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Statistical unfolding of atmospheric turbulence ALLAN MORALES, PATRICK MILLAN, JOACHIM PEINKE, ForWind-University of Oldenburg, TWIST-FORWIND TEAM — Intermittent statistics, higher probability of extreme events in comparison to Gaussian statistics, is one of the trademarks of homogeneous isotropic turbulence (HIT). In the atmosphere, wind speed increments' probability density functions (PDFs) remain intermittent for a broader range of temporal and spatial scales. Moreover, wind speed fluctuations from the mean are intermittent for wind time series, which is not the case for HIT. In this work we revisit some features behind HIT with a free stream experiment and compare the results with those coming from atmospheric time series. We validate the idea that, within the inertial range, intermittency is coming from the randomness of the energy transfer rate. With a formulation, due to Castaing, based on Kolmogorov 62 (K62) we model increments' PDFs for packages of HIT in the atmosphere. With this knowledge and the observation that in the atmosphere not only the mean wind speed is non-stationary but also the turbulent kinetic energy, we are able to clearly identify two sources of intermittency in wind. We build a general model for modeling atmospheric turbulence statistics. Our model encapsulates mesoscale fluctuations, whereas high frequency turbulence can be treated and modeled with the full machinery developed in laboratory turbulence, in our case K62. We elaborate in the implications and utility of this work for Wind Energy.

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