



Ion observations close to Phobos: A new type of the solar wind interaction with a planetary body

Y. Futaana, S. Barabash, M. Holstrom, and H. Nilsson
Swedish Institute of Space Physics, Kiruna, SE-98128, Sweden

During the close Phobos flyby on July 23, 2008, ASPERA-3/IMA (Ion Mass Analyser) on board Mars Express (MEX) was carrying out ion observations. The flyby occurred in the upstream solar wind far away from the Martian bow shock where no interference with/from the Martian plasma environment is expected. In the vicinity of Phobos, IMA detected unusual signatures in the proton fluxes. Because MEX do not have a magnetometer on board it is not possible to directly back trace the trajectories of the observed protons. Thus, it is difficult to decide if those protons came from Phobos. However, after careful analyses, we conclude that the origin of these protons is indeed Phobos. The reasons are: 1. The energy of the observed protons is slightly less than the solar wind proton energy, and the energy spectrum have a low energy tail. Therefore, the protons can be interpreted as backscattered solar wind protons as was observed by the Japanese Kaguya mission [Y. Saito et al, GRL, 2008] at the Moon. 2. We conducted test particle backtracing assuming that the protons originate from Phobos under various magnetic field conditions. A unique solution for all independent observations was found. We conclude that the observed protons are solar wind protons backscattered from Phobos. The Kaguya observations at the Moon suggest a backscatter efficiency of 0.1 - 1%. Therefore, Phobos and any other atmosphereless body injects into the solar wind a substantial flux of protons. The interaction of the these ions with the solar wind flow results in a specific type of the interaction.