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Scale-by-scale energy transfer in the production region of a fractal grid RAFAEL GOMES FERNANDES, Imperial College London, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton, CHRISTOS VASSILICOS, Imperial College London — An experimental study of turbulence generated by low-blockage space-filling fractal square grids was performed using time-resolved Particle Image Velocimetry in a water tunnel. Scale-by-scale energy transfer is computed using the transport equation of the second order structure function for inhomogeneous flows. The balance of each of the equation terms is presented. In some particular locations in the production region, the map of the radial divergence of the energy flux shows an upward energy transfer in the direction of the mean flow and downwards in the perpendicular direction. In these locations, the energy spectra already exhibits a well-defined -5/3 power law over more than one decade; and the third order structure function of the velocity component parallel to the mean flow, evaluated in that direction at the centerline, has a positive sign throughout the range of scales dominated by the -5/3 scaling. Any velocity derivative checks of small-scale isotropy available to us indicate that the small-scales are indeed isotropic in these locations.

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