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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: Description and assessment of a nudged version of the new dynamics Unified Model" *by* P. J. Telford et al.

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1. (a) *Page 17266: Section 3 title. What this actually is, is an "Assessment of the Nudging Technique"; Line 16 "assessment of the model performance"; same as above.*

   (b) *Page 17268: Line 15 "evidence that nudging improves"; "this is an evidence that the nudging works", that is, it does what it is supposed to do. That is excellent, but no more than that.*

   (c) *Page 17269: Line 12 "though nudging introduces large scale dynamics to the model that are similar to the analysis data";: Hopefully, the model does have the large scale dynamics referred to, but - of course not synchronised with a particular date. This writing points to some confusion between model*

dynamics and nudging technique.

This will be clarified to make it clear that we are talking about synchronising the model to the analysis data not introducing large scale dynamics where they didn't exist before.

(d) *Page 17270: Line 13;The ability of the model to produce the same variation as the analysis data is assessed; The ability of a model to represent variability (on all scales) should be assessed in a free running mode, statistically. Here again, what the calculations show is that the nudging technique works. This is a result worth the technical note, no need to attach additional (wrong) interpretations.*

(e) *And many more, the Authors may find the rest themselves.*

We do not claim that the nudging itself improves the model. The aim of the nudging is to allow the model to approximately reproduce the conditions in the analyses to allow other aspects of the model, such as chemistry, to be validated. We will try and clarify this for these points, and all the others we can find.

2. *Title; new dynamics; what does it means? Why new? New with respect to what? There is nothing explaining this novelty in the manuscript.*

   The new dynamics refers to a major change in the dynamics of the UM, including a switch from a hydrostatic hybrid pressure level based system to a non-hydrostatic hybrid height level based system. There was also a switch from the Arakawa-B to Arakawa-C horizontal grid system. A more detailed description can be found in the reference given.

3. *Page 17264: Line 3-4 "Data assimilated"?, "assimilation"? What is meant? Unclear.*

   Assimilated has been employed in a few places in an ambiguous sense. As you have pointed out the term can cause confusion and will be replaced by "data adjusted to" or words to that affect.

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4. *Line 21 "these disadvantages were felt to make this solution impracticable"; Unclear.*

   This sentence was perhaps shortened too much. Rephrasing “As the errors are....impracticable” as

   “The errors in the interpolation occur predominantly in the lowest few model levels, which are not utilised by the nudging. The small improvements to the few layers used by the nudging was not felt to justify the problems that using the ECMWF orography would cause.”

5. *Page 17265: Line 1 "assimilated"?*

   See answer to point 3.

6. *Page 17268: Why stopping at 20 km? Given that the nudging extends to about 40 km. another level would have been of interest.*

   The selection of the levels was chosen for their relevance to planned work, encompassing areas such as the lower stratosphere where the ozone hole forms. As can be seen from Figures 2 and 5 the performance of the nudging technique does not vary much over the height range and so adding another level would contribute little additional information.

7. *Page 17269: Line 8-9: Maybe also differences in the sea-ice distribution. Did you look at it?*

   See answer to the 6$^{\text{th}}$ comment of referee 2.

8. *Line 14-15: It is unclear what are the initial conditions used (or I have missed it). Are the initial conditions also taken from ECMWF? For all the prognostic fields? Please, add a paragraph in section 2 (or a new subsection) on initial conditions*

   The initial conditions are taken from the default climate integration initial file as provided by the UM, which we can note in the text. However the nudging ‘spins

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up' quickly, reducing the importance of the initial conditions, a fact which is confirmed by the three assessment periods being so similar. Initialising the unadjusted assessment runs from the year long nudged runs, so that the nudged and unadjusted assessments have the same starting conditions, also reduces the importance of the original starting conditions.

9. *Line 17: It would be of interest to re-computed the RMSE of the surface pressure above the ocean points only.*

   Using only the points with no land in the model the RMSE was 8.3 hPa without nudging and 1.7 hPa with nudging. This would seem to confirm the conclusion that the nudging allows the surface pressure of the analyses to be well reproduced by the model and that the large RMSE is as a result of differing orographies.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17261, 2007.