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Exciting atmospheric turbulence on lab-scales by an active grid LARS NEUHAUS, MICHAEL HÖLLING, University of Oldenburg, WOUTER J.T. BOS, Université de Lyon, JOACHIM PEINKE, University of Oldenburg — Wind tunnel investigations are an important tool for studying flow phenomena and effects on different objects. Therefore, it is crucial to create realistic turbulence in the wind tunnel. Atmospheric turbulence is known to exhibit large integral scales and Reynolds numbers, which are hard to reproduce in a wind tunnel. In this investigation turbulence is generated by an active grid. The active grid shafts are driven by a stochastic process, which is keeping the global blockage constant. The flow is additionally excited by a dynamic variation of the wind tunnel fan speed (also based on a stochastic process). This broad band excitation allows for the generation of a longitudinal integral length scale much larger than the transverse dimension of the wind tunnel (>100m) and a four-decade inertial range. The generated turbulence behaves like a slice cut out of a much-larger-scale turbulence. Even though deviations occur on the large scales, on the small scales both longitudinal and transversal components behave in the same way and as if both are part of the same turbulent flow, forced at very large scales. The integral-scale Reynolds number measured in the flow is of the order of $2.2 \cdot 10^7$, thereby allowing for investigations under realistic atmospheric-like conditions.

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