

Abstract Submitted
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Dynamics of Coherent Structures in Localized Turbulence in a Pipe JERRY WESTERWEEL, DIRK-JAN KUIK, Delft University of Technology — The transition to turbulence in pipe flow is still not completely understood. Recently it was shown that localized turbulent structures (puffs) can survive for hundreds of pipe diameters (or integral time scales) and then suddenly disintegrate. Questions that emerge are: Why is the turbulence localized? What mechanism is required for puffs to sustain itself? What changes in the structure of a puff when it suddenly decays? For the investigation a high resolution DNS is used. The high resolution is required to resolve the localized high energy peaks, which were observed in earlier experimental investigations. We use a stereoscopic planar PIV measurement as initial condition for the DNS and continued the time evolution at $Re=1900$. The first observation is that the velocity of the structures is higher than the bulk velocity at $Re=1900$ as opposed to the $Re=2500$ case, which is in agreement with experimental observations. The peaks in in-plane kinetic energy are reproduced in the DNS, and can be associated with hair-pin vortices.

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