A low Mach number model for moist convection

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In the series of papers starting with Almgren et al 2006 [1], a sound-filtering low Mach number model with source terms and compositional changes for Supernovae is developed. Motivated by this work we aim to create a similar low Mach number model for moist convection. To date, most sound-filtering moist convection models use the anaelastic approximation which is only valid for small density variations. Whereas our model correctly captures incompressible flows with large density variations and is therefore more generally applicable, as shown in Achatz et al 2010 [2].
To make the transition from astrophysics to meteorology we utilise the moist convection model in Bannon 2002 [3]. Then to implement the model numerically we are incorporating it into an finite volume code for low Mach number flow. Details of the numerics can be found in Klein 2009 [4].
The model will be verified against the bench-mark test case given in Bryan and Fritsch 2002 [5]. Once our model is verified against this ideal case we would like to develop it further by incorporating precipitation, more complicated microphysics and thermodynamcics, using LES to model the turbulence of deep precipitation and of the convective boundary layers and also developing the code to model squall lines.

References

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