

Abstract Submitted
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The cascade of energy in homogeneous turbulence: a 5D approach¹ JOSE CARDESA-DUENAS, ALBERTO VELA-MARTIN, JAVIER JIMENEZ, Univ Politecnica de Madrid — The inherent multi-dimensional nature of the turbulent cascade is a major challenge to its study. In order to characterize a process occurring in space, time and scale, we present a new approach where we track coherent structures representing energy in different scales from a time-resolved simulation of isotropic turbulence lasting 66 large-eddy turnovers. We couple the dynamics at different scales by computing the geometric intersection between individual coherent structures from any two scales. Statistically, we find that eddies at scale r intersect those at scales $2r$ and $r/2$ preferentially at the beginning and at the end of their life, respectively. With our simulation at $Re_\lambda = 315$, we could check this trend to hold for r values spanning a ratio of 8. We thus report on 4 generations of eddies that trace the transfer of energy from scale $8r$ to scale r via intermediate steps through a scale-local, spatially-localized process. We found the geometric intersection between scales separated by ratios of 4 or larger to be of the same order of magnitude as the random intersection levels found for those scale combinations.

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