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Comparison of fractal and classical grids with the same blockage R. JASON HEARST, PHILIPPE LAVOIE, Univ of Toronto — Recently, the field of canonical grid turbulence has been reenergized by measurements in the wake of fractal grids. Fractals have produced turbulence that decays more rapidly than traditional grid turbulence experiments. In addition, in the wake of fractals, the normalized dissipation scaling, C_ϵ, appears to grow rapidly, in sharp contrast with traditional expectations that $C_\epsilon \sim$ constant. In the present study, we compare a square-fractal-element grid, composed of a 12×8 mesh of small square fractal elements, to two regular grids with the same blockage, and similar mesh lengths and thicknesses. The same grid Reynolds number is used so that the results in the wake of the grids are comparable. We also employ a secondary contraction to marginalize anisotropy as a contributing factor to differences in the decay. Ultimately, we demonstrate that in the far-field the turbulence produced by all three grids is similar. However, the development region in the wake of the fractal is extended relative to the classical grids. One of the major conclusions of the present study is that certain classical grid configurations are able to produce higher turbulence intensities and Reynolds number than a fractal for the same blockage.

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