**Atmospheric
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Discussions

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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.

Anonymous Referee #2

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This note describes an adjustment procedure for removing global-mean temperature discontinuities in ERA-Interim reanalysis data. These data are being used by various modeling groups to constrain the dynamical behavior of chemistry-climate models. The authors show that using unadjusted data can lead to unphysical behavior of calculated chemical species whose mixing ratio depends strongly on temperature, such as ozone in the upper stratosphere.

The paper is acceptable for publication in ACP after minor revision, as detailed below.

Specific Comments (page, line):

(25803, 1) "nudge or relax" Please be more specific. What is done in the models is to linearly combine the computed state with the reanalysis state at each time step. This is tantamount to applying a linear relaxation of the model-computed fields to the reanalysis data. The magnitude of the effective relaxation coefficient that results from this procedure depends on the coefficients used to blend the model and reanalysis states and the size of the model time step. It is probably worth noting, then, that the effective relaxation coefficients depend on the modeler's choices of these parameters.

(25806, 7) "The deseasonalized time series is then fit..." A couple of predictors related to the quasi biennial oscillation (QBO) are often included in fits like this. Perhaps such predictors are superfluous in the upper stratosphere (1 hPa), where the amplitude of the QBO becomes small. What about at other levels? Have the authors determined that fitting to the QBO is not needed even in the middle stratosphere, e.g., at 7 hPa? Or is it the case that any QBO signal is diluted to the point of irrelevance in these global data?

That point aside, somewhere in this paragraph it should also be mentioned that the fits are performed individually for each of the segments of the time series separated by the discontinuities (same as was done when removing the seasonal cycle).

(25806, 18-24) "A simpler approach ..." This discussion of a potential alternative procedure for defining the offsets is out of place here. It should follow the description of the actual procedure adopted, say after (25807, 4).

(25807, 7) "apply the offsets to the first and second time periods" It might be better to be more specific and write something like "apply the offsets in sequence, first to the 1985-1998 segment of the time series and then to the 1979-1985 segment, while treating the post-1998 segment as the (unaltered) reference. Note that referencing the adjustment procedure to the post-1998 period is an arbitrary choice..." [which I presume is the case]

By the way, it is never mentioned how these global-mean offsets are applied as a function of latitude and longitude. I presume the same offset is applied everywhere–no?

(25809, 6) "as expected, the largest component is the annual cycle" The "largest component" of what? The calculated offset?

(25810, 17) "affects photochemical constituents" More specifically, "temperature-dependent chemical constituents". Presumably, constituents that are affected mainly by transport, or by photochemical processes that are not sensitive to temperature, will not display the same extreme pathology as ozone. And, by the way, although this has not been discussed, there must be an underlying assumption that making a globally uniform temperature adjustment does not have a major effect on dynamics. Some discussion of this point is probably called for.

(25811, 5) "results in a continuous ozone trend" Better to say "results in continuous ozone evolution". There is little linear trend in the years near 1998.

(25812, 10) "ozone starts to decline" OK. But what happens after about 2000, when ozone begins to increase? Are we seeing here the effect of curtailed emissions of ODS, per the Montreal Protocol?

(25813,7) "this technical note describes" => "this technical note has described"

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 25801, 2013.

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