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Magnetic intermittency of solar wind turbulence in the dissipation range

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The feature, nature, and fate of intermittency in the dissipation range are an interesting topic in the solar wind turbulence. We calculate the distribution of flatness for the magnetic field fluctuations as a functionof angle and scale. The flatness distribution shows a “butterfly” pattern, with two wings located at angles parallel/anti-parallel to local mean magnetic field direction and main body located at angles perpendicular to local B0. This “butterfly” pattern illustrates that the flatness profile in (anti-) parallel direction approaches to the maximum value at larger scale and drops faster than that in perpendicular direction. The contours for probability distribution functions at different scales illustrate a “vase” pattern, more clear in parallel direction, which confirms the scale-variation of flatness and indicates the intermittency generation and dissipation. The angular distribution of structure function in the dissipation range shows an anisotropic pattern. The quasi-mono-fractal scaling of structure function in the dissipation range is also illustrated and investigated with the mathematical model for inhomogeneous cascading (extended p-model). Different from the inertial range, the extended p-model for the dissipation range results in approximate uniform fragmentation measure. However, more complete mathematicaland physical model involving both non-uniform cascading and dissipation is needed. The nature of intermittency may be strong structures or large amplitude fluctuations, which may be tested with magnetic helicity. In one case study, we find the heating effect in terms of entropy for large amplitude fluctuations seems to be more obvious than strong structures.