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Structure and scale interaction in anisotropic homogeneous turbulence DOUGLAS CARTER, FILIPPO COLETTI, University of Minnesota — The structure and dynamics of anisotropic turbulence have mostly been investigated in shear flows. Here we use particle image velocimetry (PIV) to investigate anisotropic homogeneous turbulence with negligible mean shear, generated by two facing planar jet arrays. The homogeneous region is much larger than the integral scales, which allow for the natural development of the Richardson-Kolmogorov cascade. Moreover, with respect to advective flows with large mean velocity, the zero-mean-flow condition effectively enhances the dynamic range of the PIV turbulent fluctuation measurements. We obtain high-order statistics along directions parallel and normal to the jet axis, as well as in arbitrary directions within the plane of measurement. Up to the considered Reynolds numbers of 500 (based on the Taylor microscale), we find evidence of anisotropy extending throughout the inertial scales and down to the dissipative scales. In addition, we investigate the scale-to-scale energy transfer utilizing the generalized Karman-Howarth equation. We explore the correlation between large-scale and small-scale velocity fluctuations, which has been recently highlighted in shear flows, and the footprint of the multi-scale anisotropy on the topology of high-dissipation and high-enstrophy regions.

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