AGU FALL MEETING
San Francisco | 12–16 December 2016

T23C-2950: A Volume-of-Fluid Interface Tracking Method for Modelling the Advection of Compositional Fields with Sharp Boundaries in the Mantle Convection Code ASPECT

Tuesday, 13 December 2016
13:40 - 18:00
Moscone South - Poster Hall

- **jmrobey_agu_poster_resize.pdf**
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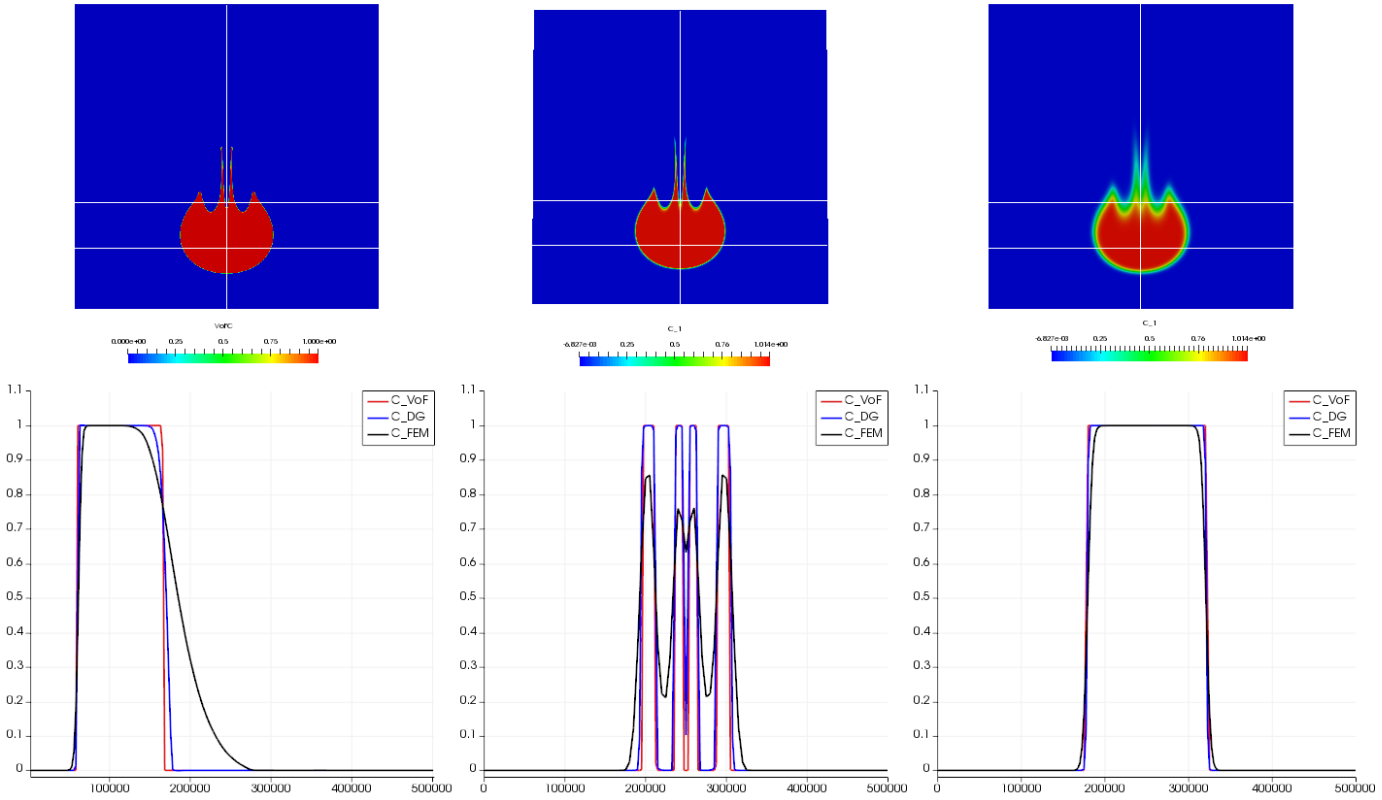
For many problems occurring in mantle convection it is desirable to track the interface between several regions that remain distinct and do not interact via diffusion. However, in the standard Finite Element Method (FEM) approach to the advection of a compositional field, the interface between the two regions is subject to numerical diffusion. Here we present a volume-of-fluid (VoF) interface tracking method implemented as an extension to ASPECT. In particular we use the ELVIRA interface reconstruction algorithm and a dimensionally split algorithm for the advection. We demonstrate the capabilities of this method by presenting results for the falling cube benchmark (Gerya and Yuen 2003), tracking the initial boundary layer in a double convection cell, and computations involving thermal bouyancy in an initially stratified density field.

In the accompanying image of the Gerya and Yuen falling block problem with a 1:1 viscosity ratio, the VoF method on the left is compared to the standard FEM approach on the right, and a bound preserving discontinuous Galerkin method in the middle. The lower half of this figure contains three plots of the concentration profile for each of the numerical algorithms: along the vertical white line (L), upper horizontal white line (C), and lower horizontal white line (R). Note the degree to which the VOF and DGBP algorithms agree, and the degree to which the standard FEM

algorithm differs from these other two algorithms.



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