Geophysical Research Abstracts
Vol. 19, EGU2017-17850, 2017
EGU General Assembly 2017


# Anisotropies of the magnetic field fluctuations at kinetic scales in the solar wind : Cluster observations

Catherine Lacombe (1), Olga Alexandrova (1), and Lorenzo Matteini (2)

(1) Observatoire de Paris, LESIA, Meudon, France (olga.alexandrova@obspm.fr), (2) Imperial College, London, UK

We present the first statistical study of the anisotropy of the magnetic field turbulence in the solar wind between 1 and 200 Hz, i.e. from ion to sub-electron scales. We consider a sample of 93 intervals of 10 minutes of STAFF measurements, on a single *Cluster* spacecraft. We find that the fluctuations $\delta B_\perp^2$ (perpendicular to the average magnetic field $B_0$) are not gyrotropic at a given frequency $f$, a property already observed at larger scales. This non-gyrotropy of the frequency spectra gives indications on the shape of the angular distribution of the wave vectors $k$: below about 10 Hz, we find that the components $k_\perp$ (perpendicular to $B_0$) of the wave vectors are much larger than the components $k_\parallel$ (parallel to $B_0$), mainly in the fast wind; above 10 Hz, fluctuations with a non-negligible $k_\parallel$ are also present. We then consider the anisotropy ratio $\delta B_\parallel^2/\delta B_\perp^2$ between the compressive fluctuations parallel to $B_0$ and $\delta B_\perp^2$, which is a measure of the compressibility of the fluctuations. This ratio, always smaller than 1, increases with $f$. It reaches a value showing that the fluctuations are more or less isotropic for $f \geq 50$ Hz. From 1 to 15-20 Hz, *i.e.* down to scales ten times smaller than the proton inertial length, there is a strong correlation between the observed compressibility and the one expected for the kinetic Alfvén waves (KAWs), which only depends on the total $\beta$. At $f > 20$ Hz, the observed compressibility is larger than expected for KAWs; and it is stronger in the slow solar wind: this could be an indication of the presence of a slow-ion acoustic type of fluctuations which is favoured by the larger values of the electron to proton temperature ratio generally observed in the slow wind.