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Wave Structure and Velocity Profiles in Downwards Gas-Liquid Annular Flows IVAN ZADRAZIL, GEOFF HEWITT, OMAR MATAR, CHRISTOS MARKIDES, Imperial College London — A downwards flow of gas in the core of a vertical pipe, and of liquid in the annulus between the pipe wall and the gas phase is referred to as a "downwards annular flow" (DAF). DAFs are conventionally described in terms of short-lived, small-amplitude "ripples," and large-amplitude, high-speed "disturbances." We use a combination of Laser Induced Fluorescence (LIF), Particle Image and Tracking Velocimetry (PIV, PTV) to study DAFs. We demonstrate through these techniques that the liquid films become progressively more complex with increasing liquid Reynolds number (ReL), while a similar increase of complexity is observed for increasing gas Reynolds number (ReG). Disturbance waves are observed for low and high ReL, and ripples for intermediate ReL. Additionally, a high degree of rolling breakdown of disturbance waves is observed in falling films at the highest ReL, which is a source of bubble entrainment into the film body. Our results will comprise: (i) statistical data on film thickness, and (ii) wave frequency, velocity, wavelength. In addition, a qualitative (e.g. re-circulation zones) and quantitative (e.g. mean/rms velocity profiles) velocity characterisation of the film flows will be presented.

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