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Interactive comment on “A hybrid Eulerian Lagrangian numerical scheme for solving prognostic equations in fluid dynamics” by E. Kaas et al.

Anonymous Referee #1

Received and published: 22 August 2013

This is an interesting paper which proposes a numerical scheme (HEL), which uses a fully- (as opposed to a semi-) Lagrangian predictive procedure for prognostic variables, corrected by values obtained from a fixed mesh Eulerian scheme. The correction is carried out such that most of the well-known desirable properties of such a scheme in this context (listed in the paper) are satisfied. But in addition the authors are able to distinguish between true mixing and spurious mixing within fluid parcels (the latter inevitable in Eulerian and semi-Lagrangian schemes) within the fully-Lagrangian advective part of the scheme. The details of the approach are given in full in the paper and the validity of the HEL scheme demonstrated for a passive transport problem and a shallow water application on a sphere. Generalisations to more realistic scenarios are

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discussed. The paper is convincing as far as it goes and offers an interesting option for the simulation of chemical transport in the atmosphere.

Whilst the scheme is reminiscent of other ALE (Arbitrary Lagrangian Eulerian) approaches the fully-Lagrange step is essentially advective and the required properties are obtained by 'nudging' the predicted solution, as opposed to intrinsic Lagrangian schemes which attempt to have these properties built-in.

On page 3823 the word 'such' is repeated halfway down.

I regret that due to shortage of time (and unfamiliarity with the context) I am unable to carry out a critical review of all the details of the approach.

Interactive comment on Geosci. Model Dev. Discuss., 6, 3819, 2013.

GMDD

6, C1287–C1288, 2013

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