Compressible MHD scaling in fast solar wind turbulence

Supratik BANERJEE, Fouad SAHRAOUI & Sébastien GALTIER

The role of compressible fluctuations in the energy cascade of fast solar wind turbulence is studied using an exact law derived recently for compressible isothermal magnetohydrodynamics and *in-situ* observations of the THEMIS spacecraft. For the first time, a direct turbulent energy cascade is evidenced over three decades of scales which is significantly broader than the previous estimates made from an exact incompressible law or from a compressible heuristic model. Unlike previous works, our evaluation gives an energy flux which keeps a constant sign over the inertial range. A term-by-term analysis reveals that the dominant contribution to the energy flux comes from pure compressible fluctuations. Furthermore, the compressible turbulent cascade rate is shown to provide the adequate energy dissipation required to account for the local heating of the non-adiabatic solar wind.