

## ***Interactive comment on “Forecasts covering one month using a cut cell model” by J. Steppeler et al.***

### **Anonymous Referee #3**

Received and published: 22 March 2013

General Comments: This paper assesses the differences of 5 day forecasts using a numerical model with terrain-following coordinates, and one with a cut cell method. The paper asserts that the cut cell method provides a more accurate forecast through comparison with reanalysis data. In my opinion, there is significant room for improvement with this paper. The comparisons between the simulations and reanalysis data are completely qualitative, and this paper would be far more compelling if the comparisons were made in a more quantitative way, for example by calculating model bias.

#### Specific Comments:

1) I think that the paper should provide a short description in the introduction of previous work by the authors. For example: “The cut cell model was described and validated against canonical solutions in Steppeler (200X)”. Additionally the 2011 paper covering 5 day hindcasts should be addressed in this paper. Explain what is new here.

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2) Line 6 “more accurate vertical discretization” I believe that you should remove the word vertical, as the cut cell method should yield additional accuracy in the representation of horizontal gradients.

3) Line 8 It is true that the cut cell method avoids a mathematical error when the change in height over a horizontal grid spacing is larger than the vertical grid height. However, there is an additional error that occurs even when the previously mentioned condition is not true. The presence of the additional metric term in the terrain-following coordinate transformation also has an associated truncation error which reduces model fidelity.

4) Line 9 “it is” is awkward wording. Please reword.

5) Line 20 The sentence starting with “Finally” should be reworded.

6) Line 28, add an “s” to Himalaya

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7) With regards to filtered topography- it would be interesting to know what the largest terrain slopes are in the unfiltered topography and in the filtered topography.

8) Line 6 “cannot be investigate here” or is it just not investigated here? Page 629

9) It would be appreciated if the main physics parameterizations were listed, for example the PBL scheme used.

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10) In general, I think that the results could be presented in a more quantitative way. For example show instantaneous model bias or time-averaged model bias with respect to the reanalysis data. I think that the presentation of the results is weak, and needs improvement.

11) The introduction of the terms noz and z is confusing, as it is not intuitive. Can you

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use terrain-following and cut cell instead? Perhaps t-f and z or t-f and cc or sigma and z would be better?

12) The reader has no idea how the terrain-following and cut cell methods are performing as a function of time within a single forecast. This should be discussed. Presumably the model bias is largest at the end of the forecast, but it could be interesting to look at how the bias grows during the forecast.

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13) Line 8 Wording is awkward. Please reword.

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14) Line 3 replace "problematical" with "problematic"

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Interactive comment on Geosci. Model Dev. Discuss., 6, 625, 2013.