Geosci. Model Dev. Discuss., 6, C1809–C1811, 2013
www.geosci-model-dev-discuss.net/6/C1809/2013/

Geoscientific Model Development Discussions

Interactive comment on "Automating the solution of PDEs on the sphere and other manifolds in FEniCS 1.2" *by* M. E. Rognes et al.

M. E. Rognes et al.

david.ham@imperial.ac.uk

Received and published: 29 October 2013

As we understand it, the modification requested is to plot the energy conservation error for the Williamson 5 test case. We do not feel that doing so would add anything to this paper. This paper is neither a model description paper, nor a model intercomparison paper. It is instead a paper about a toolkit which can be employed to build models.

The reasons for including test cases are (a) to demonstrate how the toolkit may be employed to produce various geoscientifically interesting models, and (b) to demonstrate that using the toolkit actually produces correct code for the specified numerics. For this reason we have employed quantitative tests to which there are answers which are clearly right or wrong. For example, the schemes either converge at the correct rate, or they do not. A scheme which is supposed to conserve energy for a given problem can

be tested in this way, since failing to conserve would be an error, and this is the case for the linear test case. For the non-linear test case, as you correctly point out, the scheme we have used is not expected to conserve energy. Were we to plot the energy for Williamson 5 with that scheme, we would have a plot demonstrating that we fail to conserve energy. However this is a result which says something about the numerical scheme, not about the correctness of its implementation, and this is a paper about the automation of correct implementations, not about the numerical scheme. Indeed, in order to have that figure make any sense at all, we would need to include a more substantive discussion of the energy conservation properties of the scheme in question, which would be a further distraction from what this paper is actually about.

We completely agree that it would be a very good thing for there to be a paper discussing the numerical properties of the $BDFM_2 - DG_1$ scheme, and that paper should definitely discuss the extent to which energy is conserved. That paper is, however, not this paper. Two of the authors of this paper have, however, written that paper, and submitted it to QJRMS (McRae and Cotter, 2013) We therefore respectfully submit that the right place for the discussion of the energy conservation properties of the scheme in question for nonlinear shallow water problems is the QJ paper, and not this paper.

We would like to emphasize that this is not about hiding data, it's about publishing the results relevant to this paper. We are very happy to supply any correspondent with a plot of the energy for any test case we have run. Indeed, part of the point of this paper is that the complete examples are so concise that we have been able to include them in the supplement, so it is quite straightforward for readers to generate for themselves any diagnostic of our results in which they have an interest.

References

McRae, A. T. T and Cotter, C. J.: Energy- and enstrophy-conserving schemes for the shallow-water equations, based on mimetic finite elements, Submitted to Quarterly Journal of the

Royal Meteorological Society, http://arxiv.org/abs/1305.4477.

Interactive comment on Geosci. Model Dev. Discuss., 6, 3557, 2013.