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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the relationship between total ozone and atmospheric dynamics and chemistry at mid-latitudes – Part 2: The effects of the El Niño/Southern Oscillation, volcanic eruptions and contributions of atmospheric dynamics and chemistry to long-term total ozone changes" *by* H. E. Rieder et al.

Anonymous Referee #2

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This is a companion paper focusing on the application of a statistical technique introduced in part 1. I have read part 1 - even though I haven't commented on it - and believe it to be a very useful contribution to the statistical assessment of atmospheric variability. Nevertheless I would encourage the authors to avoid too much statistical slang as to make the paper easier to appreciate by the meteorological community. In

particular I would encourage the authors to give a very simple summary of what the methodology adds to the common assessment of the mean value and to point more clearly to particular examples where mean and extreme value statistics show indistinguishable or very similar results and cases in which significant differences occur. The content of part 2 (reviewed here) is very suitable for publication in ACP. The paper references well existing work and shows how the extreme value statistical model can add nuances to existing knowledge. The paper focuses on ENSO and volcanic finger prints in total ozone. Before publication the paper requires some important changes in the presentation to communicate results better. Many of the changes requested depend on the underlying weakness of part 1 to distinguish between cases where extreme value theory adds information to the standard framework and where it does not. I recommend publication of the paper after a reduction and clarification of the figures as detailed in my comments below (obviously I am very happy for the existing figures to be provided as an appendix, but I believe that the paper will be much better with a well guided selection of figures).

General question: Why is the analysis not applied to the tropics? Immediately the paper pre-selects two regions (60S-30S and 30N-60N) without providing a rational for it. I would much prefer a global view (60S-60N) and not the sometimes very confusing split into two regions and too many panels in one figure. I appreciate that sometimes two different seasons are shown, but why not show a global map for a season, and if required show other seasons as well?

General comment: Nearly all figures contain an information overload, because always all three results (two for the extreme values and one for the mean) are shown. Is this necessary? In many plots the differences between the methods are not large and are not addressed in the text. I would recommend to show only the result of one method and to tell the reader that there is no difference. If there is a significant difference show all methods and highlight the additional information the extreme value methodology achieves. You should give an example of what the deviations between methods actually

ACPD

12, C5014–C5016, 2012

mean, e.g. the shape of a distribution function might be changing.

Figure style (e.g. figure 1): Most readers of ACP will be interested in the "global" coefficient estimates and how they differ between the statistical models, and where the estimates provide a value significantly different from zero. I would suggest plotting global maps (60S-60N) of the coefficients and stippling regions that are significant. I am not convinced that the smoothly varying standard error adds a lot (anything?) to the discussion; just mention it is smoothly varying with a small latitudinal gradient. This brings a nine panel figure down to three legible panels (or even less if all methods show the same). Make it clearer in the text what conclusions come from the annual mean figures and seasonal figures.

Figure style (e.g. figure 9): This figure style is totally overloaded and the message that the authors might wish to communicate about regional and methodological differences is getting lost. I would suggest to focus on one region (year round or particular season) first, where the estimates differ between the different statistical models and to focus on the differences. Based on this figure select your favourite model and look at the regional differences.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 13201, 2012.