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Large-eddy simulations of turbulent plane and radial wall-jets
RAYHANEH BANYASSADY, UGO PIOMELLI, Queen's University — Large-eddy simulations of turbulent plane and radial wall-jets were conducted at different Reynolds numbers. The results were validated with the available experimental data. The radial wall-jets decay faster compared to the plane ones, due to the extra expansion in the azimuthal direction. This causes the pressure-gradient distributions to be different in radial and plane wall-jets (e.g. the inner layer in the plane case is under a favorable pressure-gradient, while in the radial case it subjected to an adverse pressure-gradient). However, these pressure gradients are not strong enough to cause any structural difference between plane and radial wall-jets. In both cases, the local Reynolds number (based on the local maximum velocity and local boundary-layer thickness) is an important determining factor in characterization of the flow. The joint probability-density function analysis shows that the local Reynolds number determines the level of intrusion of the outer layer into the inner layer: the lower the local Reynolds number the stronger is the interaction of inner and outer layers. These results were used to clarify some of the observations reported in literature; as an example the scatter of the reported log-law constants can be explained using the above-mentioned results.

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