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The magnetohydrodynamic turbulent cascade in polar solar wind: the role of local dynamic alignment

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In recent years the occurrence of magnetohydrodynamic (MHD) turbulent cascade has been validated in the solar wind. This has been done through the systematic observation of the exact scaling law of the mixed third order moment of the Elsasser variables, also known as Politano and Pouquet law. The scaling was observed in the ecliptic and in polar wind, the properties of the cascade depending on the local wind conditions, such as cross-helicity. In polar fast, Alfvénic wind measured by Ulysses spacecraft the observation of the turbulent cascade is not ubiquitous, the reason for this sporadic behavior being unknown so far. After a brief review of the main results obtained in this framework, we show that occurrence of cascade is related with the local properties of the velocity and magnetic field fluctuations. In particular, the alignment of the fields inhibits the nonlinear interactions, as suggested in the early 80' (dynamic alignment), whilst the cascade takes place when the alignment is locally perturbed. Dependence of the cascade rate with radial distance, latitude and solar activity is presented, corroborating the importance of local dynamic alignment, and confirming the non universal character of solar wind MHD turbulence.