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Time irreversibility of fully developed turbulence: multifractal statistics of Lagrangian power GUIDO BOFFETTA, University of Torino, LUCA BIFERALE, University of Roma Tor Vergata, MASSIMO CENCINI, Istituto Sistemi Complessi, CNR, MASSIMO DE PIETRO, University of Roma Tor Vergata — The irreversible energy cascade of fully developed turbulence is a prototype for systems far from equilibrium. Recently, time irreversibility in turbulence has been discovered at the level of single Lagrangian trajectory, whose rate of kinetic energy change - the Lagrangian power - displays an asymmetric distribution with a power-law dependence on the Reynolds number. In this contribution the statistics of Lagrangian power, obtained from extensive direct numerical simulations at different Reynolds numbers, is shown to be well described by the Multifractal model of turbulence. The predictions of the multifractal model are also compared with the results from a shell model of turbulence, which allows to reach very high Reynolds numbers. Surprisingly in this case the even moments of power, insensitive to time asymmetry, are well described by the model, while the odd moments display different scaling exponents. The relevance of our finding for modeling Lagrangian turbulence are discussed.

Guido Boffetta
University of Torino

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