SPECIAL MMM/RAL/GTP JOINT SEMINAR

Unsteady Turbulence Cascades and Dissipation

J. Christos Vassilicos

Department of Aeronautics, Imperial College London

Turbulence energy transfer through length scales is arguably one of the most central and important processes in turbulent flows. Much of turbulence theory and modelling over the past 70 years has been based on the Kolmogorov (1941) stationary/equilibrium cascade which implies a particular well-known scaling of the turbulence dissipation rate. However, accumulating evidence from laboratory experiments and, more recently, numerical simulations is pointing at a very different, non-equilibrium, turbulence dissipation scaling in important extended regions of various turbulent flows. There are consequences for turbulent shear flows such as self-similar turbulent wakes and jets because their growth rates are closely linked to the centerline turbulence dissipation scaling. These consequences include new turbulent mean flow scalings with streamwise distance, and consequences concerning entrainment and even the local entrainment velocity of the turbulent/non-turbulent interface. Direct numerical simulations of unsteady periodic turbulence show how non-equilibrium turbulence dissipation scalings are related to unsteady interscale energy transfer processes. Different dissipation scalings result from different types of unsteady interscale energy transfers. Large scale coherent structures seem to be playing an important role in the case where unsteady interscale energy transfers dictate an apparently universal dissipation scaling which has an explicit dependence on inlet conditions.

Thursday, 11 April 2019, 3:30pm

Refreshments 3:15pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane, FL2-1022, Large Auditorium

This seminar will be webcast live at:
http://ucarconnect.ucar.edu/live

Recorded seminar link can be viewed here:
https://www.mmm.ucar.edu/events/seminars