STATISTICAL ANALYSIS OF PSEUDO-LOCAL PROPERTIES IN TURBULENT SPACE PLASMAS USING 3D NUMERICAL SIMULATIONS

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Abstract:

In-situ measurements of space plasma have shown a turbulent cascade transporting the energy injected at the magnetohydrodynamic (MHD) scales towards the dissipative scales [1,2], through the inertial range. This medium is characterized by its low inter-particles collisions rate, and it has been extensively studied in the last decades. However, the physics of the dissipative mechanisms present at these small scales, and the different dissipation processes triggered by them, are still a matter of research [2]. In recent years, direct numerical simulations, where novel statistical analysis and models can easily be tested, have been a valuable support to satellites and spacecraft observations. In this work, we present the first pseudo-local analysis, using the Local Energy Transfer (LET) proxy [3], in a three-dimensional direct numerical simulation of a quasi-turbulent plasma. The scale-by-scale properties of the different "energy" channels are estimated using the LET parameter, which is based on the third order moment scale law for Hall-MHD. The isolated structures found in this study could be interpreted as manifestations of intermittence localized at turbulent dissipation locations. Finally, a comparison with recent results, from a 2D turbulent case-of-study, presented in [4] is discussed.

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