

Abstract Submitted  
for the DFD16 Meeting of  
The American Physical Society

**Time tracking and interaction of energy-eddies at different scales<sup>1</sup>**

JOSE I. CARDESA, ALBERTO VELA-MARTIN, JAVIER JIMENEZ, Technical University of Madrid — We study the energy cascade through coherent structures obtained in time-resolved simulations of incompressible, statistically steady isotropic turbulence. The structures are defined as geometrically connected regions of the flow with high kinetic energy. We compute the latter by band-pass filtering the velocity field around a scale  $r$ . We analyse the dynamics of structures extracted with different  $r$ , which are a proxy for eddies containing energy at those  $r$ . We find that the size of these “energy-eddies” scales with  $r$ , while their lifetime scales with the local eddy-turnover  $r^{2/3}\epsilon^{-1/3}$ , where  $\epsilon$  is the energy dissipation averaged over all space and time. Furthermore, a statistical analysis over the lives of the eddies shows a slight predominance of the splitting over the merging process. When we isolate the eddies which do not interact with other eddies of the same scale, we observe a parent-child dependence by which, on average, structures are born at scale  $r$  during the decaying part of the life of a structure at scale  $r' > r$ . The energy-eddy at  $r'$  lives in the same region of space as that at  $r$ . Finally, we investigate how interactions between eddies at the same scale are echoed across other scales.

<sup>1</sup>Funded by the ERC project Coturb

Jose I. Cardesa  
Technical University of Madrid

Date submitted: 28 Jul 2016

Electronic form version 1.4