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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A global historical ozone data set and signatures of El Niño and the 11-yr solar cycle" *by* S. Brönnimann et al.

Anonymous Referee #1

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Review of Bronnimann et al. A global historical ozone data set and signatures of El Nino and the 11-yr solar cycle, submitted to ACPD.

This paper addresses the interesting issue of trying to reconstruct an ozone record going back to circa 1900. The problem is difficult because of the paucity of data in the early part of the century. Their approach to reconstruction involves an off-line assimilation using the SOCOL chemistry-climate model and measurements of total ozone from multiple sources.

The reconstruction method seems to make sense to me, but I am not really qualified to judge the mathematics or the analysis. I do have a few questions about the results and some comments on the presentation.

My main problem with this paper is that I came away without any appreciation for the properties of the data set. The only presentation of the long-term behavior of ozone is Figure 7 that presents an almost unreadable summary of the total ozone behavior versus latitude and time. What is the ENSO structure of the data set? The QBO structure? The solar cycle structure? How does it represent the combination of chlorine dependence and carbon dioxide dependence of ozone?

Another issue is the lack of skill found in the ozone profile results. I understand that the authors only assimilated total ozone data, but I wonder what is the meaning of this lack of skill in the profile. My understanding is that profile is the important piece of information for climate model simulations. It is the profile of ozone that determines its radiative properties. Does this mean that the HISTOZ data set is not useful for these climate simulations? Or does it just mean that a much simpler climatology with chlorine dependence would work just as well.

The stated goal of this data set was to include realistic variability, but I am not certain that variability is important to the long-term climate simulations. Is a data set with ENSO variability in ozone going to have any different impact in climate simulations than a data set that contains the same response to chlorine but no representation of ENSO? I appreciate that the unusual ozone variability in the early 1940s is interesting. The authors present some results for this time period in Figure 10 but I did not understand the basis for these results. Are they just taking the ENSO variability from a later time period (post 1979) and applying it to the ENSO index for the 1940s? If so, how do we test the validity of the results? I assume that the test is the few Dobson stations that exist during this time period. Do these stations have a clear enough signal to provide a meaningful test?

Overall, I think that this paper does not provide a clear enough explanation of the methods to allow the reader understand the data set. It also does not provide a clear picture of the results. I suggest that the explanation of the methods be expanded and placed in supplementary material. The big picture of the methods can be briefly

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presented in the paper. I also suggest an expanded description of the results of the data set; enough so that the reader can gain some appreciation of the properties of the data set. As the paper stands, I came away with the impression that the authors did a lot of work and have produced a data set that may be useful. However, it is not clear to me how that data set is useful.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 7767, 2013.