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Choking flow modeling with mechanical and thermal non-equilibrium. (English)

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Summary: The mechanistic model, which considers the mechanical and thermal non-equilibrium, is described for two-phase choking flow. The choking mass flux is obtained from the momentum equation with the definition of choking. The key parameter for the mechanical non-equilibrium is a slip ratio. The dependent parameters for the slip ratio are identified. In this research, the slip ratio which is defined in the drift flux model is used to identify the impact parameters on the slip ratio. Because the slip ratio in the drift flux model is related to the distribution parameter and drift velocity, the adequate correlations depending on the flow regime are introduced in this study. For the thermal non-equilibrium, the model is developed with bubble conduction time and Bernoulli choking model. In case of highly subcooled water compared to the inlet pressure, the Bernoulli choking model using the pressure undershoot is used because there is no bubble generation in the test section. When the phase change happens inside the test section, two-phase choking model with relaxation time calculates the choking mass flux. According to the comparison of model prediction with experimental data shows good agreement. The developed model shows good prediction in both low and high pressure ranges.

MSC:

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choking mass flux; mechanical non-equilibrium; thermal non-equilibrium; slip ratio; relaxation

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