ANISOTROPY OF SOLAR WIND FLUCTUATIONS FROM LARGE TO SMALL SCALES

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In a recent paper, Perri et al. (2008) analysed magnetic field fluctuations recorded by the Cluster S/C in three different plasma environments, namely the solar wind, the Earth's foreshock and the Earth's magnetosheath. In all cases, they found a strong anisotropy of magnetic field fluctuations with very interesting cross-scale effects at the ion cyclotron frequency. The analysis was performed from larger to smaller scales across the ion-cyclotron frequency. In particular they showed that: a)the eigenvalues of the variance matrix have a strong intermittent behavior, with very high localized fluctuations below the ion cyclotron scale; b)the minimum variance direction is almost parallel to the background magnetic field at scales larger than the dissipative scales while it tends to become nearly perpendicular at scales within the "dissipation" range. We show that these features can be reproduced to a good level by a simple toy-model in which the tip of the magnetic vector randomly fluctuates on the surface of a sphere with its directional fluctuations following a double-lognormal distribution. In addition, we show that in our model compressive fluctuations play a key role confirming similar conclusions recently reported in literature.