

Mercury's Cratering Record: First Results from Messenger's First Flyby

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The terrestrial planets have two crater populations based on their size/frequency distributions. The heavily cratered highlands of the Moon, Mars and Mercury all have complex size/frequency distributions (Population 1) that represent the period of Late Heavy Bombardment (LHB). Younger post-LHB surfaces on the Moon, Mars and Venus show a different crater size distribution characterized by a single-slope differential -3 size distribution (Population 2).

On Mercury the heavily cratered surfaces have a paucity of craters below ~ 40 km diameter due to their obliteration by intercrater plains formation (Fig. 1). The MESSENGER images of the Caloris basin show that it is larger than measured from images from Mariner 10; 1550 km diameter rather than 1300 km diameter. The crater counts within the basin show a size distribution the same as the heavily cratered highlands of the Moon, Mars and Mercury but at a lower crater density (Figure 1). This indicates that the Caloris basin formed near the end of Late Heavy Bombardment when the flux was in a state of decline. It probably formed between 3.8 – 3.9 Ga. The western side of the basin has a significantly lower crater density than the eastern side indicating the western side was flooded by volcanism later than the eastern side. Furthermore the smooth plains surrounding the basin have the same size-distribution and crater density as the western half of the Caloris basin indicating they were formed by volcanism at about the same time as the western part of Caloris. There is additional strong geologic evidence for volcanism within are surrounding Caloris.

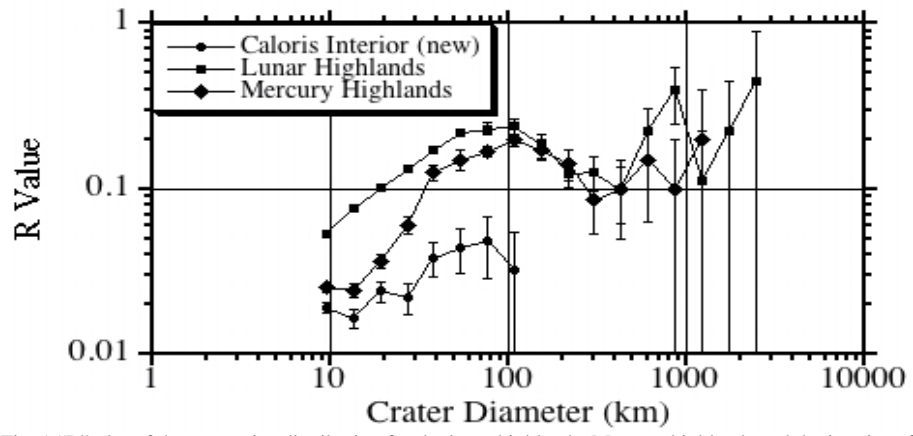


Fig. 1 "R" plot of the crater size distribution for the lunar highlands, Mercury highlands and the interior of the Caloris basin.