Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Growth of finite amplitude disturbances in pipe flow with sudden expansion SHUN ISHIZAKA, Laboratory for Flow Control, Division of Energy and Environmental Systems, School of Engineering, Hokkaido University, BENOT LEBON, JORGE PEIXINHO, Laboratoire Ondes et Milieux complexes, UMR CNRS 6294, YUJI TASAKA, YUICHI MURAI, Laboratory for Flow Control, Division of Energy and Environmental Systems, School of Engineering, Hokkaido University — Visualizations of the flow in circular pipe with a sudden expansion with subcritical transition were performed using reflective flakes and dye to elucidate growth of finite amplitude disturbances. At five inlet pipe diameters upstream of the expansion, disturbances were introduced through a small hole from the pipe wall in the form of a continuous jet or an alternation of injection and suction. Localized turbulent patches formed when the disturbance amplitude exceeded a critical value of the control parameter depending on the Reynolds numbers. For the crossflow jet, the duration of turbulent patches at fixed downstream point is related to the velocity ratio of the mean jet velocity to the bulk velocity. By injection disturbances with velocity of around 30% of main flow, turbulent patches formed intermittently and a response delay of the patch formation was observed. For synthetic jet, turbulent patches are formed depending on the driving frequency, which is around 1 Hz. The synthetic jet initiates turbulent patches through the growth of a wavy disturbance in the flow, that amplifies and breaks, further downstream than in the cases of the crossflow jet. Overall, these results suggest the existence of different mechanisms for the development of turbulent patches

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Date submitted: 01 Aug 2017 Electronic form version 1.4