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Interaction between solar wind flow and the Hermean magnetosphere: hybrid simulations

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The interaction between a collisionless solar wind flow and an obstacle with a typical scale comparable to ion scales is beyond the applicability of standard agnetohydrodynamic (MHD) models. To include ion kinetic effects one can use a hybrid scheme. Results of our numerical experiments are sumarised on figure **??**. Estimated dipole has approximately correct order of magnitude. Bow shock stand off distance > predicted by the simple paraboloid model (kinetic effects and/or by magnetic pressure of magnetosphere). Strongly turbulent magnetosphere (reason why is under study). Boundary conditions imposed on the fields and particles on the obstacle strongly influence the behaviour of the magnetosphere plasma and the formation and dynamic of the tail.

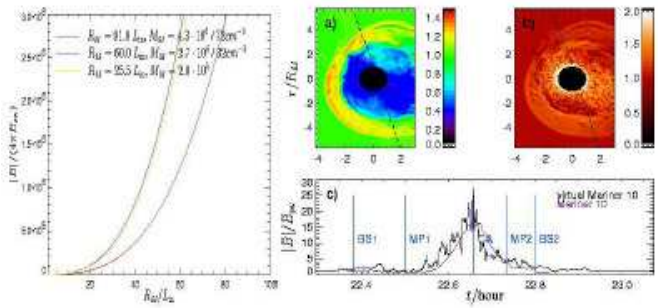

Figure 1: Scalling of magnetic field (left) with respect to the radius of the obstacle. One may use smaller numerical model of the magnetized obstacle to save the space in the simulation domain. The three curves show, how the magnetic moment of Mercury scales with radius under different solar wind conditions (density) considered. Results from the 3D simulation (right) of the Hermean magnetosphere: Panel a) shows distribution of density in the equatorial plane with a projection of the Mariner 10 passage during its third Hermean flyby at March 16, 1975. Panel b) shows the magnitude |B| of magnetic field in the equatorial plane. Mariner 10 data (the measurement of the magnitude |B| of the magnetic field) are compared with the simulated data on the panel c). Vertical lines mark the bow shock crossings (BS1 and BS2), two magnetopause crossings (MS1 and MS2) and finally the closest approach of the probe to the hermean surface (CA).