

Small-scale ridges newly identified on the equatorial region of the Phobos nearside

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Although the craters and grooves on Phobos are indicative of widespread and abundant surface modification during Phobos' geologic history [Basilevsky et al., 2014], little definitive evidence exists for geologically recent regolith migration other than down-slope mass-wasting [Shi et al., 2016]. Here we report newly found small-scale sinuous ridges identified in Mars Reconnaissance Orbiter's High Resolution Imaging Science Experiment (HiRISE [McEwen et al., 2007]) images of the nearside of Phobos. These ridges are spatially focused within the equatorial region (-5° to 20° N). Some of them superpose on craters and grooves, which is consistent with a geologically recent activity. They are ~ 200 m to ~ 1 km in length, several 10's m in width, and most of them are roughly parallel to each other and are generally oriented in NE-SW direction. To extract detailed topographic profiles, we constructed a high-resolution (~ 5 -6 m/pixel; almost same as the original image) digital elevation model (DEM) by using shape-from-shading [Alexandrov and Beyer, 2018] in the selected regions of a HiRISE image and a stereo-derived HiRISE DEM (20 m/pixel) [Hemmi and Miyamoto, 2019]. Our preliminary analysis shows these ridges are less than several meters high. Their morphology and topography are unlikely to be formed by impact cratering, extensional stress fields, or mass wasting processes. In this presentation, we provide initial results of geological mapping of the small-scale ridges and discuss their possible origins.

References

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