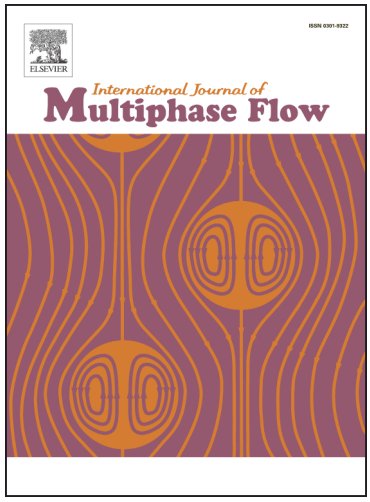

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An Experimental Characterization of Liquid Films in Downwards Co-Current Gas-Liquid Annular Flow by Particle Image and Tracking Velocimetry

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Abstract

The hydrodynamics of downwards gas-liquid annular flows and falling films in a pipe were studied experimentally using simultaneous planar laser-induced fluorescence and a combination of particle image and particle tracking velocimetry techniques. The investigated conditions covered the range of liquid and gas Reynolds numbers: $Re_{\mathrm{L}} = 306 - 1\,532$ and $Re_{\mathrm{G}} = 0 - 84\,600$. The results presented in this paper concern: (i) information on the local and instantaneous velocity fields underneath the interfacial waves and the appearance of recirculation zones within the liquid films under certain conditions, and (ii) mean velocity, velocity fluctuation rms and kinetic energy profiles within the liquid films. The results indicate that large waves contain multiple recirculation zones, which may play an important role in the gas and

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