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Intermittency, Anisotropy and the onset of reconnection in strong Alfvénic turbulence[1]

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On length scales larger than the ion gyroradius, the turbulence in a plasma with a strong mean magnetic field may be modelled using the equations of reduced magnetohydrodynamics, which describe the evolution of Alfvénic fluctuations propagating up and down the magnetic field. This (strongly nonlinear) turbulence is (i) "critically balanced" - anisotropic with respect to the direction of the local mean magnetic field, (ii) "aligned" - vector fluctuations in the fields in the perpendicular plane point in the same direction to within a small angle, and the structures are highly sheet-like, (iii) highly intermittent - the shape of the probability distributions of many (but not all!) turbulent quantities depends on scale in a non-trivial way. I will discuss the work we have performed connecting these phenomena, and the resulting statistical model for the Alfvénic turbulence we have developed. Finally, I will discuss recent results concerning the onset of reconnection at the small scales of Alfvénic turbulence, and the subsequent disruption of the sheet-like turbulent structures at these scales. This dramatically affects the turbulent cascade at small scales, and may provide a resolution to recent disagreements as to the value of asymptotic spectral index of the turbulence.

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