



## **Evolution of alpha-proton differential motion in the expanding solar wind**

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During the initial phase of solar wind acceleration, solar wind minor ions are accelerated above the proton bulk speed. The resulting differential speed between alpha particles and protons is usually closely aligned with the interplanetary magnetic field and reaches the Alfvén speed near the Sun. At larger distances from the Sun, the differential speed decreases with increasing solar wind travel time but it remains below the local Alfvén speed, probably due to a limiting action of local plasma instabilities. We focus on dynamic effects occurring in the expanding solar wind that cause variations of the alpha-proton differential speed. WIND plasma observations in the L1 point show that the differential speed is proportional to the proton speed and that the alpha to proton speed ratio changes in a systematic manner with the angle between the ambient magnetic field and proton velocity. Moreover, we found a clear separation of two types of the solar wind flow (alpha particles faster than protons and vice versa) that are present in both slow and fast solar winds. However, the number of observations of protons moving faster than alpha particles decreases with the increasing solar wind speed. In order to clarify the origin of this feature, we processed solar wind plasma and magnetic field data measured at different distances from the Sun and carried out a statistical study of an evolution of the alpha-proton differential speed.