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The onset of turbulence in channel flow BJORN HOF, VASUDEVAN MUKUND, CHAITANYA PARANJAPE, PHILIP SITTE, Institute of Science and Technology Austria — In channel flow turbulence arises at Reynolds numbers where the laminar state is linearly stable. In order to define the critical point where turbulence first becomes sustained we identify the growth and decay processes of individual turbulent stripes in experiments. As shown, the critical point is reached when the (continuous) entrainment of laminar fluid at the stripes downstream tip outweighs the(stochastic) shedding of turbulence at their upstream tip. For growing stripes, the probability to collapse decreases while the probability to split increases in time. Consequently, neither collapse nor splitting are memoryless and unlike in pipes and unlike in directed percolation, the contamination rate changes in time. The coupling between the growth of individual stripes and the creation of new stripes leads to a significantly lower critical point than most earlier studies suggest.

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