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Oil-Water Flow Investigations using Planar-Laser Induced Fluorescence and Particle Velocimetry[1] ROBERTO IBARRA, OMAR K. MATAR, CHRISTOS N. MARKIDES, Imperial College London — The study of the complex behaviour of immiscible liquid-liquid flow in pipes requires the implementation of advanced measurement techniques in order to extract detailed in situ information. Laser-based diagnostic techniques allow the extraction of high-resolution space- and time resolve phase and velocity information, which aims to improve the fundamental understanding of these flows and to validate closure relations for advanced multiphase flow models. This work shows a novel simultaneous planar-laser induced fluorescence and particle velocimetry in stratified oil-water flows using two laser light sheets at two different wavelengths for fluids with different refractive indices at horizontal and upward pipe inclinations ($<5^\circ$) in stratified flow conditions (i.e. separated layers). Complex flow structures are extracted from 2-D instantaneous velocity fields, which are strongly dependent on the pipe inclination at low velocities. The analysis of mean wall-normal velocity profiles and velocity fluctuations suggests the presence of single- and counter-rotating vortices in the azimuthal direction, especially in the oil layer, which can be attributed to the influence of the interfacial waves.

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Omar Matar
Imperial College London

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