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Single-pressure and multi-pressure models for multiphase flows DUAN ZHANG, BRIAN VANDERHEYDEN, QISU ZOU, NELY PADIAL-COLLINS, LANL — In many multiphase flow models, only one pressure appears in the momentum equations for all the phases. For disperse multiphase flows, this pressure is usually chosen to be the pressure of the continuous phase. The pressure of the disperse phase is simply related to the pressure of the continuous phase by, for instances, adding surface tension. We refer to these types of multiphase flow models as single pressure models. While these types of models have been proven successful in many computations of disperse two-phase flows, they encounters conceptual difficulties when applied to continuous multiphase flows. For instance, the single pressure model cannot be used to study the tension break of a sponge with interconnected pores because the air in the pores of the sponge can never go into tension, while the sponge material can never break under compression. To avoid these conceptual difficulties, a multi-pressure model is introduced by analyzing assumptions related to the single pressure model. It is found that the applicability of the single pressure model relies on the validity of the small particle approximation. When the length scale of the "disperse phase" is comparable to the length scale of the flow, the small particle approximation fails and so does the single pressure model. Physical and numerical aspects of the multi-pressure model are discussed. Examples calculated using the multi-pressure model are presented. *Work carried out under the auspices of U.S. DOE.

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