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Interactive comment on "A global finite-element shallow-water model supporting continuous and discontinuous elements" *by* P. A. Ullrich

Anonymous Referee #2

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Author uses some "local" high-order schemes to construct the global shallow water models on cubed-sphere grid in this manuscript. The "local" high-order schemes are suitable for constructing global atmospheric models due to many reasons and getting popular recently. Different schemes under the same framework using FR method are adopted and compared by author through checking the benchmark tests for SWE model on sphere. It is a very interesting study for this community. I recommend the publication of this manuscript subject to the following revisions.

1. Although the high-order models give many impressive results in the smooth cases, an effective limiter is necessary for any high-order model to correctly simulate the discontinuities even for atmospheric flows. The artificial viscosity was introduced in this study and may improves the results near the discontinuities to some extent. Is there

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any further plan to develop other better methods to deal with the discontinuities?

2. I would like to see the numerical results of the Rossby-Haurwitz wave (Williamson's test case 6). To my knowledge, this test is sensitive to the numerical viscosity. Please check this test using different schemes with and without the artificial viscosity.

3. FR method is a general framework for the arbitrary high-order schemes. Why do you chose np=4? Have you ever tried the higher order schemes?

4. Please check the balanced setup of barotropic instability test. In Chen et al., JCP, 2014, the evolution patterns of l1 errors are different on three different grids (see their Fig.23). On cubed-sphere grid, at the beginning of the simulation the l1 error becomes much larger compared with other two grids and will not decrease on the refined grids. Will you find the similar issues using your models?

Interactive comment on Geosci. Model Dev. Discuss., 7, 5141, 2014.

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