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Impact of Volume Fraction Evolution on the Mathematical Model for Multiphase Flow THOMAS MCGRATH, IHDIV NSWC — A major challenge in multiphase flow modeling is describing the evolution of volume of each constituent in the flow. Volume, or volume fraction, arises as an independent variable in multiphase models not rigidly applying pressure equilibrium, necessitating a separate evolutionary equation for closure. While many existing models adopt the dynamic compaction equation proposed by Baer & Nunziato, this equation is non-unique and may not be physically accurate. In this work, an extended version of the dynamic compaction equation is investigated in the context of a two-phase flow consisting one continuous and one dispersed (particulate) phase. The extended version includes an additional term based on the divergence of the dispersed phase; this allows the behavior of the dispersed phase to range from incompressible to fully-compressible. The governing equations are presented, and a characteristic analysis is performed. Results indicate that the form of the volume fraction equation has a significant impact on the mathematical characteristics of the governing equations.

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