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A probability distribution approach to synthetic turbulence time series MICHAEL SINHUBER, Stanford University, EBERHARD BODENSCHATZ, MICHAEL WILCZEK, Max Planck Institute for Dynamics and Self-Organization — The statistical features of turbulence can be described in terms of multi-point probability density functions (PDFs). The complexity of these statistical objects increases rapidly with the number of points. This raises the question of how much information has to be incorporated into statistical models of turbulence to capture essential features such as inertial-range scaling and intermittency. Using high Reynolds number hot-wire data obtained at the Variable Density Turbulence Tunnel at the Max Planck Institute for Dynamics and Self-Organization, we establish a PDF-based approach on generating synthetic time series that reproduce those features. To do this, we measure three-point conditional PDFs from the experimental data and use an adaption-rejection method to draw random velocities from this distribution to produce synthetic time series. Analyzing these synthetic time series, we find that time series based on even low-dimensional conditional PDFs already capture some essential features of real turbulent flows.

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