

Interactive comment on “The “ABC model” (Vn 1.0): a non-hydrostatic toy model for use in convective-scale data assimilation investigations” by Ruth Elizabeth Petrie et al.

Anonymous Referee #2

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- General comments:

This paper presents a 'toy' model for convective scale data assimilation. After physically-based simplifications and more modifications, the end result is a model with 3 tunable parameters which allows for large and small scale motions and yet is computationally non-expensive, and where the effects of acoustic and gravity waves are identifiable and traceable.

I think this work fills a very important gap for DA experiments (and beyond DA) in the sense that right now we have either extremely simple models or medium-complexity or full GCM's to use. As indicated in the introduction, one of the only toy models that

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allow convective-type behaviour is that of Craig and Wursch. So this is a welcomed development indeed.

In my opinion, the structure of the paper is very clear, and the steps taken from the Navier-Stokes equations to the final product are very well explained. Caution has been taken in conservation of energy. The authors have also discussed the numerical implementation, as well as a linearised analysis, and finally some numerical experiments.

- Specific comments: Having read the other review, I strongly agree with the request for a further analysis of the sample integrations in section 5, and their relation with the findings of the previous sections. I have to requests not mentioned before. 1. Understandably, there are a lot of symbols. I believe it would be useful to have a list of symbols as an appendix. While reading the paper, I had to go back sometimes between sections to know the differences in variables, e.g. p vs p_0 vs p_{00} , or when are the variables calligraphic, when do they have a star, etc. 2. It was a little difficult to read the axes in some of the figures. In fact, could some of the panels be done larger? For example, a figure has 4 panels stacked vertically with a lot of white space to the sides, while a 2x2 grid would show them better.

- Typos: There are some typos both in the text and in the equations. For instance $\delta t = \delta t / N$. These have been identified by the other reviewer so I am not repeating them.

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