



## **Sodium ions circulation in the magnetosphere of Mercury and its contribution to ion sputtering.**

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**Abstract.** Here we present the result of our model for the circulation of Sodium ions in the magnetosphere of Mercury. Magnetospheric Na<sup>+</sup> ions are the results of the photon ionization of the neutral Na exosphere. We first use a Na exospheric model as a source; then we simulate the Na<sup>+</sup> circulation using a single particle Montecarlo model, which takes into account the latest findings from the MESSENGER mission. The Na<sup>+</sup> densities and fluxes are computed inside the whole magnetosphere. A subset of the simulated data, corresponding to the MESSENGER orbit, is compared against the data from MESSENGER FIPS instrument, showing a good agreement. Then, the validated Na<sup>+</sup> circulation model is used to estimate the Na<sup>+</sup> flux onto the surface of Mercury. The precipitation of heavy planetary ions, in fact, is believed to give a substantial contribution to the sputtering process on the surface of Mercury (Delcourt et al., 2003), comparable with that from the precipitation of solar wind plasma. In fact, Na<sup>+</sup> ions have a larger sputtering yield compared with that of protons. The results, in terms of sputtered fluxes and generated neutral exosphere, are presented.