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Characterization through global hybrid simulations of solar wind ions impacting the dayside of Mercury

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It has long been suspected since Mariner-10 observations that solar wind ions could reach the surface of Mercury: Kallio & Janhunen (2003) and Travnicek et al (2010) have presented simulated maps of precipitating proton fluxes. Attempts to refine estimations of precipitating fluxes of solar wind ions are important as these precipitations create additional sources of exospheric and possibly magnetospheric populations, and as their space-weathering effects modify the properties of the regolith.

We run the global hybrid model used by Richer et al. (2012) which takes self-consistently into account the alpha particles of the solar wind to estimate fluxes of solar wind protons and alphas impacting the surface of Mercury under different IMF conditions. The internal source of the Hermean magnetic field is axisymmetric and is the superposition of a dipole and a quadrupole consistent with MESSENGER observations (Anderson et al., 2011) as in Richer et al. (2012). Results are briefly compared to predictions made with the offset dipole model of the planetary field. New simulations, made with an improved spatial resolution of 40km, reveal important differences between proton and alpha fluxes and show large variations with interplanetary conditions. In a first step we investigate the properties of solar wind ions impacting the dayside of the planet, precipitations on the night side will be examined later in a second step.

References

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