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Geoscientific Model Development Discussions

Interactive comment on "Direct numerical simulations of particle-laden density currents with adaptive, discontinuous finite elements" *by* S. D. Parkinson et al.

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Comparisons with Espath and the Fluidity "erosion algorithm"

Many thanks for submitting this interesting paper to GMD and many thanks to the reviewers for their insightful comments. I am looking forward to a revised version taking the reviewers comments into account. I have some comments of my own, following some of the comments of the reviewers:

You use a Reynolds number of 2236, the same as Espath. You use <10ˆ7 elements with adaptivity, saying that you would need 10ˆ9 elements without adaptivity. However Espath use 6*10ˆ7 uniform grid points with 6th order finite differences. 2 points about

this:

How can they get away with resolution so much lower than what you say is needed (10ˆ9 elements)? Are their results less accurate? Or does the 6th order accuracy give them back the accuracy that you obtain with much higher (local) resolution.

I appreciate your honesty when discussing the cost of your model, explaining why you need adaptivity to counteract the cost of the model. However, with the adaptivity, you should be able to get to higher Reynolds number than Espath for a similar number of degrees of freedom. However Espath also do simulations of Re=10,000 with 5*10ˆ8 grid points. They seem to be able to do bigger simulations with higher Reynolds number but at lower resolution.

It is a shame that you feel that you cannot repeat the test case without the Fluidity erosion algorithm. There are so many differences between your model and that of Espath that I would be very interested to see confirmation that these differences are down to the erosion model.

Interactive comment on Geosci. Model Dev. Discuss., 7, 3219, 2014.