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Intermittency and Multifractal behavior in the Slow and Fast Solar Wind Beyond the Ecliptic Plane

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In this work we study the evolution of intermittency in the solar wind magnetic turbulence at heliocentric distances between 1.5 and 5.4 AU and at heliolatitudes between -80 and 70^o. We use the a multifractal analysis based on the partition function formalism. More precisely, we consider magnetic field intensity for the solar wind data from Ulysses spacecraft measured during two solar minima (1997-1998, 2007-2008) and one solar maximum (1999-2001). By modeling multifractal spectrum we reveal intermittent character of turbulence in the small-scale fluctuations of the magnetic field embedded in the slow and fast solar wind. Generally, at small distances from the Sun both in the slow and fast solar wind we observe the high degree of multifractality (intermittency) which decreases somewhat slowly with distance and slowly with latitude. The results seem to suggest that generally intermittency in the solar wind has solar origin. However, the fast and slow streams, shocks and other nonlinear interaction can only be considered as the drivers of the intermittent turbulence. It seems that analysis shows that turbulence beyond the ecliptic plane evolves too slowly to maintain the intermittency with the distance and latitude. Moreover, we confirm the lower level of multifractality and intermittency than in the ecliptic, as well as the existence of symmetry with respect to the ecliptic plane, suggesting similar turbulent properties observed in the two hemispheres.

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