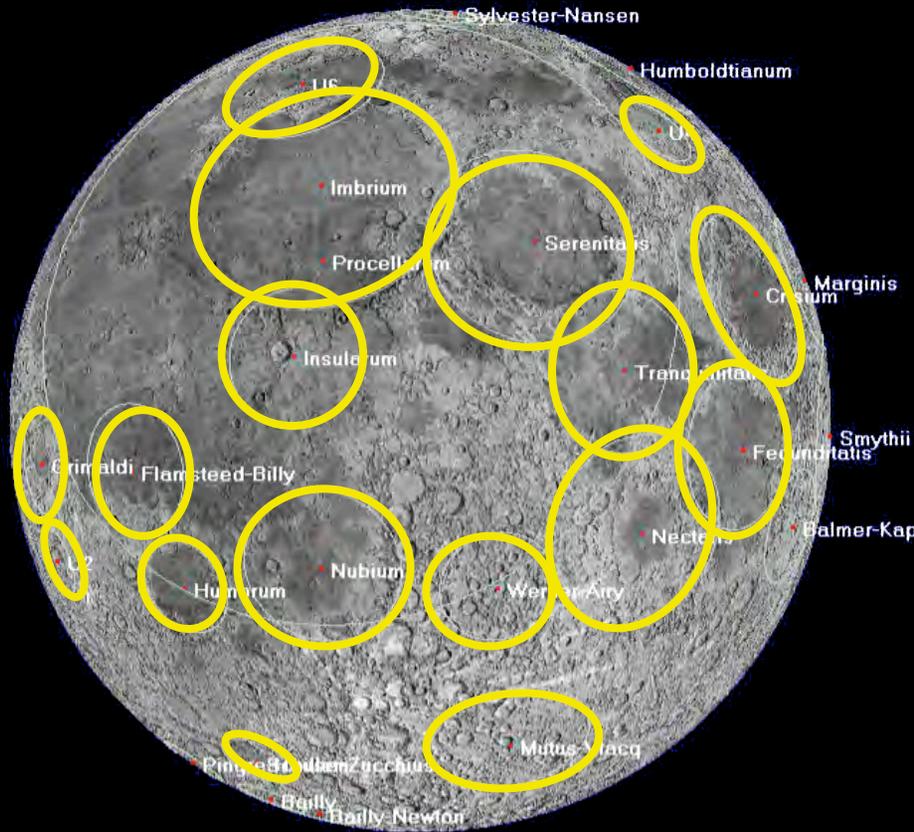
- Earliest period of Moon's history
- Characterized by basin-forming impacts
- Impact rate not known



What is the basin forming epoch?

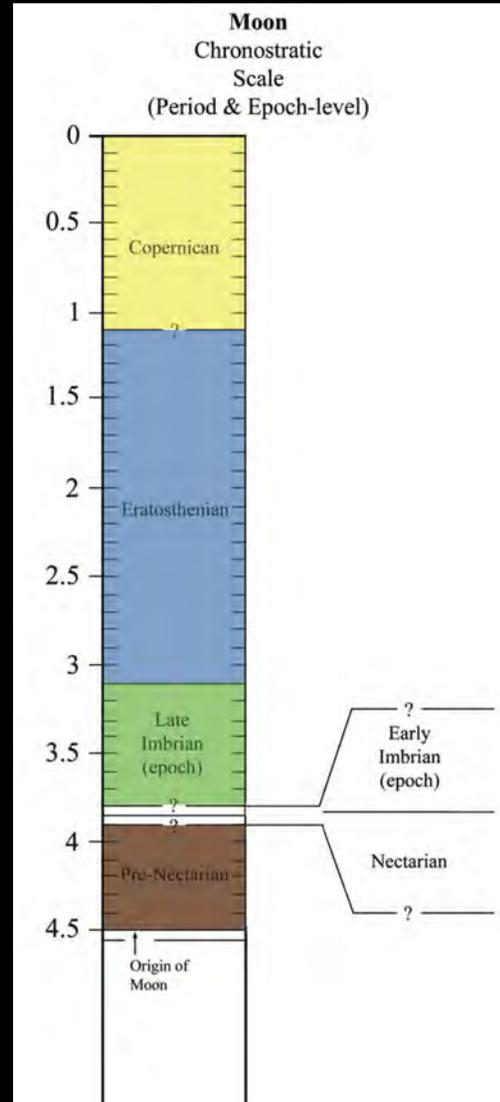
near side

far side



What is the basin forming epoch?

Orientele →
South Pole Aitken →



Why is it important?

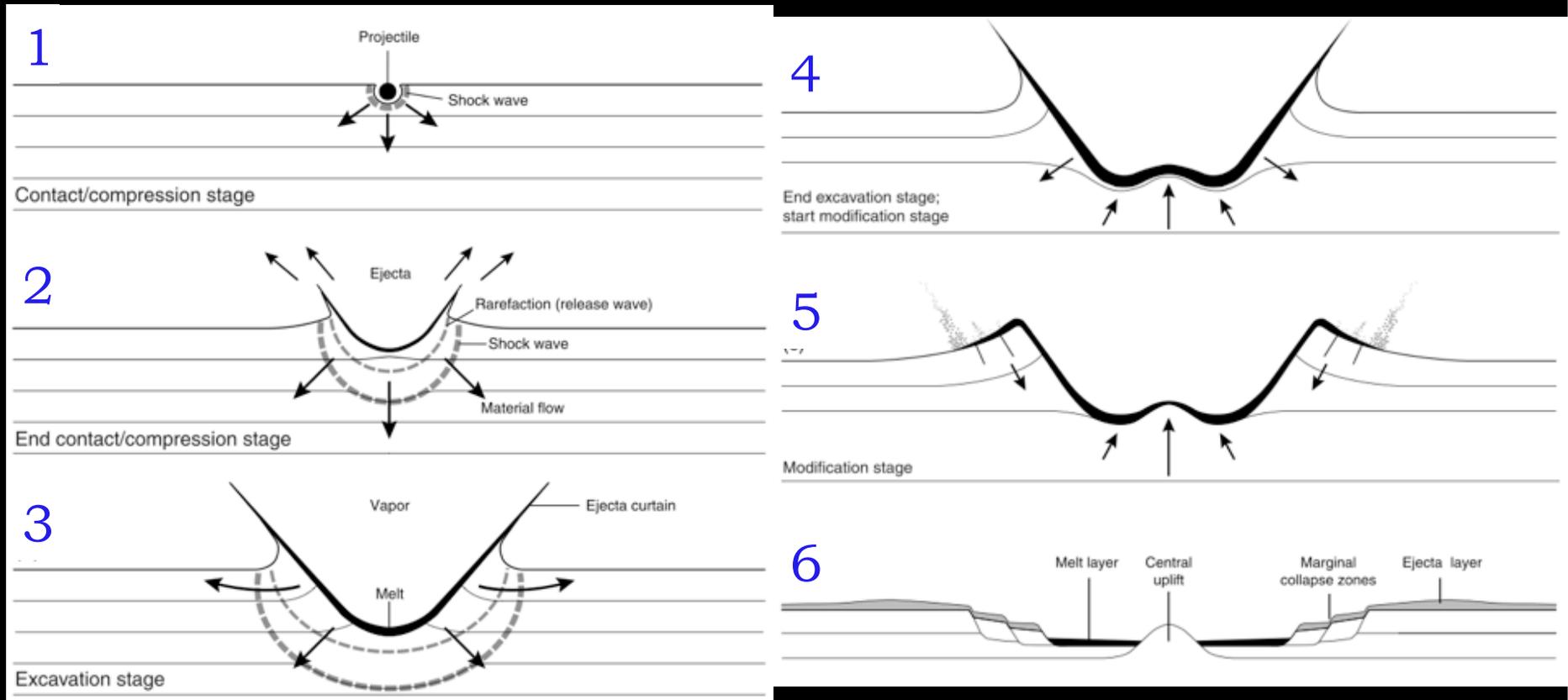
- High priority science goal
 - “1a. Test the cataclysm hypothesis by determining the spacing in time of the creation of basins.”
- Next most important after the South Pole Aitken basin



National Research Council, 2007

Dating a basin

- Age is reset when target rock degasses/ melts



Identifying Impact Melt

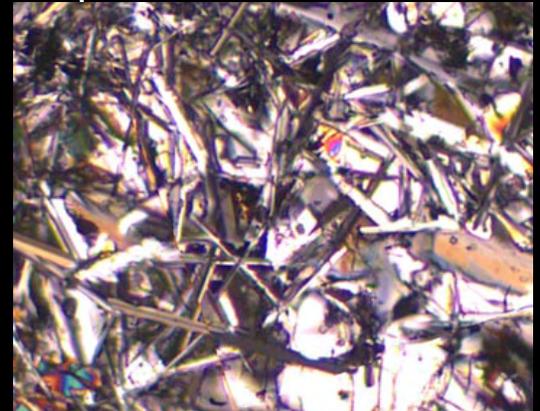
- In some cases impact melt is indistinguishable from pristine basalt- texturally & geochemically

Pristine Basalt 15382



← 1 mm →

Impact Melt 63545

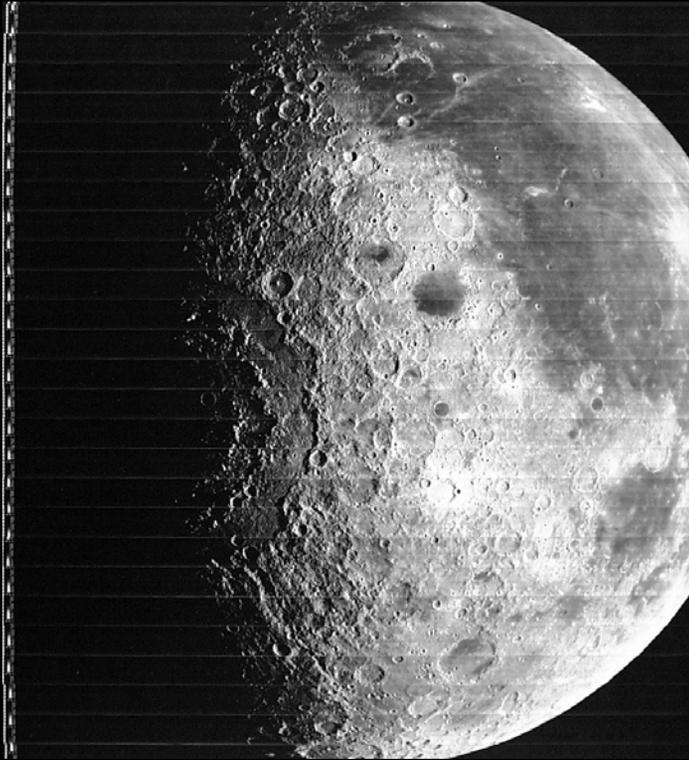


← 1 mm →

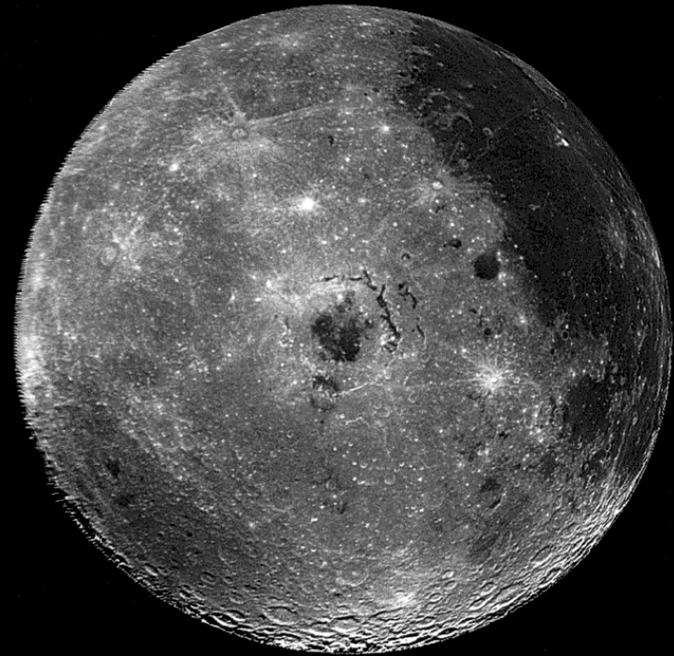
Identifying Impact Melt

- Troublesome without context
- Need an In-Situ sample:
 - younger crater or basin
 - not filled with mare
 - smooth surface
 - identify from remote sensing
 - on the nearside
- Orientale is the perfect candidate!

Oriente Basin



Lunar Orbiter photo: IV-173-M



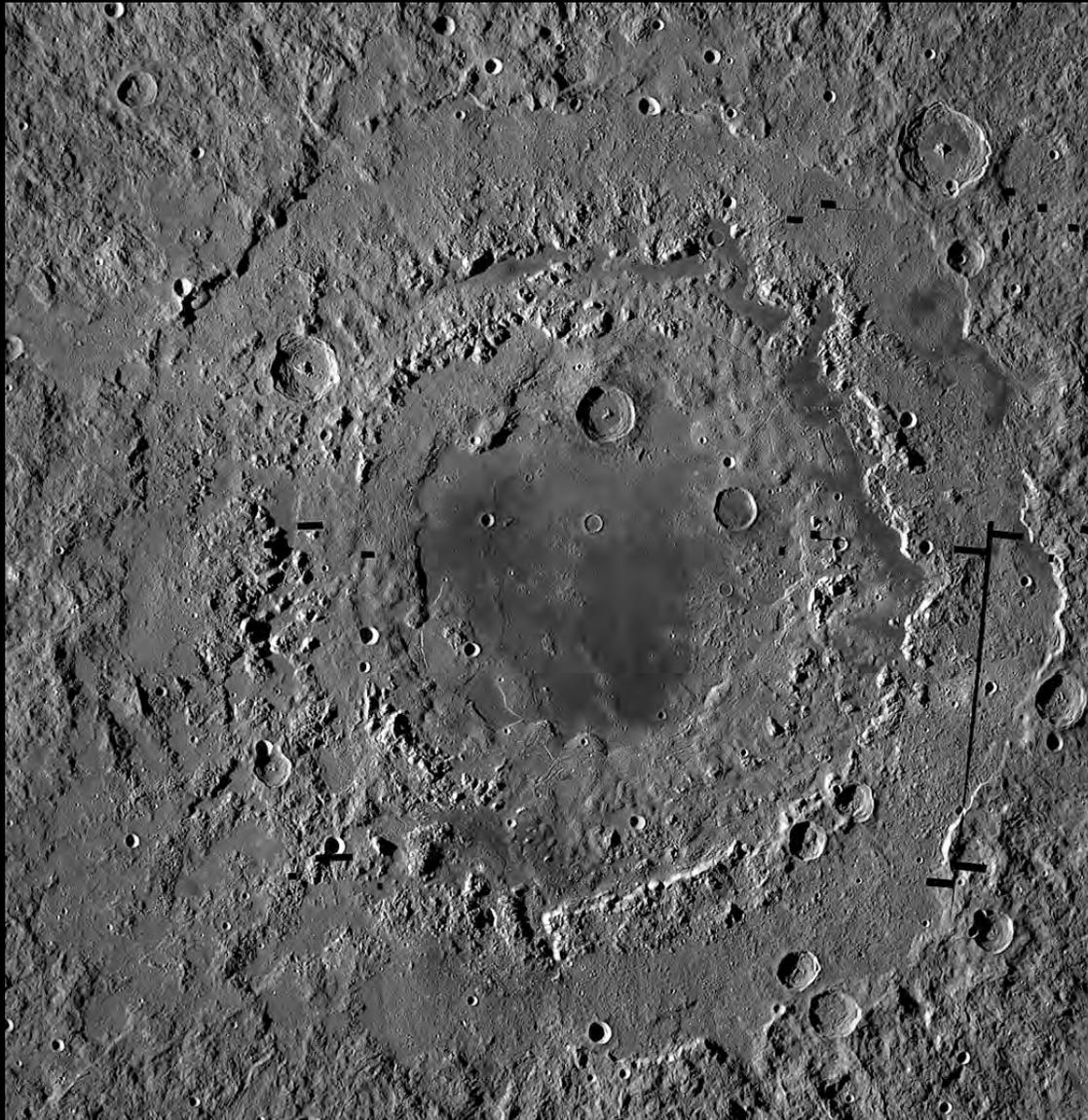
Oriental Basin

- 960 km in diameter



Rick Kline, Cornell University:
www.lpi.usra.edu/nlsi/training/illustrations/

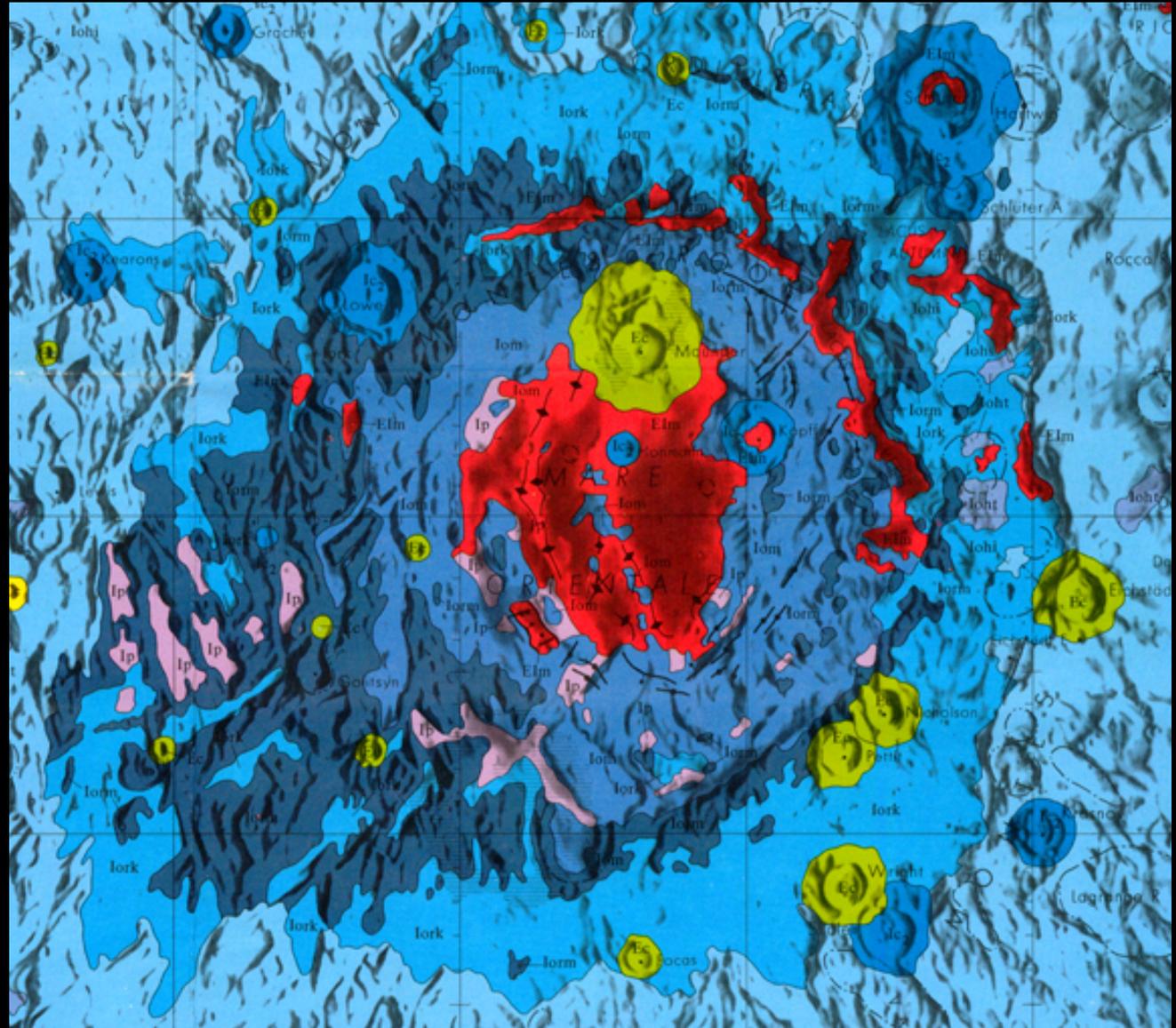
Oriente Basin



LROC mosaic: http://wms.lroc.asu.edu/lroc_browse/view/orient_100m

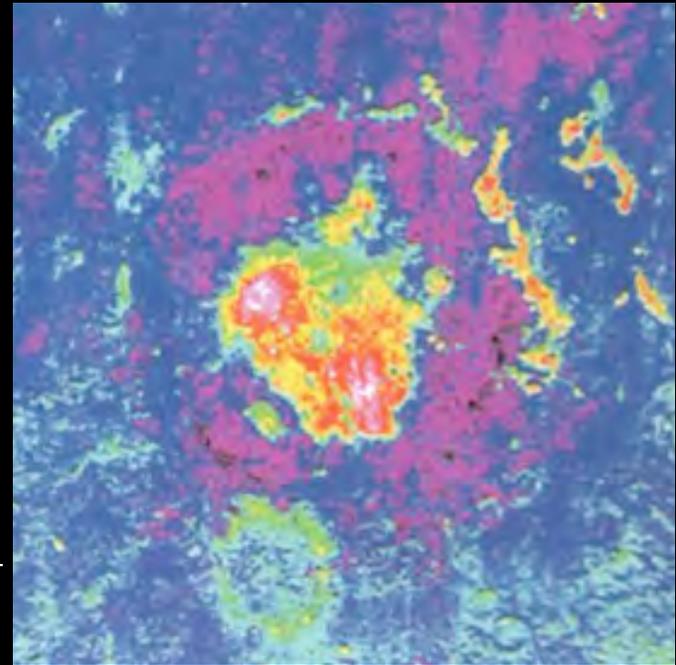
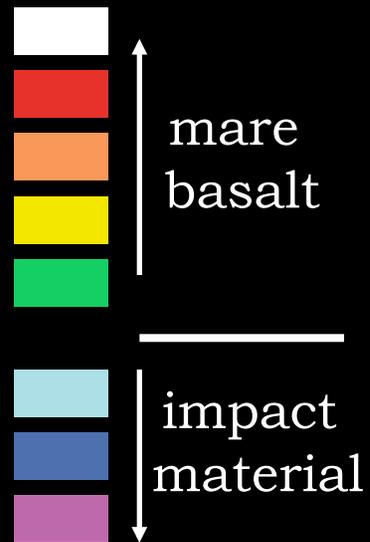
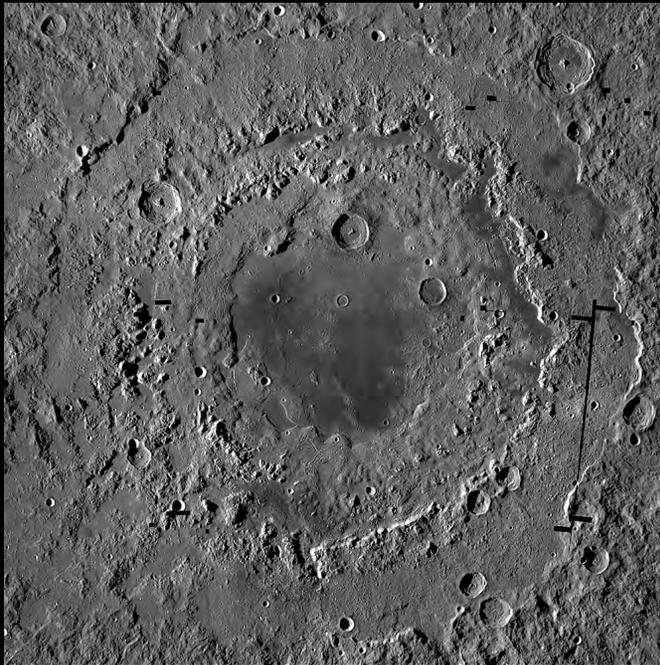
Oriente Basin

-  } Oriente
-  } impact
-  } materials
-  } mare
-  } basalt
-  } erathostenian
-  } craters



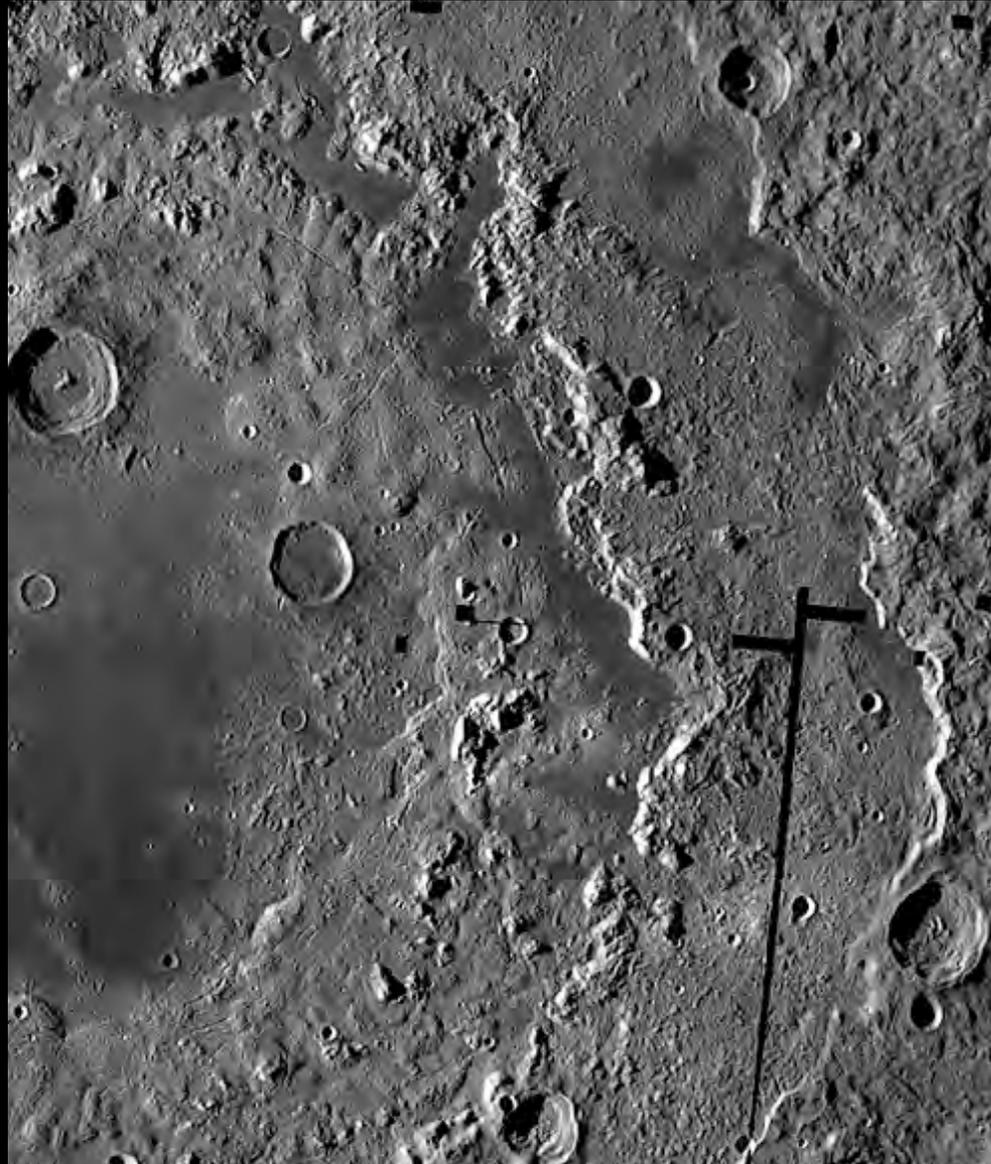
Geologic Map of the West Side of the Moon, Scott et al., 1977

Oriental Basin



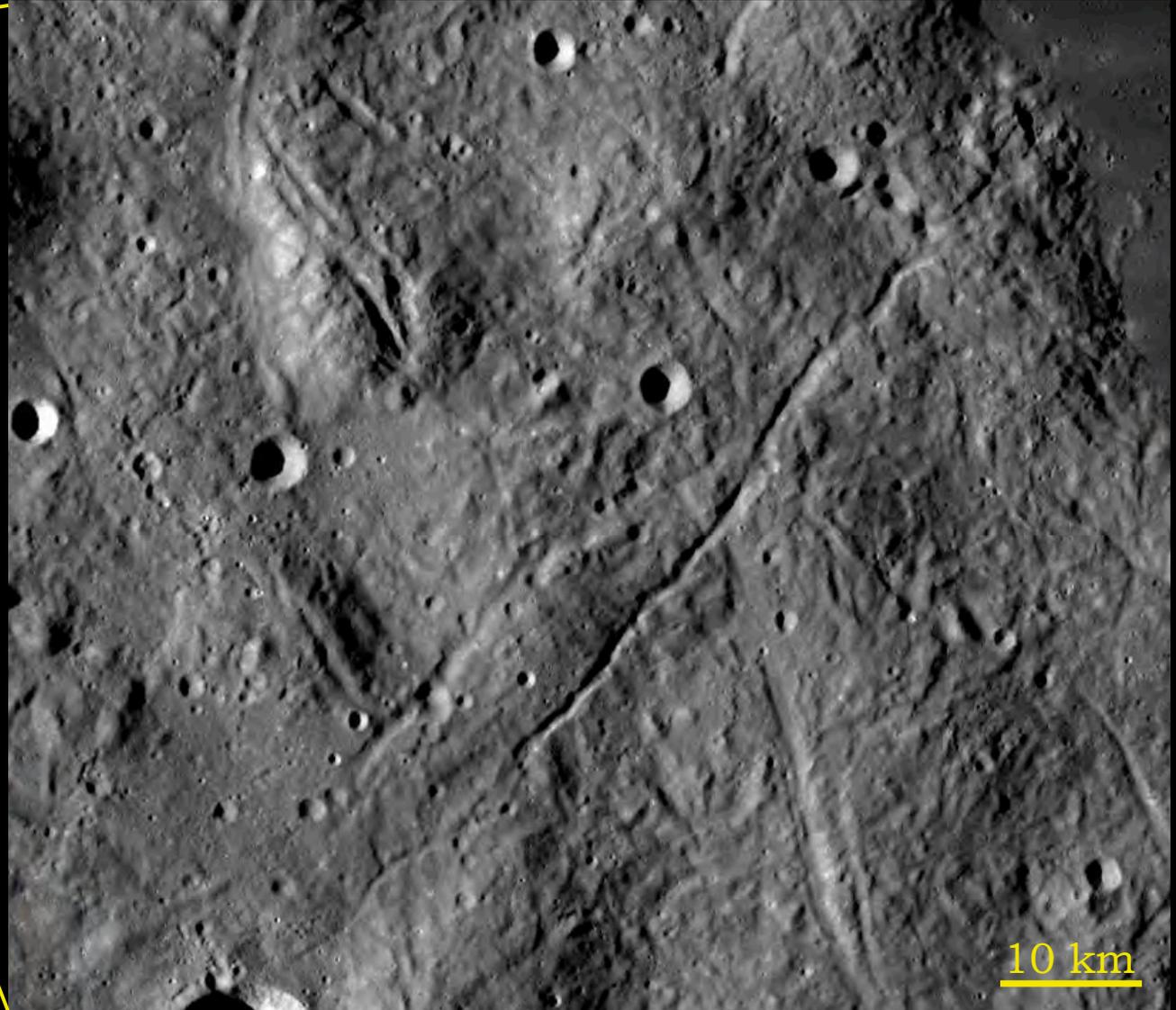
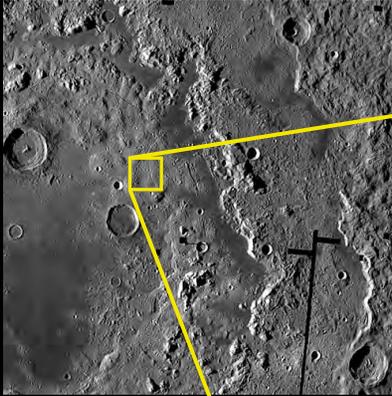
Bussey and Spudis, JGR, 2000

Oriental Basin

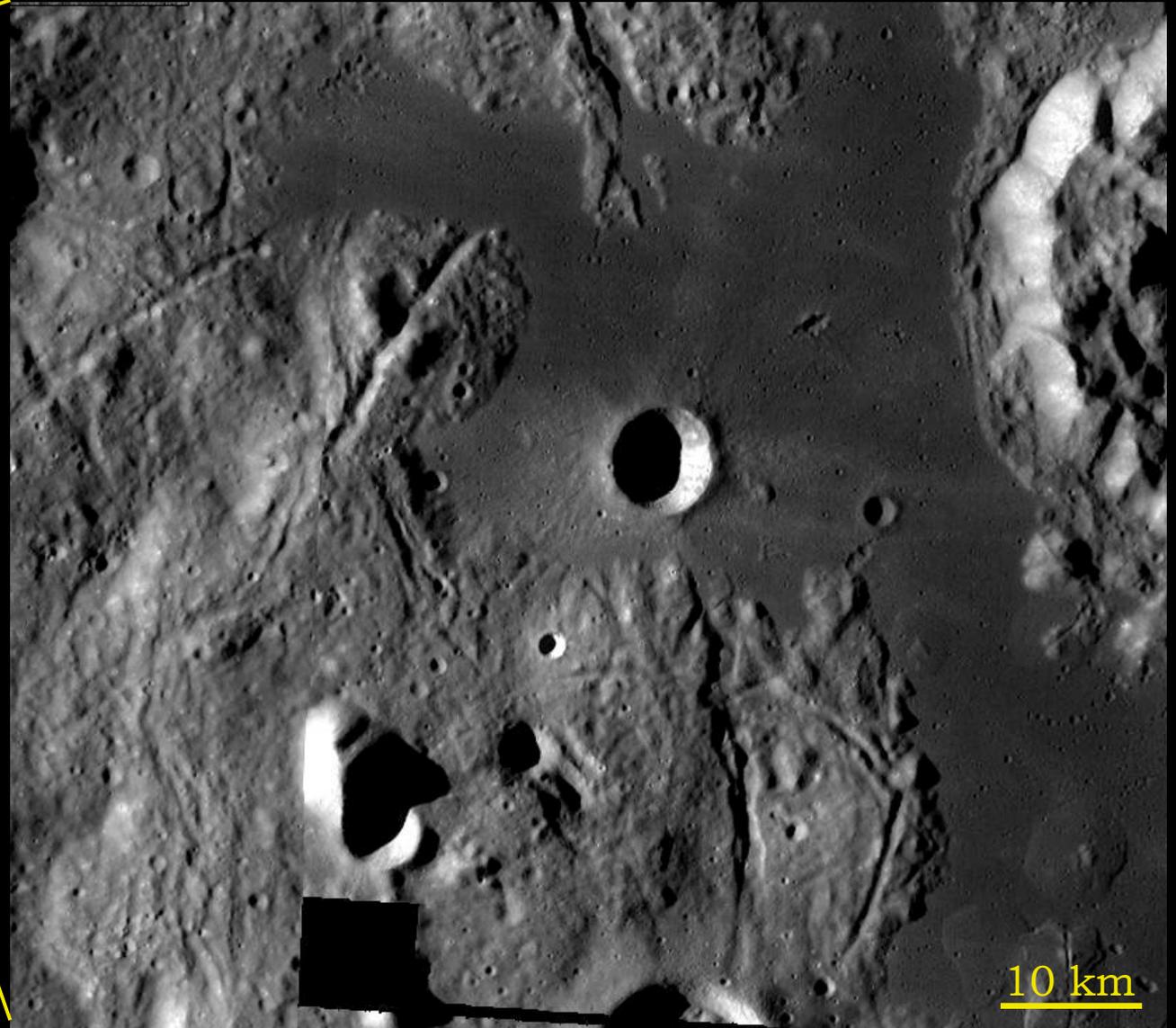
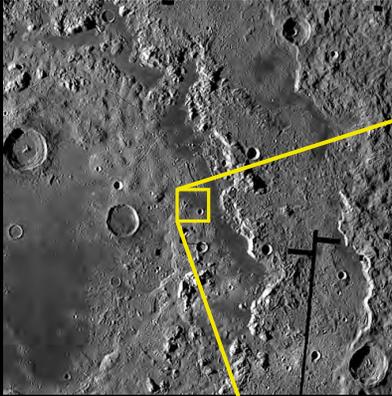


50 km

Recommended Missions



Recommended Missions



Recommended Mission

- Ideal landing site:
 - younger crater or basin
 - not filled with mare
 - smooth surface
 - identify from remote sensing
 - on the nearside



Conclusions

- Need to date the youngest lunar basin- after oldest (South Pole Aitken)
- Collecting & dating impact melt is a reliable method of dating impact basins
- Orientale has ideal landing sites for such a mission

Thank you

Travel support
provided by
SSSR!

