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Interaction of Inflow Jet and Flow Recirculation in Large Mixing Tanks MARKUS VAAS, Institute for Hydromechanics, Karlsruhe Institute of Technology, EMMA THOMPSON, University of Guelph, JOCHEN KRIEGSEIS, Institute of Fluid Mechanics, Karlsruhe Institute of Technology — Jet inflow into a confined box-shaped domain (tank) can induce a slow, stable recirculation flow. Once developed, these large scale structures compete with the spatial distribution of the inflow jet. The objective of the present work is to understand the underlying mechanisms which lead to this interaction/competition of the respective flow patterns. Particular emphasis is placed on the jet's self-similarity and its axial velocity decay, since both are of prime importance for the resulting entrainment along the jet borders and the overall mixing efficiency in the tank. Particle image velocimetry (PIV) measurements have been performed in a tank with turbulent inflow jets of varying jet Reynolds numbers. Coherent large-scale structures superimposed to the aforementioned mean flow fields were identified by means of proper orthogonal decomposition (POD). As such, both the meandering character of the jet core as well as fluctuating patterns of the recirculation zone have been identified. The impact of the confinement is demonstrated by a direct comparison of the POD results with the most salient free-jet patterns. Based on these insights, implications for entrainment and mixing stemming from the interaction of the jet and the recirculating flow are discussed.

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