On the direct and inverse energy transfer in 2-dimensional and 3-dimensional turbulent flows and in turbulent models[1] GANAPATI SAHOO, LUCA BIFERALE, MASSIMO DE PIETRO, Department of Physics, University of Rome Tor Vergata, Rome, Italy — In this seminar, I will discuss a few important open problems in "Fully Developed Turbulence" concerning its most idealized realization, i.e. the case of statistically homogeneous and isotropic flows. I will discuss the importance of inviscid conserved quantities in relation to the most striking statistical properties shown by all turbulent flows: the growth of small-scales, strongly non-Gaussian fluctuations, including the presence of anomalous scaling laws. By using unconventional numerical methodology, based on a Galerkin decimation of helical Fourier modes [1-3], I will argue that some phenomena characterizing homogeneous and isotropic flows might be important also for a much larger spectrum of applications, including flows with geophysical and astrophysical relevance as for the case of rotating turbulence and/or conducting fluids. Results about both real 3D decimated Navier-Stokes equations and dynamical models of it will be presented.

[1] L. Biferale, S. Musacchio and F. Toschi, Phys. Rev. Lett. 108 164501(2012).
[2] L. Biferale, E.S. Titi, J. Stat. Phys. 151, 1089(2013).
[3] L. Biferale, S. Musacchio and F. Toschi, J. Fluid Mech. 730, 309(2013).

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