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Ion Flow in the Martian Magnetotail

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According to the first theoretical model of cometary tails by Alfven (1957) the regionbehind the gaseous non-magnetic planet looks like a long wake filled by draped magneticfield with the large BX component. The Martian magnetotail is a classical example of such a structure. Because of direct interaction of the solar wind with the planetaryexosphere the wake region is filled by ions of the planetary origin. Observationsof the planetary ion flow performed by mass analyzer IMA (ASPERA-3 experiment)onboard of Mars Express during last two years allow to reconstruct the main featuresof the Martian tail. Our statistical study shows that due to the finite Larmore radiusof the heavy planetary ions (O+, O2+, etc), the ion spatial distribution is veryasymmetric in the frame referred to the direction of convectional electric fieldof the solar wind. For instance, there is clear North-South asymmetry and someDawn-Dusk asymmetry. Measurements show that the Martian magnetotail can be divided intotwo large regions. The first one is a magnetic pileup region, where the ions are accelerated mostly by pickup mechanism and where there is a pronounced velocity gradient from the magnetic pileup boundary to the center of the tail. The second region, plasma sheet, is rather narrow layer elongated in North-South direction. Here an another ionacceleration mechanism acts, and the ions demonstrate an almost monoenergetic flowincreased with the distance from the planet. The present talk discuss in detailsthe magnetotail structure, different acceleration mechanisms, and different reasons of the observed asymmetry. The role of the magnetic anomalies in the plasma acceleration is discussed also.