



The Influence of Space Environment on the Evolution of Mercury

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Mercury, due to its close location to the Sun, is surrounded by an environment whose conditions may be considered as 'extreme' in the entire Solar System. Both solar wind and radiation are extremely strong, so that their interactions with the planet cause high emission of material from its surface. Moreover, the meteoritic precipitation plays a significant role in surface emission processes. This emitted material is partially lost in space. Although under the present conditions the surface particles loss rate does not seem to be able to produce significant erosion/particle depletion of the planetary mass and volume, the long-term effects over billion of years should be carefully considered, to properly understand the evolution of the planet. In the early stages, under even more extreme conditions, some of these processes were much more effective in removing material from the planet's surface. This study attempts to provide a rough estimation of the material loss rate as a function of time, in order to evaluate whether and how this environmental effect can be applied to understand the Hermean surface evolution. We show that the most potentially effective Sun-induced erosion/depletion process in early times is a combination of ion sputtering, photon stimulated desorption and enhanced diffusion (a), which could have caused the loss of a surface layer down to a depth of some meters.