Introduction

Small craters (<150 m diameter) in the lunar highland smooth plains are investigated with respect to their depth-to-diameter ratio and wall slopes using newly derived LROC Narrow Angle Camera (NAC) Digital Elevation Models (DEM). We find that this population of craters (N=540) is characterized by smooth interiors, parabolic profiles, and relatively shallow depth-to-diameter ratios (Ra/Da).

Crater data from LRO NAC DEMs

NAC stereo-pairs acquired in the highland smooth plans were used to derive DEMs at 2 meters/pixel. The crater morphological parameters were obtained from the subsequent modeling and analysis of the DEMs.

Methods

Robust estimates of crater parameters were obtained by common image analysis methods. The crater depth was obtained with allowance for the local slope at the crater rims. The diameter of the crater was measured by fitting 3D data points by a robust algebraic fitting method.

Conclusion

The lunar highland smooth plains craters investigated in this study exhibit relatively shallow slopes with parabolic radial profiles. The NAC topography show that contrary to allometric variation of crater sizes inferred from Apollo data, small craters (<150 m diameter) do not strictly adhere to a power law. A lower depth-to-diameter ratio is also obtained, contrary to ratios for larger craters reported in previous studies [1,2,3]. While further analysis is required for better characterization, it is likely that the craters of this size degrade rapidly as they formed dominantly in the regolith rather than more coherently from depth (as per larger craters). Similar morphologic analysis of craters in the size range 150 m to 1000 m diameter may lead to a better understanding of the highland regolith and transition to megaregolith.