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The structure of the bow shock in fully kinetic simulations

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We report the results of two dimensional fully kinetic (both electrons and ions are treated kinetically) simulations of the solar wind interaction with a magnetic dipole. We carried out a parametric study by (i) varying the strength of the magnetic dipole and keeping fixed solar wind properties (density, temperature, solar wind velocity) and (ii) varying the solar wind speed and keeping other parameters fixed. By changing the dipole moment intensity and the solar wind velocity, different types of magnetospheres, of waves and characteristic structures of bow shock and magnetotail are observed. In this work, we focus on the analysis of the effects of the electron kinetic physics and compare the results with those obtained by means of MHD and hybrid simulations. Finally, we discuss the implications for planetary magnetospheres.