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Interactions and "puff clustering" close to the critical point in pipe flow MUKUND VASUDEVAN, BJÖRN HOF, Institute of Science and Technology Austria — The first turbulent structures to arise in pipe flow are puffs. Albeit transient in nature, their spreading determines if eventually turbulence becomes sustained. Due to the extremely long time scales involved in these processes it is virtually impossible to directly observe the transition and the flow patterns that are eventually assumed in the long time limit. We present a new experimental approach where, based on the memoryless nature of turbulent puffs, we continuously recreate the flow pattern exiting the pipe. These periodic boundary conditions enable us to show that the flow pattern eventually settles to a statistically steady state. While our study confirms the value of the critical point of $Re_c \approx 2040$, the flow fields show that puffs interact over longer ranges than previously suspected. As a consequence puffs tend to cluster and these regions of large puff densities travel across the puff pattern in a wave like fashion. While transition in Couette flow has been shown to fall into the "directed percolation", pipe flow may be more complicated since long range interactions are prohibited for the percolation transition type. Extensive measurements at the critical point will be presented to clarify the nature of the transition.

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