Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

The structure of energy transfer in homogeneous turbulence[1]
JOSE I. CARDESA, ALBERTO VELA-MARTIN, ADRIAN LOZANO-DURAN, JAVIER JIMENEZ, Universidad Politecnica de Madrid — The filtering approach to scale decomposition in physical space leads to several energy evolution equations in incompressible flows. By comparing the statistics of the different inter-scale energy transfer terms that arise, we choose a novel optimal expression for the energy transfer which exhibits large-scale independence of the ratio of forward to backward energy flux, in addition to a milder filter-width dependence of this ratio than the classical subgrid-scale dissipation. We study the flow regions of intense energy transfer between resolved and subgrid scales from a geometrical point of view, to gain insight into the mechanism by which a predominant forward energy cascade is obtained in homogeneous 3D turbulence. The concept of length scale becomes a difficulty with this approach, because both a filter width r and an object size L are present. We show that with our energy transfer marker, L depends on r only to the extent that two regimes are observed: one above and one below $r \approx 30\eta$, where η is the Kolmogorov length scale. Such a clear distinction is not observed with the usual expression for the subgrid-scale dissipation.

[1]Funded by the ERC project Multiflow

J.I. Cardesa-Duenas
Universidad Politecnica de Madrid

Date submitted: 28 Jul 2015 Electronic form version 1.4