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Proton precipitation at Mars: statistical study and comparison with modelling studies.

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Hybrid models of the solar wind interaction with Mars predict solar wind ions precipitation onto the Martian atmosphere. The reason is that, at Mars, the gyroradius of heated protons and alpha particles can have a size comparable to the subsolar magnetic pile-region. This allows some of these particles to go through the magnetic pile-up region without being deflected away by the strong magnetic field strength there.

We have made an observational statistical study of proton fluxes at low altitudes around Mars to check this prediction. We have used ion and electron data from the Mars Express spacecraft and magnetic field data from the Mars Global Surveyor spacecraft. The data coverage is from February 2004 to April 2011.

We found that the proton precipitation indeed occurs at Mars. We have investigated the dependence of the precipitation on the solar wind convection electric field, upstream solar wind conditions and planetary crustal magnetic anomalies. The measured precipitating energy flux varies in the range 10^7-10^{10} eV/cm^2/s on average, being larger on the dayside than on the nightside. We will present some results from this study and compare with modelling studies.