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Return to isotropy in high Reynolds number turbulent shear flow
CHERYL KLIPP, US Army Research Laboratory — Given that turbulence decays from large scales to smaller scales, and that large scales are anisotropic and the smallest scales are isotropic, can the results of return to isotropy experiments be applied to the cascade of turbulence from large scales to small scales? If energy is added to the system only at larger scales, then probably yes. For atmospheric flow over relatively open and flat terrain (Kansas), the 'decay' of turbulence progresses from fairly anisotropic at the large scales (maximum turbulent kinetic energy) toward pure isotropy at smaller scales via pancake-like axisymmetry. The smallest scale resolvable by the instrumentation is on the order of 1m, so dissipation scales are not evaluated. The flows with cigar-like axisymmetry occur inside an urban canyon. In these cases it is not clear if turbulence is generated at only the maximum turbulent kinetic energy scale. The turbulence at larger scales possesses a strong cigar-like axisymmetry, but can often progress to pancake-like axisymmetry at smaller scales.

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