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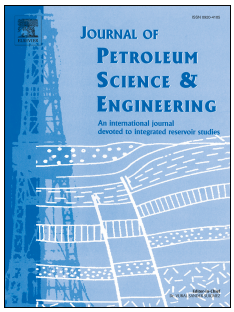

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Slug flow models: feasible domain and sensitivity to input distributions

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Abstract

The present work discusses the feasible and validity domains of unit-cell slug models. The models of Dukler and Hubbard (Ind. Eng. Chem. Fund. 14(4): 337–347, 1975) and Orell (Chem. Eng. Sci. 60(5):1371–1381, 2005) are particularly considered as reference models, for they are based on distinct formulation hypotheses. A parameter sensitivity analysis is also carried out to assess the uncertainty in predicted slug length distributions. The work further discusses a kinematic methodology for the estimation of slug length distributions, a problem of great interest in the design and determination of the operational conditions of gas-liquid separators. The results are validated through new experiments and the data of Ujang et al. (Int. J. Multiphase Flow 32(5): 527–552, 2006). The new experiments introduce data (including the pdf distributions) on pressure gradients, bubble lengths, passage frequency and translational velocity of bubbles. Particle image velocimetry measurements furnish the local mean velocity profiles in the continuous phase of the liquid slug and film.

Keywords: Horizontal Slug Flow, Feasible Domain, Sensitivity Analysis, Unity Cell

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