

UNRAVELING THE STRATIGRAPHY AND GEOLOGICAL HISTORY OF DAS CRATER ON THE FAR SIDE OF THE MOON BASED ON MORPHOLOGY, MINERALOGY AND EJECTA EMPLACEMENT DYNAMICS

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Copernican craters on Moon are the craters that formed less than a billion years ago. These younger craters which appear to have exposed fresh materials on the surface and not undergone extensive degradation processes are of greater significance for understanding the fundamental processes of impact cratering on the Moon. The stratigraphy and the dynamic and complex evolutionary history of such craters can be discerned from a detailed and in-depth analysis of the morphological and lithological aspects of the crater, thereby help us improve our understanding of recent geological processes on the Moon. The present study characterizes the morphology, mineralogy and ejecta emplacement dynamics of Das crater on the farside of the Moon using a wealth of orbital remote sensing data. The location of Copernican-aged Das crater (centered at 26.48° S and 137° W) on the lunar farside at the periphery of the more or less degraded peak ring of the 2600 km wide South Pole-Aitken basin, low crustal thicknesses of about 5 km in the region, and the presence of a linear gravity anomaly in the region [1] adds its potentiality for the present study.

The morphological units of the crater cavity include central uplift region, elevated hummocky floor, lower hummocky floor, scarp and tread region of the inner crater wall, outer wall, pooled deposits of impact melt, melt platform, melt fronts, fractures in impact melt. Pyroxenes (pigeonite and augite) and spinel were identified in the crater. The pyroxenes occur in conjunction with impact melt deposits, with estimated crystallization temperatures of roughly 1100 – 1250 °C. The ejecta deposits around Das crater are observed to have manifested in four facies units (Fig. 1). Facies A is characterized by the appearance of radially oriented linear striations seen to have deposited in a contiguous fashion exterior to the crater rim (Fig. 1). Facies B is characterized by smooth deposits of low albedo material that occur near the crater rim and may have been interspersed with chaotically arranged blocks as to the East of the crater. Facies C is characterized by pooled deposits of smooth textured material in local topographic lows that occur predominantly in the lower elevated pre-impact terrain. Facies D is characterized by the presence of radially oriented grooves and clusters of nearly-circular depressions that are typically seen beyond the extent of Facies A (Fig. 1). The impact event of Das crater was likely caused by a projectile from about 30° East of North inclined at 30°-45° from the horizontal (Fig. 1). The transient cavity of Das crater was probably 31.8 km wide and 9.54 – 10.4 km deep. Zones of peak shock pressures and maximum impact melt generation were observed in the hypothesized downrange direction to the southwest of the Das crater.

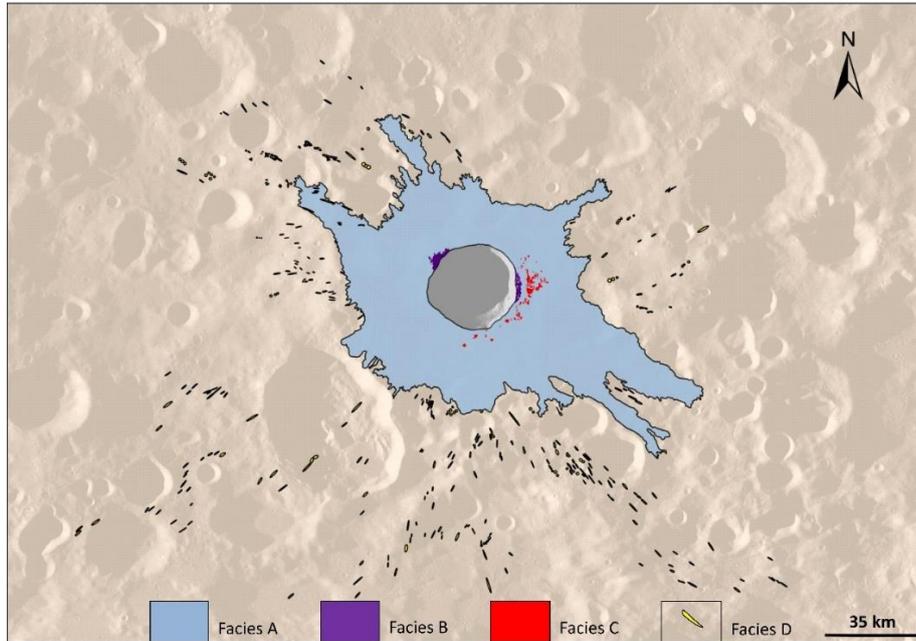
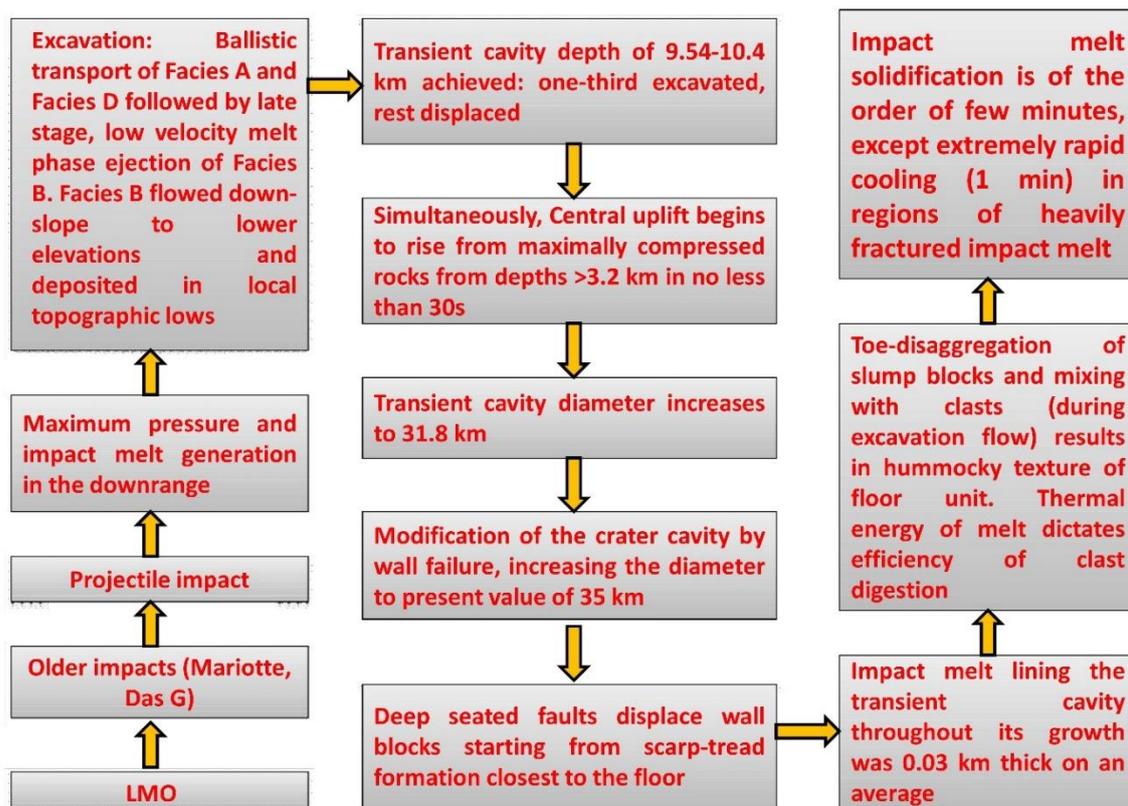


Fig. 1 Spatial extent of different ejecta facies of the Das crater mapped and draped over WAC mosaic

The possible series of processes that occurred in the Das crater during the crater evolution are shown in a schema below.



References:

- [1] Andrews-Hanna J.C., Asmar S.W., Head J.W., Kiefer W.S., Konopliv A.S., Lemoine F.G., Matsuyama I., Mazarico E., McGovern P.J., Melosh H.J. and Neumann G.A. (2013.) *Science*, 339(6120), 675-678.