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Solar system plasma turbulence and intermittency at the maximum and minimum of the solar cycle

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We report on the analysis of turbulence properties of the solar wind and the planetary magnetosheaths of Venus and Earth at solar maximum (2000-2001) and minimum (1997-1998, 2007-2008) as revealed by Ulysses, Cluster and Venus Express. We provide an overview of the spectral and scaling properties of turbulence during the targeted time periods. A selection of Ulysses data reveals the spectral properties of the "pure" slow and "pure" fast solar wind turbulence, out of the ecliptic, at radial distances ranging between 1.3 and 5.4 AU. Venus Express and Cluster data contribute to the description of the solar wind turbulence at 0.72 AU and respectively 1 AU. The spectral analysis of magnetosheath data from Venus Express and Cluster reveals the properties of turbulence to be compared to solar wind turbulence. The statistical properties of plasma and magnetic field fluctuations exhibit features linked with intermittency revealed as non-Gaussian Probability Distribution Functions (PDFs) and scale dependent kurtosis. PDFs are computed for the solar wind data from Ulysses, Venus Express and Cluster, and complement the analysis based on second order corrrelation function. The same strategy is applied to study the intermittency of the magnetosheath turbulence of Venus and the Earth. The results of our thorough survey of data bases are organized in catalogues available on line: PSD and PDFs results are stored in three solar wind data bases (one for the solar maximum, 1999-2001, two for the solar minimum, 1997-1998 and respectively, 2007-2008), and two planetary databases (one for the solar maximum, 2000-2001, that includes PSDs and PDFs obtained in the terrestrial magnetosheath, and one for the solar minimum, 2007-2008, that includes PSDs and PDFs obtained in the terrestrial and Venus magnetosheaths). As an example of higher order analysis resulting from these results we discuss the similarities and differences between fast and slow wind turbulence and intermittency. We also discuss how the exploitation of data bases produced by the FP7 project STORM contribute to developing a (virtual) laboratory for studying solar system plasma turbulence and intermittency.

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