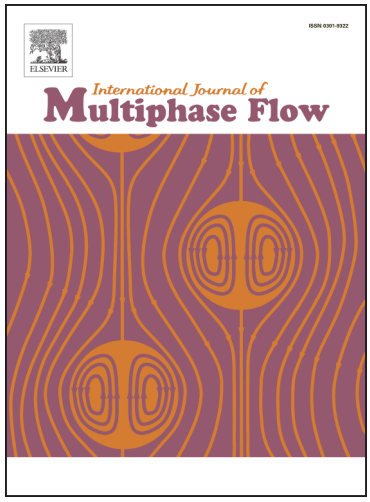

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The existence and behaviour of large diameter Taylor bubbles

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Abstract

Large tube filling bubbles rising up through quiescent fluid in a vertical tube are commonly known as Taylor bubbles. Their apparent simplicity of form and behaviour has led to them being viewed and modelled as a paradigm for both large bubble dynamics, where there is no continuous gas flow, and slug flow for the case of continuous gas flow. Central to this approach is the question: what diameter tubes support stable Taylor bubbles? In this paper we examine the case of low viscosity Taylor bubbles through experiments and theory and show that they exist in much wider diameter tubes than had previously been reported. In order for the bubbles to be stable a settling period is required to allow the column to sufficiently quiesce. This settling period is compared favourably with the classical stability analysis of Batchelor (1987). We also observe such bubbles rising in an oscillatory manner if the gas input is abruptly curtailed. The oscillations match theoretical predictions well.

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