



Alfvénic Turbulence in Strongly Magnetized Media

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Turbulence is omnipresent in magnetized plasmas. I will briefly introduce properties of magnetized turbulence. Plasma Physics deals with various length scales and different descriptions should be used for different scales. On large scales, magnetized turbulence can be described in the framework of magnetohydrodynamics (MHD). In this regime, I will consider a fluid threaded by a very strong mean magnetic field. In the presence of a strong mean magnetic field, disturbances travel along the magnetic field line and collisions between opposite-traveling Alfvén wave packets (or 'eddies') are essential for development of turbulence. In this talk, I will mostly discuss Alfvénic turbulence in non-relativistic plasmas (Goldreich & Sridhar 1995; Cho & Vishniac 2000). I will also briefly discuss relativistic Alfvénic turbulence (Thompson & Blaes 1999; Cho 2005; Cho & Lazarian 2014). On the other hand, near and below the ion gyro-scales, we should include plasma effects. In this talk, I will discuss how we can treat such small-scale magnetized turbulence and show how magnetic helicity affects spectral evolution of the small-scale turbulence (Cho & Lazarian 2004; Cho 2012; Cho & Kim 2016). When time permits, I will also discuss why magnetic reconnection should be fast in MHD turbulence.

References

- J. Cho, Simulations of Relativistic Force-free Magnetohydrodynamic Turbulence, *Astrophysical J.*, 621, 324 (2005)
- J. Cho, Magnetic Helicity Conservation and Inverse Cascade in EMHD Wave Packets, *PRL*, 106, 191104 (2011)
- J. Cho & K. Hoonkyu, Spectral Evolution of Helical Electron Magnetohydrodynamic Turbulence, *J. of Geophysical Res.: Space Physics*, 121, 6157 (2016)
- J. Cho & A. Lazarian, The Anisotropy of Electron Magnetohydrodynamic Turbulence, *Astrophysical J.*, 615, 41 (2004)
- J. Cho & A. Lazarian, Imbalanced Relativistic Force-free Magnetohydrodynamic Turbulence, *Astrophysical J.*, 780, 30 (2014)
- J. Cho & E. Vishniac, The Anisotropy of MHD Alfvénic Turbulence, *Astrophysical J.*, 539, 273 (2000)
- P. Goldreich & S. Sridhar, Toward a Theory of Interstellar Turbulence. 2: Strong Alfvénic Turbulence, *Astrophysical J.*, 438, 763
- C. Thompson & O. Blaes, Magnetohydrodynamics in the Extreme Relativistic Limit, *PRD*, 57, 3219 (1998)