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Turbulent Kinetic Energy Budgets in a Planar Channel with a Sudden Expansion and Transverse Jets NIMA MOALLEMI, PhD Student, School of Engineering, The University of British Columbia-Okanagan campus, Canada, LUCA CHIAB, Graduate Student, Instituto Universitario de Matematica Pura y Aplicada, Universitat Politecnica de Valencia, Valencia, Spain, SERGIO HOYAS, Associate Professor, Instituto Universitario de Matematica Pura y Aplicada, Universitat Politecnica de Valencia, Valencia, Spain, JOSHUA BRINKERHOFF, Assistant Professor, School of Engineering, The University of British Columbia-Okanagan campus, Canada — Numerical simulations are performed to analyze the development of a planar channel flow through a sudden expansion with transverse jets. The budgets of turbulent kinetic energy (TKE) have been computed downstream of the transverse jets at various velocity ratios. At low velocity ratios, a bifurcation phenomena occurs due to the asymmetric growth of disturbances from the sudden expansion, leading to asymmetry in the reattachment lengths on the upper and lower channel walls. Increasing the velocity ratio causes first a disappearance of bifurcation and then the development of localized turbulence. TKE budgets show that the localized turbulent region experiences high negative production of turbulence energy with two peaks adjacent to the mean trajectory of the transverse jets, resulting in a gradual relaminarization of the turbulent flow. The pressure transport and turbulent diffusion terms are found to dominate the relaminarization process. Validation of the numerical simulations is achieved via comparison with numerical and experimental data available in the literature.

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