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Implementation of Drift-Flux Correlations in ARTIST and its Assessment in Comparison with THETIS Void Distribution

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Abstract

Non-homogeneous, non-equilibrium drift-flux model was developed in ARTIST code to enhance capability of predicting two-phase flow void distribution at low pressure and low flow conditions. The governing equations of ARTIST code consist of three continuity equations (mixture, liquid, and noncondensibles), two energy equations (gas and mixture) and one mixture momentum equation constituted with the drift-flux model. In order to provide the *Co* and the *Vgj* of drift-flux model, four drift-flux correlations, which are Chexal-Lellouche, Ohkawa-Lahey, GE Ramp and Dix models, are implemented. In order to evaluate the accuracy of the drift flux correlations, the steady state void distributions of the THETIS boil-off tests are simulated. The results show that the drift-flux model is quite satisfactory in terms of accuracy and computational efficiency. Among the four drift-flux correlations, the Chexal-Lellouche model showed wide applicability in the prediction of void fraction from low to high pressure condition. Especially, the axial void distribution at low pressure and low flow is far better than those of both the two-fluid model of RELAP5/MOD3 code and the homogeneous model. Thus, the drift-flux model of the ARTIST code can be used as an efficient tool in predicting the void distribution of two-phase flow at low pressure and low flow conditions.