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Asymmetry of plasma fluxes at Mars. ASPERA-3 observations and hybrid simulations

E. Dubinin (1), G. Chanteur (2), M. Fraenz (1), R. Modolo (3), J. Woch (1), E. Roussos (1), S. Barabash (4), R. Lundin (4)

(1) MPS, Katlenburg-Lindau, Germany, (2) CETP-IPSL, Velizy, France, (3) IRF-Uppsala, Sweden, (4) IRF-Kiruna, Sweden

The asymmetry of fluxes of solar wind and planetary ions is studied by using the ASPERA-3 observations onboard the Mars Express spacecraft in February, 2004-March, 2006. Due to the small scale of the Martian magnetosphere and its induced origin, the flow pattern near Mars is sensitive to the directions of the interplanetary magnetic and electric (-V x B) fields. Asymmetry of the magnetic field draping produces an asymmetry in plasma flows in the plane containing the IMF, while the motional electric field results in an asymmetry of ion fluxes in the perpendicular plane. The crustal magnetic fields on Mars also influence the flow pattern. Scavenging of planetary ions is less efficient in the regions of strong crustal magnetization and therefore the escape fluxes of planetary ions in the southern hemisphere are smaller. The results of the observations are compared to simulations based on a 3-D hybrid model with several ion species.