EPSC Abstracts,
Vol. 2, EPSC2007-A-00003, 2007
European Planetary Science Congress 2007

Mercury's exosphere from perihelion to aphelion

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A Monte Carlo code has been used to model the sodium exosphere of Mercury as it moves about the sun from perihelion to aphelion and returning to perihelion. The surface interaction has been explored in the modeling for the first time. Both the sticking coefficient and the fraction of energy exchanged with the surface have been varied to determine their influence on the resulting exosphere. Radiation pressure is also calculated, along with feedback mechanisms. We have employed photon-stimulated desorption, impact vaporization as well as the ion sputtering as sources. The ion flux capable of sputtering is obtained from our magnetosphere code (Mercury-adapted TH93 model) as a function of solar wind pressure and IMF parameters. The probability of occurrence of each magnetospheric configuration is computed from Helios particle and field data. The resulting atmosphere, surface concentration of volatiles, and maps of escaping atoms and the tail are shown. The modeled results are compared with data to constrain the sources and surface interaction. Expected atmospheres for K, Ca and O will also be shown for a limited range of conditions.