Modelling relaxation source terms in two-phase flows

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Compressible two-phase flows occur in several natural phenomena and are of interest for many industrial applications (impinging jets, jet atomizations,...). The Baer-Nunziato multi-fluid model allows to accurately model these flows. The model allows the phases to be out of thermo-mechanical equilibrium and is endowed with relaxation sources terms driving the system towards equilibrium. A hierarchy of sub-models has been derived assuming some of the relaxation processes to be infinitely fast. This has also given rise to several numerical strategies where the hyperbolic part of the system and the relaxation source terms are split. After the hyperbolic step, the relaxation terms are then applied in the limit of instantaneous relaxations, effectively turning them into projection operators on some equilibrium manifold.
In this talk, we will discuss the different instantaneous relaxation processes and analyse the resulting numerical schemes. Main focus will be given to instantaneous pressure relaxations for which effect of the relaxation parameters on the convergence and stability of the schemes will be detailed, these results will then be compared to instantaneous pressure-temperature relaxation schemes.

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