

Plasma, Mercury exosphere in light of recent new observations.

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Abstract

The proximity of Mercury to the Sun makes this planet a particularly interesting subject for extreme environmental conditions. In particular, the Mercury's exosphere, its interaction with the solar wind and its origin linked to the surface of the planet, can provide important clues about planetary evolution. In fact, the Hermean exosphere is continuously eroded and refilled by these interactions. Recently, big efforts in ground-based observations provided interesting results, but they are limited to just a few exospheric species, mostly Na. The NASA MESSENGER mission (launched in March 2004), up to now, performed three flybys providing still a few but important results on the exospheric distribution of already observed species, like Na and Ca, as well as new species as Mg. Differences in spatial distributions for different species suggest different release mechanisms. Waiting for further more systematic observations, it is of crucial importance to perform accurate and comprehensive simulations in order to maximize the science return of the future space-based observations by MESSENGER as well as by the ESA-JAXA BepiColombo mission. Different mechanisms compete in the Hermean environment for the exosphere generation, depending by external conditions (the Sun distance and activity, interplanetary dust distribution, etc...) and by planet surface characteristics (surface illumination and composition, etc...). We present an updated view of the exospheric generation processes at Mercury, trying to identify the key observations needed to distinguish among the many different scenarios.

