



THE STRUCTURE OF THE MAGNETIC PILEUP BOUNDARY AT MARS AND VENUS

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The lack of global-scale intrinsic magnetic fields and the presence of an atmosphere at Mars, Venus and comets makes their interactions with the solar wind very similar, with the formation of a magnetic barrier in front of a highly conducting obstacle and an induced magnetic tail as their most prominent features. A sharp plasma boundary marks the entry into the magnetic barrier: the Magnetic Pileup Boundary (MPB). At Mars, the MPB has been identified by very clear observational signatures, including a gradient in the magnetic field magnitude (often as a sharp jump) accompanied by a decrease in the magnetic field fluctuations and a drastic decrease in the solar wind electron and proton densities, as exospheric-induced ions become more numerous. The presence of another MPB signature, the enhancement of the magnetic field draping, allowed to identify this boundary also at Venus. We study the magnetic structure of the magnetic pileup boundary at Mars and Venus by performing minimum variance analysis on Mars Global Surveyor and Pioneer Venus Orbiter magnetic field measurements. For each one of the crossings analyzed, we obtain a very well defined normal vector to the current sheet. At Mars, its direction is in very good agreement with the normal vector deduced from a fit of the Martian MPB. We also study its thickness compared to physical scales, as well as its temporal variations. The results confirm that the MPB is a well-defined plasma boundary, where the magnetic field is essentially tangential though it cannot be a tangential discontinuity in the strict MHD sense. However, its nature seems to be rather explicable from a multi-fluid approach. Finally, we compare our results with similar observations at the MPB of comets and at the tail boundary of Venus.