Geophysical Research Abstracts,
Vol. 11, EGU2009-8000, 2009
EGU General Assembly 2009

A new estimate of micrometeoritic flux at Mercury

P. Borin (1), G. Cremonese (2), F. Marzari (3), M. Bruno (4), and S. Marchi (5)

(1) CISAS, Padova, Italy (patrizia.borin@unipd.it), (2) INAF-Astronomical Observatory of Padova, Italy (gabriele.cremonese@oapd.inaf.it), (3) Department of Physics, University of Padova, Italy (francesco.marzari@pd.infn.it), (4) Dipartimento di Scienze Mineralogiche e Petrologiche, University of Torino, Italy (marco.bruno@unito.it), (5) Dipartimento di Astronomia, University of Padova, Italy (simone.marchi@unipd.it)

Meteoroid impacts are an important source of neutral atoms in the exosphere of Mercury. Recent papers attribute to impacting particles smaller than 1 cm the major contribution to exospheric gases. However, fluxes and impact velocities for different sizes are based on old extrapolations of similar quantities at the Earth.

In this work, in order to determine the meteoritic flux at the heliocentric distance of Mercury we utilize the dynamical evolution model of dust particles of Marzari and Vanzani (1994) that numerically solves a (N+1)+M body problem (Sun + N planets + M body with zero mass) with the high-precision integrator RA15 (Everhart 1985). The solar radiation pressure and Poynting-Robertson drag, together with the gravitational interactions of the planets, are taken as major perturbing forces affecting the orbital evolution of the dust particles.

From our numerical simulations we extrapolate the flux of particles hitting Mercury's surface and the corresponding distribution of impact velocities.

A precise calibration of the particle flux on Mercury has been performed by comparing the predictions of our model concerning the dust infall on the Earth with experimental data.

The model provide the flux of different size particles impacting Mercury and their collisional velocity distribution. We compare our results with previous estimates, in particular we take into account the work of Cintala (1992), and we find lower velocities but significantly higher fluxes.

Our results show that the number of impacts given by Cintala, measured in N/years, is 80.2 times higher, but the flux measured in g/cm^2s, is 409.4 times lower. We can conclude that our model predicts a number of impacts smaller than Cintala, but a much higher mass contribution.