STUDY OF A FLOOR-FRACTURED CRATER IN CENTRAL EASTERN ARABIA TERRA OF MARS

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Abstract

On Mars, floor-fractured craters (FFCs) have been hypothesized to be modified by a suite of geological processes that includes groundwater migration, melting of subsurface ice and flow, fluvial activities etc [1]. As far as the role of igneous intrusion activity in the modification of the FFCs is concerned, there has been no consensus within the scientific community. because there have been only few studies conducted in the past that showed the typical evidence of unique combination of mounds and ridges within a FFC that can imply igneous intrusion[2]. In this study, we document unique remnant structures hosted by an FFC in the Arabia Terra region to show that they have possibly formed by igneous intrusion activities and led to the extensive modification of the crater floor. We have chosen Arabia Terra as more than 50% of the total FFCs identified on Mars is in this region. At first, using a mosaic of Mars Reconnaissance Orbiter Context Camera images (~6 m/pixel), we conducted morphologic investigation of the Arabia Terra region to identify the FFCs and then mapped the evidence of mounds and/or ridges inside ~ 60 FFCs. From the mapped FFCs, we conduct detailed investigation of an unnamed crater (diameter: ~85 km; 27.95º N, 28.12º E, 3.6 Ga) as it has very nicely preserved the morphologic evidence of mounds and ridges. For the mounds mapped inside this FFC, our detailed morphometric, statistical and morphological study depicts good resemblance to the scoria cones and martian mud volcanoes mapped elsewhere on Mars. The unidirectionality of the ridges and the azimuth of the mounds depict the regional stress state (direction) i.e. NW-SE at the time of fracture formation, unlike the concentric and radial fractures developed by the impact process. Moreover, orientation of the large linear tectonic features of Arabia Terra is also comparable with the features inside the studied crater. Together, from our study, we propose that the remnant structures inside this FFC might correspond to plausible evidence of igneous activity in response to a regional intrusive event that the Arabia terra as a whole or in part might have experienced in the past.

References:

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