Abstract Submitted
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Onset of spatio temporal disorder described by directed percolation[1] TOM WESTER, DOMINIK TRAPHAN, GERD GLKER, JOACHIM PEINKE, ForWind - Center for Wind Energy Research, Institute of Physics, University of Oldenburg, Germany, AG TWIST TEAM — The energy transport and mixing behavior of a fluid strongly depends on the state of the flow. These properties change drastically if the flow changes from laminar to turbulent state. This transition is a very complex and highly unsteady phenomenon, which is not fully understood up to now. The biggest problem is the characterization of the onset of spatio temporal disorder. This means that turbulent spots in the flow field irregularly spread or decay on their way downstream. In this presentation we will show that this critical behavior of turbulent spreading in the flow can be described by the directed percolation model. This approach was already used for a transitive channel flow, pipe flows or different couette flows. The charm of this model is the complete characterization of the whole transition with only a few unique exponents. In contrast to the majority of previous studies, the underlying data base of this study is acquired experimentally by high-speed Particle Image Velocimetry. Thus the evolving flow can be captured in a highly resolved spatio-temporal manner. In this way it is easily possible to determine the critical exponents which describe the transient area between laminar and turbulent flow. The results will be presented and compared to theoretical expectations.

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