

Some Accuracy Related Aspects in Two-Fluid Hydrodynamic Sub-Grid Modeling of Gas-Solid Riser Flows

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Abstract : Sub-grid closures for filtered two-fluid models (FTFM) useful in large scale simulations (LSS) of riser flows can be derived from highly resolved simulations (HRS) with microscopic two-fluid modeling (mTFM). Accurate sub-grid closures require accurate mTFM formulations as well as accurate correlation of relevant filtered parameters to suitable independent variables. This article deals with both of those issues. The accuracy of mTFM is touched by assessing the impact of gas sub-grid turbulence over HRS filtered predictions. A gas turbulence alike effect is artificially inserted by means of a stochastic forcing procedure implemented in the physical space over the momentum conservation equation of the gas phase. The correlation issue is touched by introducing a three-filtered variable correlation analysis (three-marker analysis) performed under a variety of different macro-scale conditions typical of risers. While the more elaborated correlation procedure clearly improved accuracy, accounting for gas sub-grid turbulence had no significant impact over predictions.

Keywords : fluidization, gas-particle flow, two-fluid model, sub-grid models, filtered closures

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