

Interactive comment on “A high-order conservative collocation scheme and its application to global shallow water equations” by C. Chen et al.

Anonymous Referee #1

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This paper reports on a very interesting method for solving conservation laws, with an application to global ocean modelling. The method is in some senses a hybrid between Discontinuous galerkin methods, Finite volume methods and Collocation methods. High order is obtained from the high order polynomial representation in the volumes, and robust high order approximation of the fluxes is obtained via an interesting combination of averaging the fluxes at the volume boundaries via (approx) Riemann solvers and interpolation in the interiors of hte volumes. The numerical experiments and the linear analysis support the conclusion that the method produces a simple robust high order method.

The paper does need an edit to pick up slight problems in the language, for instance
C1581

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there are a number of places where definite or indefinite articles are missing.

Some minor points or comments:

(1) As discussed on page 4255, the pointwise representation of the quantities and the fluxes are obtained via high order polynomial interpolation. a question: Is it always safe to do this, i.e. is it ever necessary to limit the interpolants or introduce some sort of artificial viscosity? Or does the use of the average fluxes at the boundaries stabilize the calculation of the derivative of the fluxes at the interior points?

(2) Equation (12). It would be good to remind the reader of the exactness of Gaussian Quadrature for polynomials of degree 5.

(3) Page 4258. Comment on the choice of Runge Kutta methods. Provide a reference.

(4) Page 4260. Provide a very short overview of the methods DG3, MCV5 which you use for your numerical comparisons.

(5) Page 4263. Provide the relationship between the covariant velocities u, v and the contravariant velocities \bar{u} and \bar{v} .

(6) Can your method work with wet/dry interfaces?

(7) Can your method reproduce a still lake (ocean) ie is well balanced for this stationary solution?

Interactive comment on Geosci. Model Dev. Discuss., 7, 4251, 2014.

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