

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

Anonymous Referee #1

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The paper describes the extension of an automated code generation and solution of PDEs framework FEniCS to immersed manifolds, which enables to use this software in geophysical simulations. The framework allows the scientist to avoid much of the coding overhead and model desired equation system on a very high level. The software takes care of generating appropriate code which implements selected finite element method.

The paper is well and clearly written. Authors very carefully explain the methods they applied to reach their goals. The mathematical concepts behind the implementation are well laid out.

The authors verify the implementation on several test cases, starting from linear transport problems to nonlinear shallow water equations on the sphere. One comment I

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have regards Fig. 10 and the discussion (p.3586 ll. 10-12) of the energy conservation. The authors claim that the energy is conserved to machine precision, however this does not follow from the figure. The total energy line on the plot is indeed flat, but the scale of the figure is linear and any small (but not machine precision) energy conservation problems would not be visible on that plot. Maybe a way to support the claim of energy conservation would be to show a time history of the total energy change on a semi-log scale?

Overall, I recommend this paper for publication providing the authors address the issue mentioned above.

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