Atmos. Chem. Phys. Discuss., 13, C9765–C9769, 2013
www.atmos-chem-phys-discuss.net/13/C9765/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: A simple procedure for removing temporal discontinuities in ERA-Interim upper stratospheric temperatures for use in nudged chemistry-climate model simulations" *by* C. McLandress et al.

C. McLandress et al.

charles@atmosp.physics.utoronto.ca

Received and published: 9 December 2013

Reply to Reviewer 1

We thank the reviewer for his or her comments, which are repeated below in italics.

The authors propose an add-hoc correction method for an obvious inconsistency in the

ECMWF ERA-Interim reanalysis data, namely two unphysical temporal discontinuities in upper stratospheric temperatures. They further show the impact of this correction on the results of their CCM, which uses the data for Newtonian relaxation ("nudging"). With this, the authors underline the fact that reanalysis data sets are not necessarily representing the truth.

This technical note therefore provides an important information for the chemistry-climate model community, since application of the uncorrected ECMWF ERA Interim data in simulations with "specified dynamics" might yield wrong results. The manuscript should be published after one major issue has been discussed and some minor improvements, as suggested below, have been considered.

1. One major question arises: If only the temperature is corrected, it becomes inconsistent to the other reanalyzed meteorological fields, which are also used for Newtonian relaxation, like for instance the flow field in form of divergence and vorticity. Can it simply be assumed that a temperature bias correction (though time dependent) leaves the flow patterns untouched? This should be discussed.

Since the temperature adjustment is applied only to the global mean, the impact on the horizontal wind fields is expected be quite small. (Significant changes in the winds would only occur in the presence of spatial gradients in temperature through geostrophy). The adjusted temperatures should therefore be consistent with the reanalysis winds to a very good first approximation. We have added a sentence in the 4th paragraph of the introduction explaining this.

2. The authors should mention somewhere that the proposed correction is only required, if the global mean temperature is nudged and if the upper stratosphere is

ACPD
13, C9765–C9769, 2013

nudged. Some model setups might nudge only up to a certain level below the region of inconsistent temperature fields, and / or only the temperature patterns but not the global mean temperature. These techniques might provide alternatives to overcome the issue presented here.

Since we state in the abstract and introduction that our adjustments apply only to the global mean temperature, it seems pretty clear to us that modeling groups that don't nudge the global mean temperature will know not to use our data. To make that even clearer we use the term "global-mean" in the first sentence of the abstract, rather than the second and have added "global-mean" before "ERA-Interim temperature" in the 4th paragraph of the introduction.

Regarding the point about nudging the stratosphere, we feel again we were being pretty clear, stating in the abstract that our adjustments applied to "upper stratospheric" temperatures and in the introduction that the adjustment proposed here is "for high-top CCMs". However, to make this even clearer we have added "stratosphere-resolving" before "chemistry-climate models" in the abstract.

3. The term "nudging", though in the meantime well-known to modelers, is still very imprecise. I suggest to mention the "Newtonian relaxation" at least once in the manuscript.

In the abstract we have added "(relaxed)" after the first occurrence of "nudged." In the second paragraph of the introduction we now say that the nudging is done using "Newtonian relaxation".

4. page 25805, line 8: The authors compute the anomalies based on the full time

ACPD
13, C9765–C9769, 2013

series mean including the inconsistent periods? Isn't this a systematic error? How does this affect the results?

The reviewer is mistaken: the offsets are computed from the monthly global mean temperatures as shown in Fig. 2a, not from the anomalies. So there is no problem here. The reason anomalies are shown in Figs 1 and 4 is simply to deseasonalize the data so that the jumps stand out more clearly. The confusion presumably arose because we did not explain this. This has now been rectified in the revised manuscript.

5. The authors might consider providing their data (time series of bias correction for different levels) as supplementary material to the final manuscript (ASCII-table or, better, time series in netCDF).

As stated in the summary both ASCII and netCDF files containing the temperature adjustments can be found at the following link:

http://www.cccma.ec.gc.ca/data/cmam/cmam30/era_interim_adjustment

This web site is maintained by Environment Canada along with its other data sets so is a safe repository for the useful life of this data set. We therefore donÕt see any reason for providing the data as supplementary material.

Besides, having more than one source for these files might cause confusion since users may wonder if the two sets were identical.

6. Last, but not least, I wonder, if the authors could provide a corrected data set (or the bias time series) also on the original ECMWF ERA-Interim model levels, since I guess some modeling groups use the raw data on model levels to prepare their input data for

ACPD

13, C9765–C9769, 2013

nudging, instead of the data interpolated on pressure levels. (Of course, this last item is just a "nice to have", but no prerequisite for the final publication of this manuscript.)"

To provide the adjustments on the ECMWF ERA-Interim model levels would be a very time-consuming and largely unnecessary task given that the vast majority of modeling groups are presumably using pressure level data for nudging. Those few groups requiring model-level nudging data would simply have to follow the procedure outlined in our paper and generate the temperature adjustments themselves.

ACPD

13, C9765–C9769, 2013