

Dust Rings of Mars: Dynamical Models and Observational Limits

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Many of the Solar System's small moons generate visible dust rings. The principle is simple: meteoroids impact a moon's surface, raising clouds of fine dust; that ejecta escapes the moon's weak gravity but remains in orbit about the central planet, leading to a ring and moon sharing the same orbit. Examples of this process are observed for some of the small moons of all four giant planets, and the same process is likely to be at work on Phobos and Deimos. For this reason, speculation about possible dust rings of Mars goes back several decades, and more than two dozen papers in the refereed journals discuss the hypothetical dynamics of the Martian rings. The most sensitive searches for Martian rings have been performed using the Hubble Space Telescope, setting upper limits on ring optical depths in the range 10^{-7} to 10^{-8} . These limits are on par with the optical depths of some of the faintest known planetary rings. Nevertheless, dynamical models continue to suggest that faint dust rings are present at somewhat lower densities than can be detected. This presentation will review the latest observational limits and their implications for Phobos and Deimos as sources of fine dust in the Martian system.