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1D and 2D Benchmark of Two phase flow In Geodynamics

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It has long been recognized that the arc volcanism is directly related to the slab dehydration and water is necessary to explain the low temperature melting of the mantle wedge and possibly of the subducting oceanic crust and the composition of arc magma. To better understand the dynamics of geophysical fluid viz. water, melts in the mantle wedge related to subduction zone, we have developed a numerical model for two-phase flow which takes into account the effects of compaction of the matrix.

In this numerical model, we solve mass and momentum conservation equations of matrix and of fluid following the formulation of Bercovici et al. (2001) using potential formulation of velocities of matrix and fluid. We use several numerical schemes that are Finite Difference (FD) method, Direct Solver method using band diagonal system of matrices to solve potential equations, Multidimensional Positive Definite Advection Transport Algorithm (MPDATA) scheme [Smolarkiewicz et al. (1998)] to solve advection equation i.e. mass conservation equation.

We have benchmarked our code in 1D and 2D by comparing it with semi analytical solution [Richard et al.(2011)] under variable (porosity dependent) and constant bulk viscosity respectively.

Here we present the formulation of our code and the results.

References

Bercovici, D., Ricard, Y., and Schubert, G. (2001). A two-phase model of compaction and damage, 1. general theory. J. Geophys. Res., 106(B5):8887-8906.

Smolarkiewicz, P. K. and Margolin, L. G. (1998). Mpdata: a finite-difference solver for geophysical flows. J. Comput. Phys., 140(2):459-480.

Richard, G., Kanjilal, S. and Schmeling, H. (2012). Solitary-wave in geophysical two-phase media : a semi analytical solution, submitted to PEPI