# The inertial energy cascade of turbulence in space and laboratory plasmas

F. Lepreti[1], V. Carbone[1], R. Marino[1], E. Martines[2], L. Sorriso-Valvo[3], M. Spolaore[2], V. Antoni[2], R. Bavassano[4], R. Bruno[4], R. Cavazzana[2], A. Noullez[5], E. Pietropaolo[6], G. Serianni[2], P. Veltri[1], N. Vianello[2], M. Zuin[2]

[1] *Dipartimento di Fisica, Università della Calabria, Rende (CS), Italy*

[2] *Consorzio RFX, Associazione Euratom-ENEA sulla Fusione, Padova, Italy*

[3] *CNR - Licryl Laboratory, Rende (CS), Italy*

[4] *IFSI/INAF, Roma, Italy*

[5] *Observatoire de la Côte d'Azur, Nice, France*

[6] *Dipartimento di Fisica, Università dell'Aquila, Italy*

The existence and width of the inertial range of the energy cascade in fully developed turbulence can be investigated by studying the scaling properties of third order structure functions of field increments. The well known exact scaling relationships holding for the third-order longitudinal structure functions in hydrodynamic turbulence (Kolmogorov "4/5" law) and for the third-order mixed structure functions of a scalar passively advected by the velocity field (Yaglom law) have been extensively verified through measurements in fully turbulent fluid flows. In this talk recent studies about the inertial energy cascade of turbulence in space and laboratory plasmas are reviewed. The magnetohydrodynamic (MHD) analogous of Kolmogorov and Yaglom laws, that is, the exact scaling law for third-order structure functions of Elsasser fields in MHD turbulence has been observed in solar wind MHD turbulence. It is also shown that a Yaglom relation of electrostatic turbulence for the third-order mixed moment involving the particle number density and the E x B drift velocity can be deduced from a simple model of bursty electrostatic turbulence in plasmas. This Yaglom law of electrostatic turbulence was recently found in the RFX-mod reversed field pinch, using measurements of velocity and density fluctuations at the edge of the device.