

Inferred Age of Mare Fill in Tsiolkovskiy Crater: Constraints on the Preservation of Exterior Impact Melt Deposits

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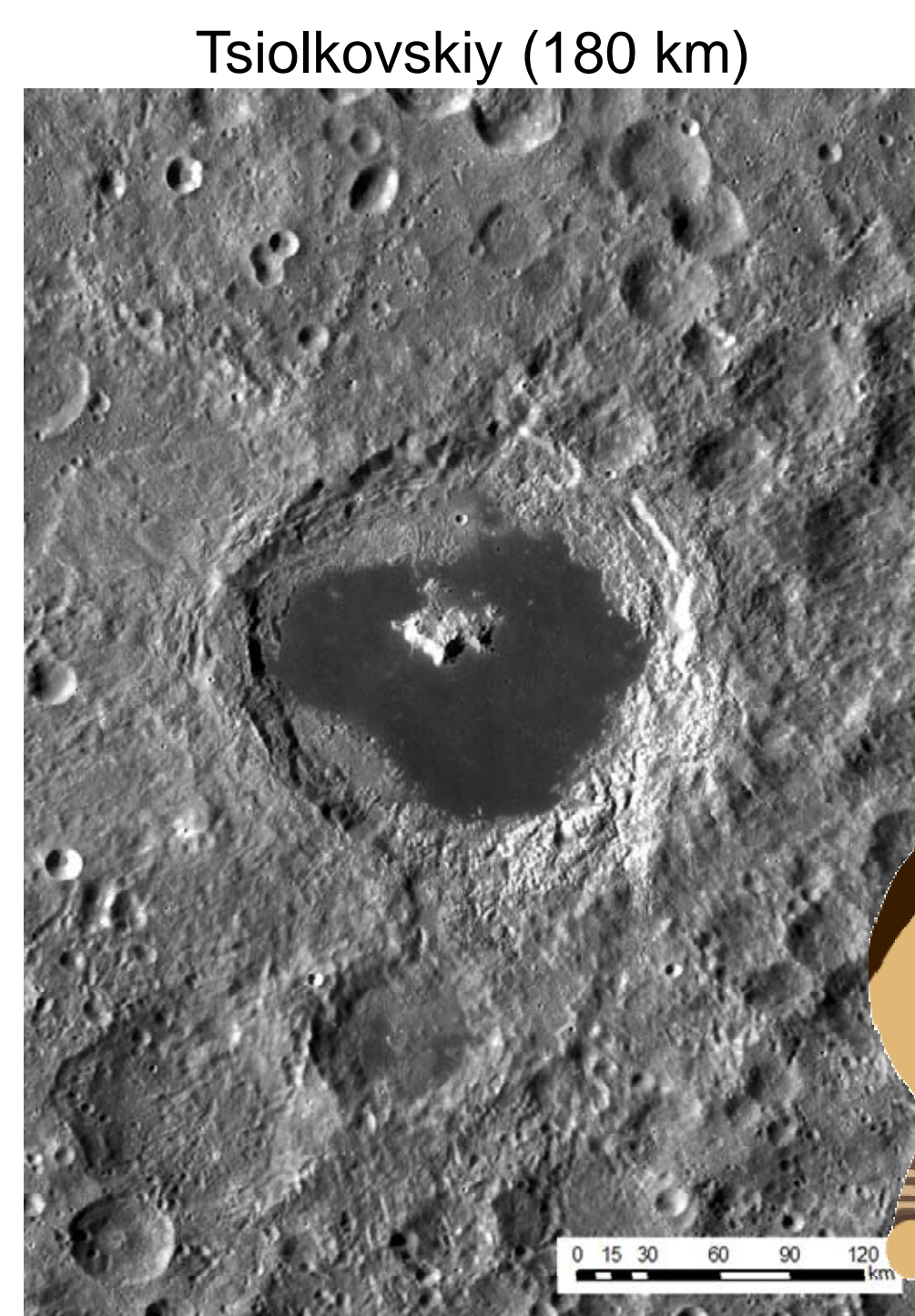
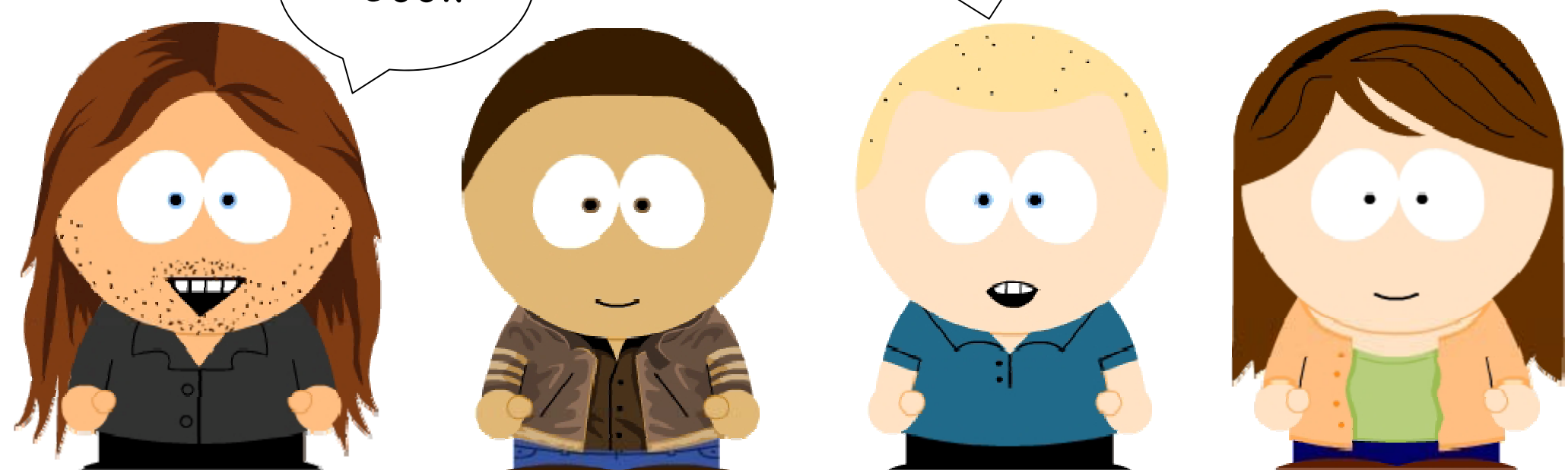
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Tsiolkovskiy is a 180 km diameter crater on the farside of Moon. It is very unusual. Why? Because it has enhanced rock abundance and radar backscatter, but is thought to be Imbrium age (~3.5 Ga). This is NOT observed around other Imbrium age craters. One interpretation is that Tsiolkovskiy is much younger than we think.

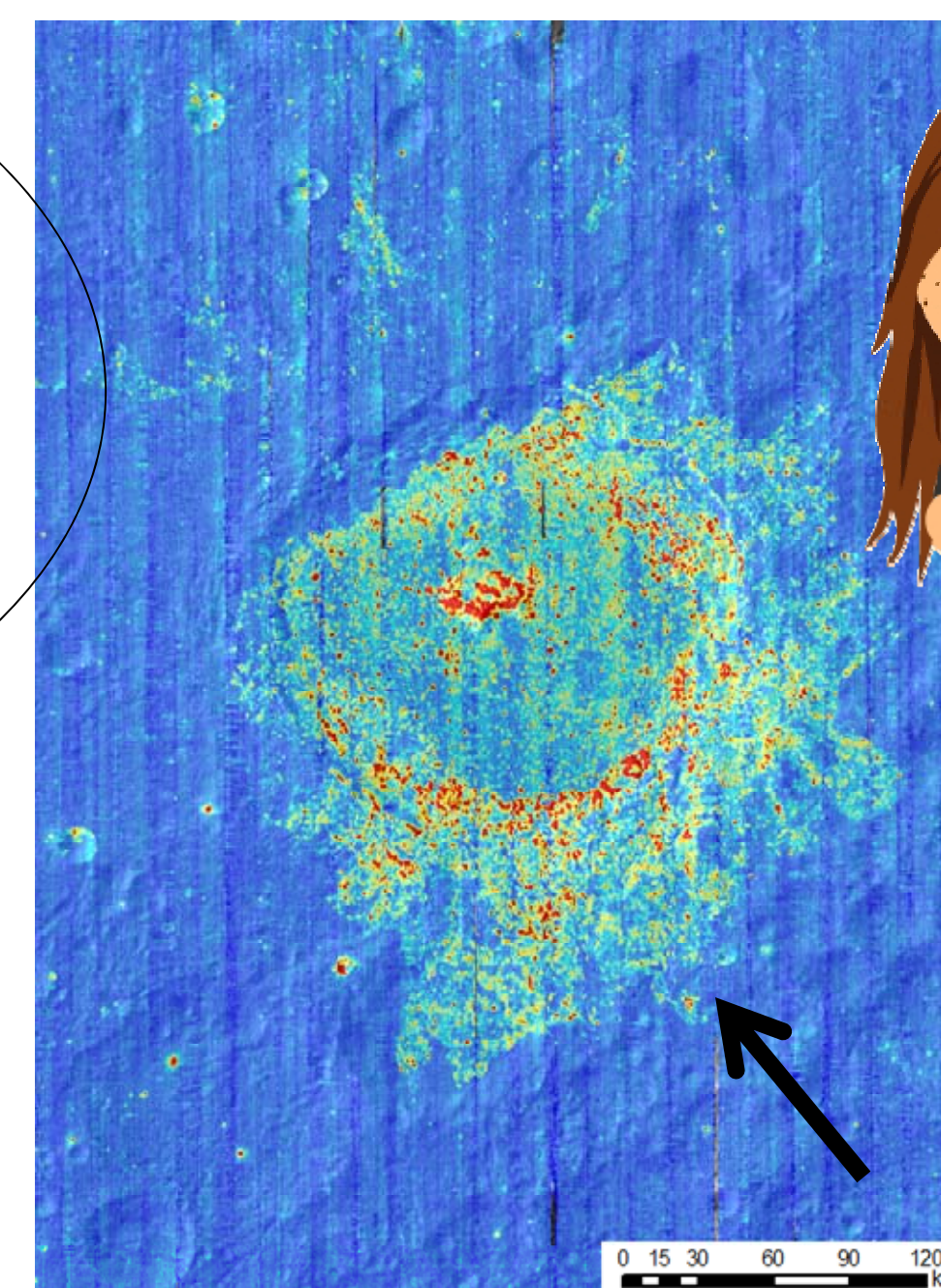
Cool!



Late Imbrium ~3.5 Ga

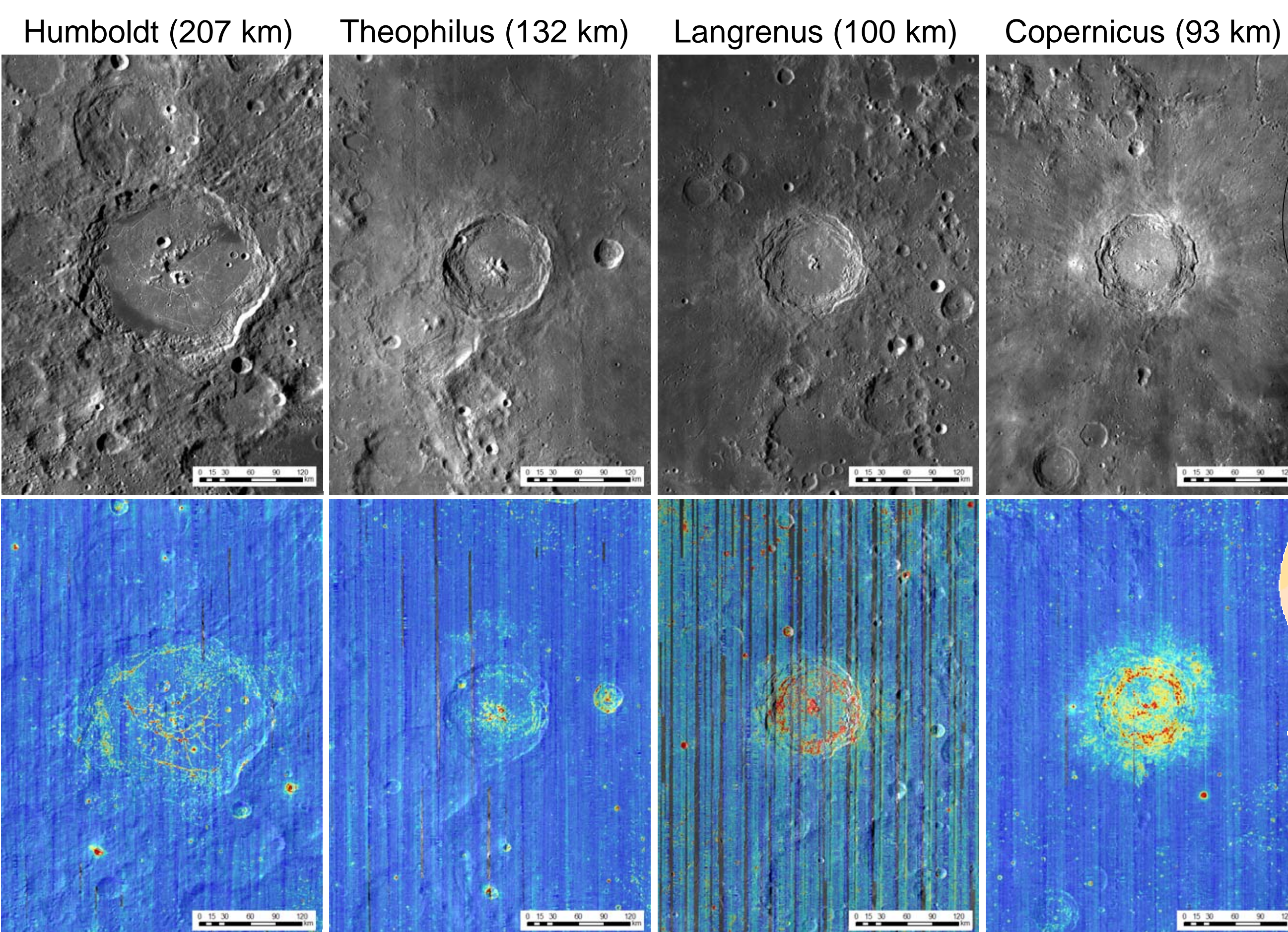
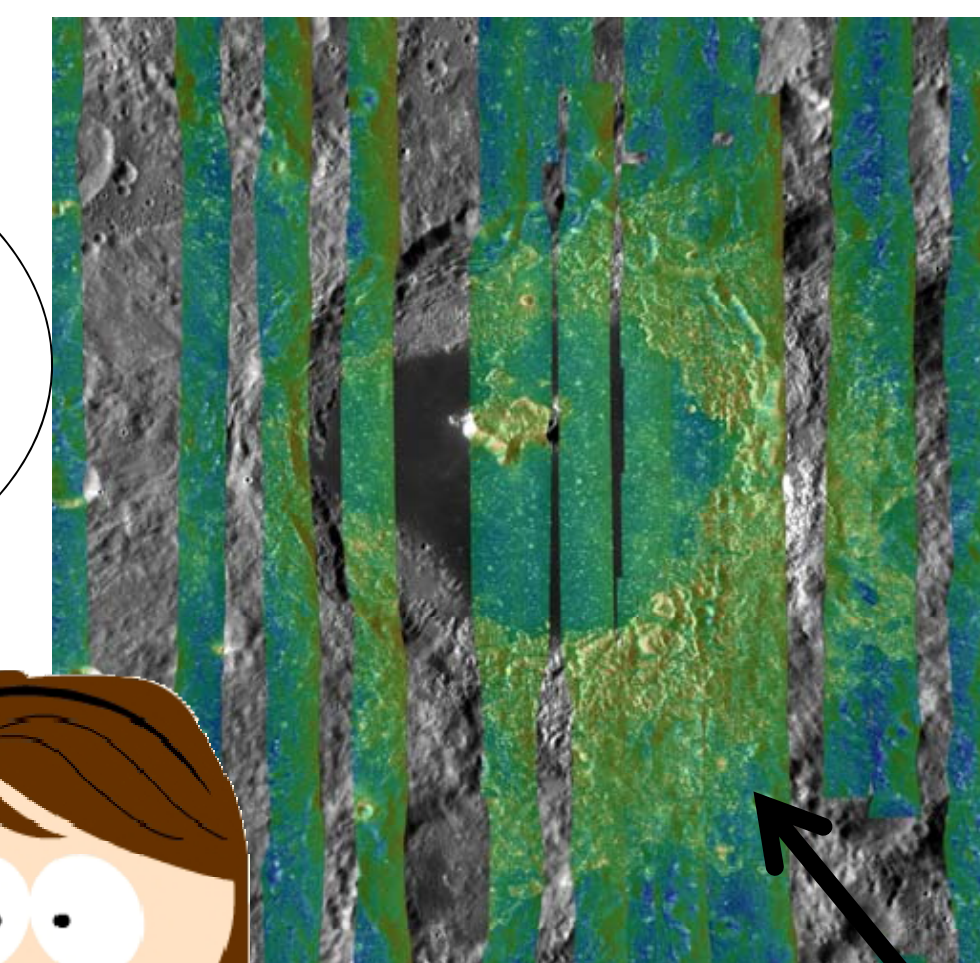
Here's Tsiolkovskiy in the LROC WAC mosaic (Thanks LROC team!) Tyrie (1988) estimated the age of the crater to be 3.5 ± 0.1 Ga from crater counts on the mare infill using Apollo 15 PanCam. The impact melt deposits on the Southeast margin were first identified by Hawke and Head (1977).

The impact melt has a high rock abundance seen by Diviner in maps made by Bandfield et al. (2011).



Rock Concentration

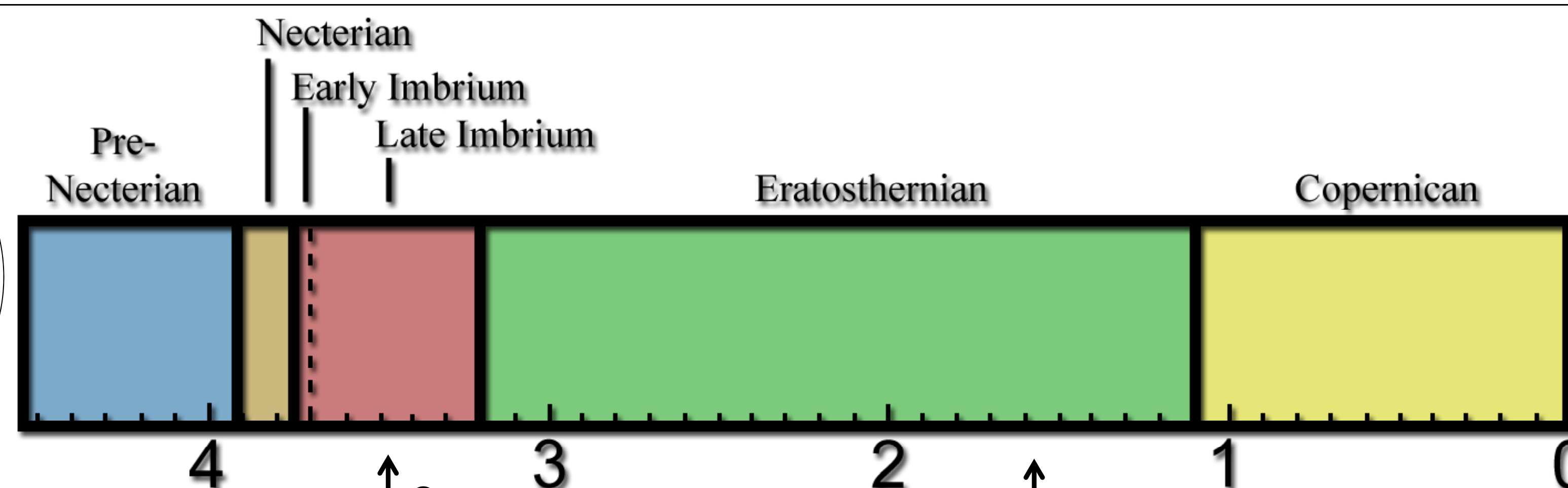
Check out the Mini-RF data. It also shows elevated radar backscatter!



Late Imbrium ~3.5 Ga Erasthothenian ~3.2-1.1 Ga Copernican ~0.8 Ga

Rock Abundance decreases with age

Looking at other large craters, we noticed a trend. Rock abundance around the craters decreased with age based on pre-LRO age estimates. Probably something to do with rocks being broken up into regolith over time or something.

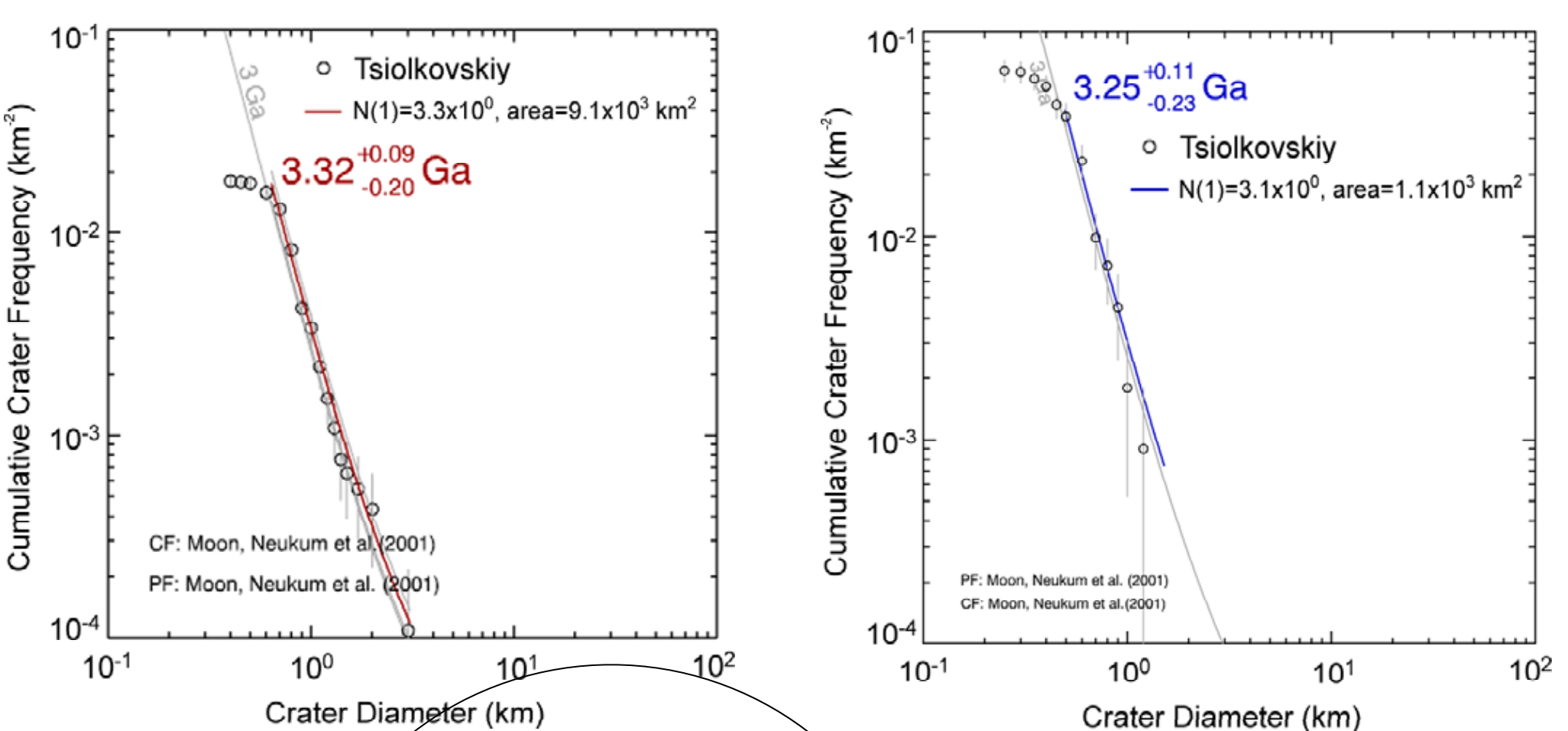
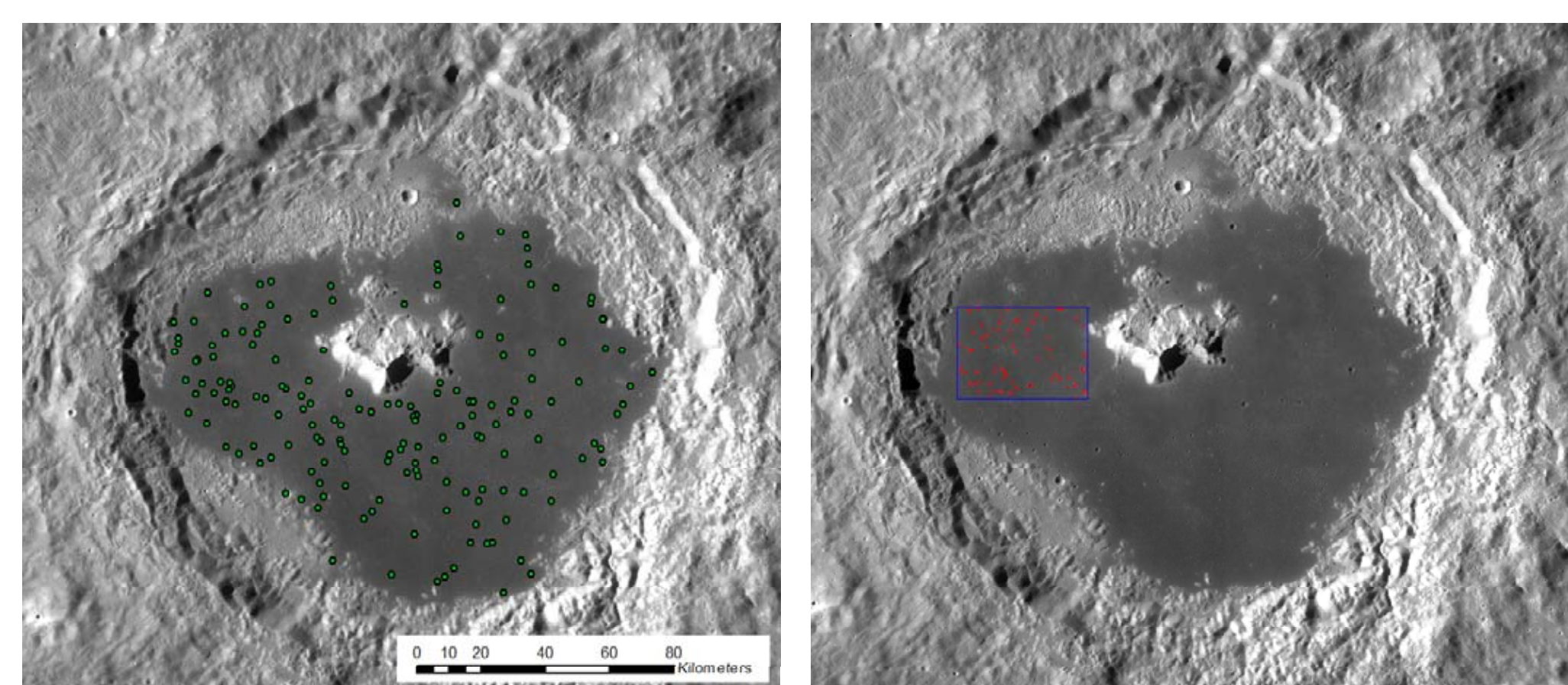


Hold up! Based on rock abundance then, Tsiolkovskiy looks like it is only 1 - 2 Ga old! Also craters with comparable external roughness observed by Mini-RF are 1 - 2 Ga old!!

Noah, Are you thinking what I'm thinking?

Exactly

We should do some new crater counts now that we have LROC data and updated crater chronology models of Neukum et al. (2001) and see if Tsiolkovskiy is really as old as we thought?



Here are my counts plotted with Craterstats2 provided by Michael and Neukum (2009). I get an age only a bit younger than before, but still > 3 Ga!

Me too, and I used smaller diameter craters in a smaller region.

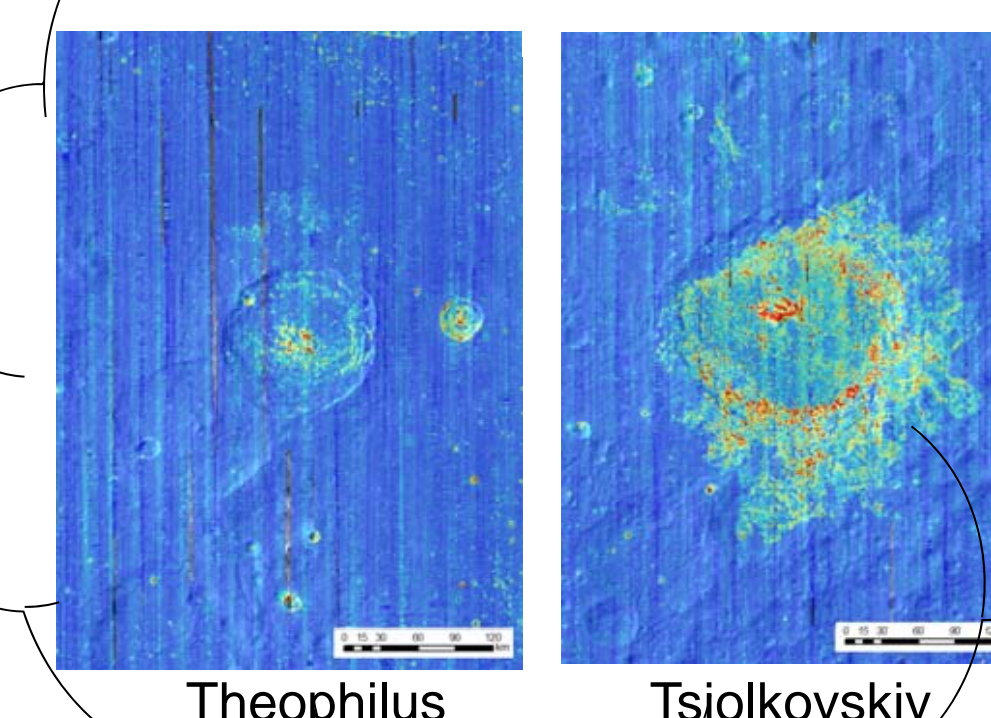
I also did counts on the floors of the other large craters and they all seem a bit older than we thought

I also did some counts on the impact melt that ponded in a crater on the southern margin. You can see the melt deposit in LROC WAC, rock abundance and CPR

What was the result?

Dude, I got the same age!

Now I'm confused. Are Theophilus and Tsiolkovskiy the same age?!



No!

Yes!

WTF?

References

- [1] Tyrie (1988) *Earth, Moon Planet.*, 42, 245-264. [2] Hawke and Head (1977) *Proc. Symposium on Planetary Cratering Mechanics*. [3] Bandfield et al. (2011) *J. Geophys. Res.*, [4] Neukum et al. (2001), *Space Sci. Rev.* 96, 55-86. [5] Michael and Neukum. (2009) *Earth Planet. Sci. Lett.*, 294,223-229. [6] South Park avatars provided by: www.sp-studio.de