Geophysical Research Abstracts
Vol. 18, EGU2016-17373, 2016
EGU General Assembly 2016

Compressible coherent structures at ion scales in the slow solar wind

Denise Perrone (2), Olga Alexandrova (1), Andre Mangeney (1), Milan Maksimovic (1), and Catherine Lacombe (1)

(1) Observatoire de Paris, LESIA, Meudon, France (olga.alexandrova@obspm.fr), (2) ESAC, Madrid, Spaine

We present a study of magnetic field fluctuations close to the ion scales in a slow solar wind stream. The nature of these fluctuations is found to be characterized by coherent structures. Although previous studies have shown that coherent current sheets can be considered as the principal cause of intermittency at the solar wind ion scales, here we show for the first time that, in the case of the slow solar wind, a large variety of coherent structures participates to intermittency at proton scales, and current sheets are not the most common ones. Precisely, we find here compressible ($\delta B_{\|} \gg \delta B_{\perp}$), linearly polarized structures in form of magnetic holes, solitons and shock waves. Examples of Alfvénic structures ($\delta B_{\perp} > \delta B_{\|}$) are identified as current sheets and vortex-like structures. Some of these vortices have $\delta B_{\perp} \gg \delta B_{\|}$, but the majority of them are characterized by $\delta B_{\perp} \gtrsim \delta B_{\|}$. Thanks to multi-point measurements by Cluster spacecraft, we could determine the normal of the coherent structures and their propagation velocity and spatial scale along this normal. Independently of the nature of the structures, the normal is always perpendicular to the local magnetic field, meaning that $k_{\perp} \gg k_{\|}$. The spatial scales of the studied structures are found to be 2 to 5 times the proton gyroradius or proton inertial length. Most of them are simply convected by the wind, but 25% propagate in the plasma frame. Possible interpretations of the observed structures and the connection with the plasma heating are discussed.