Geophysical Research Abstracts
Vol. 21, EGU2019-16316-1, 2019
EGU General Assembly 2019

Local anisotropy of velocity fluctuations in the solar wind

Andrea Verdini (1), Roland Grappin (2), Olga Alexandrova (3), Luca Franci (4), Simone Landi (1), Lorenzo Matteini (3), and Emanuele Papini (1)

(1) Dipartimento di Scienza e Astronomia, Università di Firenze, IT, (2) LPP, Ecole Polytechnique, FR, (3) LESIA, Observatoire de Paris, FR, (4) School of Physics and Astronomy, Queen Mary University of London, UK

We use *Wind* data in the period 2005-2015 to study the anisotropy of velocity fluctuations in two previously identified datasets in which the effects of solar wind expansion are expected to be small and large, respectively. The anisotropy is measured by computing II-order structure functions SF and by partitioning their power in a local reference frame attached to the scale dependent mean magnetic field. When axisymmetry is assumed, the two datasets show almost identical anisotropies, with a larger power in the perpendicular SF than in the parallel SF and power-law indices, $SF \propto k^{-\alpha}$, that are $\alpha = 0.47$ and 0.64, respectively. The three-dimensional anisotropy, for which the two perpendicular directions are analysed separately, is instead different. For strong expansion the two perpendicular directions have the same index (0.47), while for weak expansion the perpendicular SF is flatter that the displacement SF, with indices 0.38 and 0.52 respectively. Turbulent eddies at small scales have qualitative similar shape, with the longest dimension parallel to the magnetic field and the smallest dimension in the perpendicular direction. However, in the perpendicular plane eddies have a scale-independent aspect ratio for strong expansion, while the aspect ratio decreases with scale for weak expansion. These properties are qualitatively similar to those of magnetic fluctuations and indicate a strong coupling with velocity fluctuations in both datasets, despite a strong correlation at large scale is only seen for strong expansion. An analysis of the properties of the two datasets indicates that the differences in the 3D anisotropy are connected to different values of the ratio between the two field-perpendicular components of fluctuations at the large scale.