Geophysical Research Abstracts
Vol. 17, EGU2015-9505, 2015
EGU General Assembly 2015

Acceleration of the solar wind in a spherical coordinate kinetic model

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We have studied the acceleration of the solar wind protons by using a spherical coordinate kinetic hybrid model (HYBs). The model treats ions as particles while electrons form a massless, charge neutralizing fluid. The model includes the gravitation, the electron pressure and the jxB forces.

We have studied a magnetized and a non-magnetized solar wind cases and performed simulations for different isothermal electron temperatures by using the same initial Maxwellian velocity distribution function for protons. We show in the presentation of how the bulk velocity, the plasma density, the electric potential and the velocity distribution function of protons depend on the radial distance from the Sun to several Astronomical Units. The derived velocity and density profiles are compared with those of the Parker's solar wind model. Finally, extensions of the model and its applicability for a space weather modelling are discussed.