



On the relationship between the Martian induced magnetosphere boundary and the solar wind

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The recent observations by Mars Express (MEX) revealed that there are some plasma boundaries in the solar wind-Mars interaction region; the bow shock, the induced magnetosphere boundary (IMB), and the photoelectron boundary [Lundin et al., 2004]. On the other hand, Mars Global Surveyor (MGS) defined another boundary, the magnetic pileup boundary (MPB). The IMB characteristics are not yet well known, especially the solar wind effect and the relationship between the MPB and the IMB are still open questions.

We searched 2324 orbits, (Jun.7 2004-Mar.13 2006), and identified IMB crossings. Due to the large thickness of the IMB layer, we defined two IMBs; top of the IMB (IMB_T) and bottom of the IMB (IMB_B). The IMB layer distribution is shown by plotting IMB crossings to investigate the difference and similarity between the IMB and the MPB. The distribution spreads very widely in the nightside and the IMB_B is very similar to MPB. The IMB crossings are sorted by the solar wind parameters and we confirmed that the IMB altitude becomes lower at the high solar wind velocity.

We next investigated the dependence of the IMB positions for different solar wind species. By the IMBs identification for the proton and alpha particle independently, we found that the alpha boundaries are occasionally higher than the proton ones. This result conflicts with the Martian ionospheric plasma-solar wind interaction theories. Theoretically the proton boundary is expected higher than the alpha one because the gyroradius of the protons is smaller than that of alpha particles. We discuss possible physical processes that explain the tendency of the IMB locations for different species.