
Description of turbulent dynamics in the interstellar medium: multifractal/microcanonical analysis.

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Abstract

We present a self-contained introduction to the multifractal formalism in a microcanonical version which allows for an improved computation of turbulence characteristic parameters in a single observational map of the ISM. We also introduce the computation of the singularity exponents and the singularity spectrum and compare to magnetohydrodynamic simulations, which include key parameters to describe turbulence in the ISM. Studying the 250 μ -m Herschel map of the Musca filament reveals the signature of a multiplicative cascade with a clear inertial range from 0.05 to 0.65 pc. An important result of this presentation is that sub-regions in Musca show different multifractal properties. We suggest a role of the filamentary structure in Musca. The difference in turbulent behavior strongly suggests that different types of dynamics exist inside the Musca cloud.

Keywords: ISM: structure, ISM: individual objects: Musca, Turbulence, ISM: clouds, magnetohydrodynamics

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