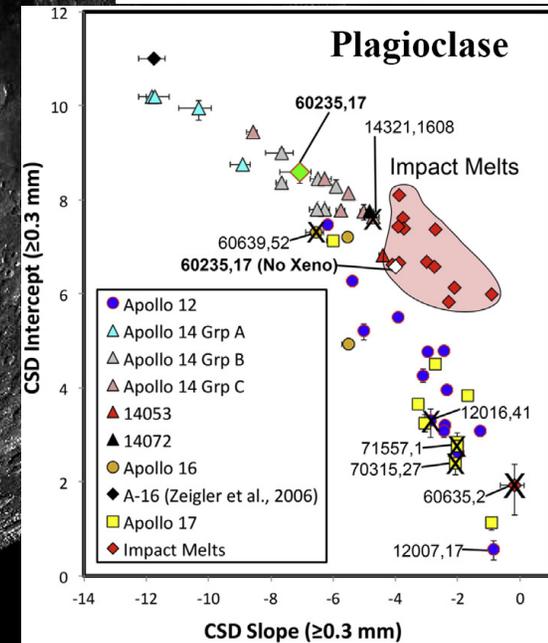
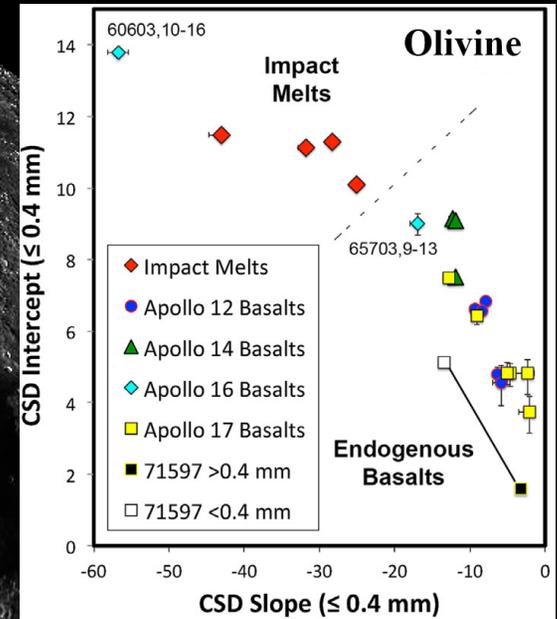


Non-Destructive Recognition of Impact Melts

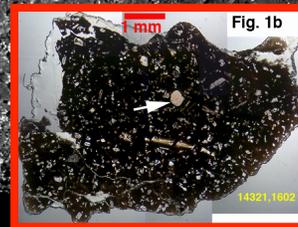
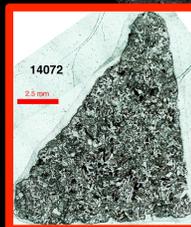
Textures used through quantitative petrography to distinguish impact melts from pristine basalts. Crystal size distributions of olivine and plagioclase.

Method

- Samples exhibit a variety of plagioclase CSD profiles. Focus on the steepest slopes (≤ 0.4 mm for olivine, ≥ 0.3 mm for plagioclase;) of CSDs.
- Calculate slope within this range only using size bins that show increasing population density.
- The intercept of the slope with the y-axis [$\ln(n^0)$ or nucleation density] was calculated using the same data.

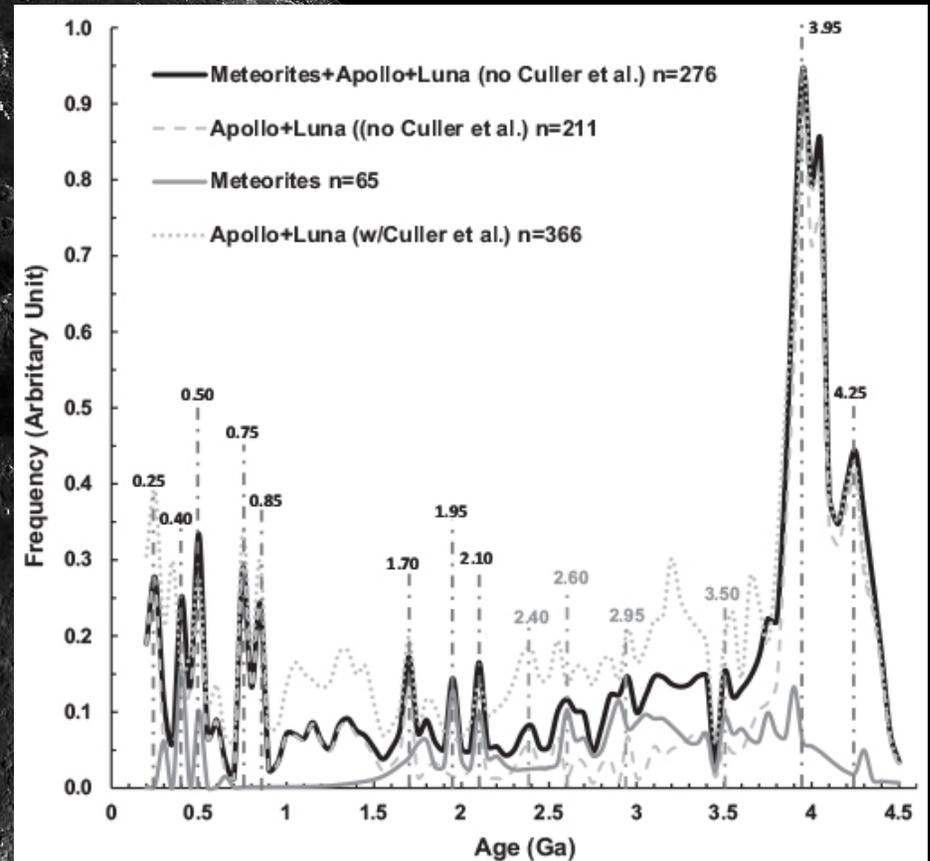


Neal et al. (2015) GCA 148, 62-80



Impact Melt Ages

^{40}Ar - ^{39}Ar ages have been obtained for 1– 3 mm sized rock fragments from Apollo 16 soil 63503 and chips from three rocks collected by Apollo 16 and Apollo 17 missions. The plateau age of 4.293 ± 0.044 Ga obtained for impact melt rock 63503,13 represents the oldest known age for such a lithology. This age may represent the minimum age for the South Pole-Aitken (SPA) Basin.

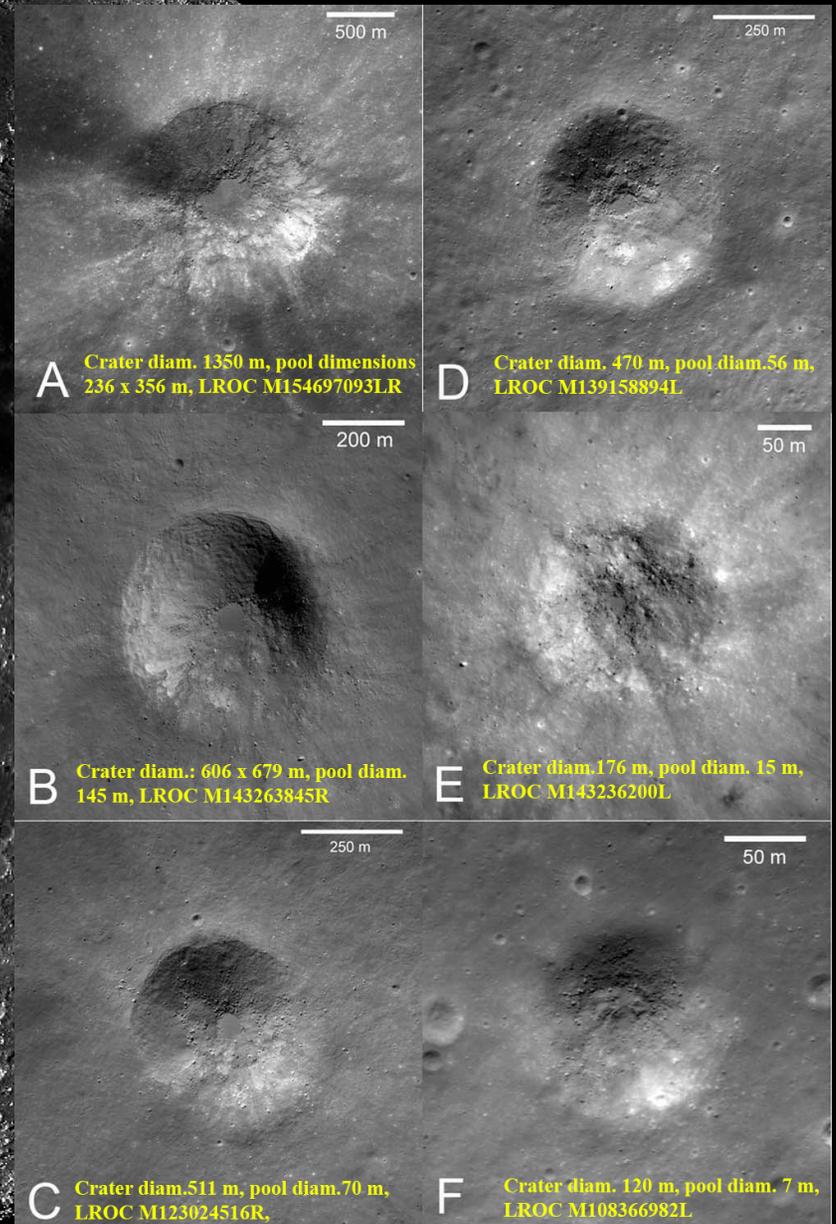


Fernandes et al. (2013) The bombardment history of the Moon as recorded by ^{40}Ar - ^{39}Ar chronology, *Meteorit. Planet. Sci.* **48**, 241-269.

Impact Melts

- Impact melt deposits have been identified in small, simple impact craters (as small as 170 m diameter) within the lunar highlands.
- Significant, visible impact melt deposits would not be expected in such small craters as most of the melt material would be ejected.
- These small melt-containing craters represent near-vertical impacts in which the axes of melting and melt motion are essentially straight down.
- Such craters also occur on the maria.

Plescia & Cintala (2012) Impact melt in small lunar highland craters. *J. Geophys. Res.*, **117**, E00H12, doi:10.1029/2011JE003941



Lunar Swirls

- Despite having spectral characteristics of immaturity, the lunar swirls are not freshly exposed surfaces.
- The swirl surfaces are regions of retarded weathering, while immediately adjacent regions experience accelerated weathering.
- Weathering in the off-swirl regions darkens and flattens the spectrum with little to no reddening, which suggests that the production of larger (>40 nm) nanophase iron dominates in these locations as a result of charged particle sorting by the magnetic field.

Kramer et al. (2011) *J. Geophys. Res.*, **116**, E04008, doi:
[10.1029/2010JE003669](https://doi.org/10.1029/2010JE003669)

