Geology of Phobos

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The martian moon Phobos is 26 x 22.8 x 18.2 km in size, and the major landforms on its surface are craters and grooves. On the surface of Phobos were identified ~1300 craters ≥200 m in diameter, ~70 craters ≥1 km, and ~30 craters ≥2 km; Stickney, the largest crater on Phobos, is about 9 km in diameter. Most craters are undoubtedly of impact origin although some small craters may be pits formed by drainage of regolith into subsurface fractures. The presence of the observed impact crater population implies that the upper hundreds of meters to a few kilometers of Phobos are heavily fractured. Using the available digital terrain model (DTM) of Phobos, the 23 craters larger than 2 km in diameter have been subdivided into three morphologic classes on the basis of freshness and state of degradation. This Phobos crater subpopulation has a considerably larger number of steep-sided craters compared to lunar highland craters of the same size: we interpret this as a combined effect the topographically rough background surface of Phobos as well as its very low surface gravity.

We conclude that the surface of Phobos is an arena for a complex of geologic processes. The leading role belongs to impact cratering with associated target destruction, material ejection and subsequent deposition partly with a temporary stay in near-martian space. Shaking by impacts and surface stirring by day-night temperature changes cause granular surface material to move down along-slope carried by very low, but nevertheless efficient, surface gravity. Sample return missions are crucially important for a better understanding of the geological processes operating on Phobos. In addition to Phobos material, a returned sample will probably contain pieces of material of Mars.

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