Geophysical Research Abstracts
Vol. 21, EGU2019-4349, 2019
EGU General Assembly 2019
© Author(s) 2019. CC Attribution 4.0 license.

Solar wind in the de Hoffmann–Teller frame of reference

Zdenek Nemecek (1), Tereza Durovcova (1), Jana Safrankova (1), Frantisek Nemec (1), Lorenzo Matteini (2), David Stansby (3), Nils Janitzek (4), Lars Berger (4), and Robert F. Wimmer-Schweingruber (4)

(1) Charles University, Faculty of Mathematics and Physics, Department of Surface and Plasma Science, Prague 8, Czech Republic (nemecek@aurora.troja.mff.cuni.cz), (2) 2 Observatory Paris, LESIA, Meudon, France, (3) Imperial College London, London, UK, (4) University of Kiel, Institute of Experimental and Applied Physics, Kiel, Germany

The solar wind can be considered as an ensemble of weakly interacting species moving with different speeds. Theoretical approaches as well as limited observations in a region close to the Sun show that heavy solar wind ions tend to flow faster than protons. The solar wind flow carries the frozen-in interplanetary magnetic and this situation evokes three related questions: (i) what is the proper solar wind speed, (ii) is this speed equal to the speed of the dominant component, whatever that may be, and (iii) what is the speed of the magnetic field? Our extended statistical analysis as well as simple theoretical considerations based on the MHD approximation and/or on the dynamics of charged particles in electric and magnetic fields suggest that the IMF velocity of motion (de Hoffmann–Teller velocity) would be deliberated as the proper solar wind velocity. Wind, Helios, ACE and SOHO observations of differential streaming of solar wind populations show that the energy of different species is conserved in the de Hoffmann–Teller frame. In spite of many indirect evidences and our careful analysis, we are not able to undoubtedly confirm that the total momentum is also conserved in this frame and we discuss possible sources of this discrepancy.