Atmos. Chem. Phys. Discuss., 2, S577–S579, 2002
www.atmos-chem-phys.org/acpd/2/S577/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "An exploration of ozone changes and their radiative forcing prior to the chlorofluorocarbon era" *by* D. T. Shindell and G. Faluvegi

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Received and published: 5 November 2002

The paper by Shindell and Faluvegi is an interesting attempt to elucidate the long term changes of atmospheric ozone prior to the onset of strong chemical perturbation by anthropogenic halogen compounds. The authors use several data stets to constrain the modelled trends. In order to derive empirical trends from these data, some processing is needed that is described in an Appendix. This comment refers to the description of the processing of historical total ozone data in the Appendix. I think that the authors, having worked extensively with historical total ozone data, could make a great contribution by describing the processing in more detail and, if possible, using standard methods. Although I do not think that this would change any of their results, it would

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provide the community with a very valuable data reference. The authors could find my comments useful when revising the Appendix, or perhaps when specifically addressing this issue in a future paper.

The authors performed several quality checks of the series and applied corrections. The procedures used are not described in great detail. First of all, it was not clear to me whether they worked with daily, monthly or annual mean values (this also holds for the trend determination!), and, if mean values were used, how they were calculated. Also, it is not clear whether the procedure involved a comparison with reference series. It would be good either to describe the procedure in more detail, or to use standard procedures. Bojkov and co-workers established guidelines of how to re-evaluate historical total ozone data, published by the WMO in 1993 in the "Handbook for Dobson ozone data re-evaluation" (Global ozone research and monitoring project. Rep. No. 29. Geneva). It would be extremely deserving if the authors would follow these guidelines, which refer to re-evaluating total ozone data based on monthly mean values (we adapted the procedure for working with daily data: Brönnimann et al., Measurements of total ozone prior to the International Geophysical Year (IGY) 1957: Data and quality (submitted), a copy can be obtained from the author). Especially, the use of reference series would remove some of the subjectivity in the determination of breaks, and statistical tests are available to decide whether a series is considered inhomogeneous or not. Upper level meteorological data can be used as potential reference series, and they are available for the time period of interest from the NCEP/NCAR reanalysis project. In our study we used the local 100 hPa temperature (as recommended in WMO, 1993) and 300 hPa geopotential height, which worked well. For Europe, there are homogenized total ozone series that can be used as reference for neighbouring sites for the 1957 to 1975 period (especially Arosa).

The series from Quetta and Bismarck were corrected by large amounts close to the beginning of the series. In order to adequately derive the magnitude of the break, more data is needed before the break. It would be careful to use these two series only

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from spring 1958 on. Also, the really large corrections (Bismarck: 31 DU, Srinagar: 32 DU, Quetta: 61 DU!) raise doubts about the general quality of these series. In some cases there are sites that are close to each other but behave differently. For instance, the trend obtained for Bracknell deviates significantly from the trends found at Oxford and Uccle. Also, the trend for Cagliari deviates significantly from the trends calculated for Vigna di Valle, Messina, and Naples. Using reference series could help to determine whether these series can be considered homogeneous or not. It might also be worth mentioning that, working with 1952-1963 data, we detected inhomogeneities in the Cagliari record in 1956-57, whereas the series from Vigna di Valle was found to be more reliable. A good quality was also found for the Oxford record.

Finally, I would like to express my appreciation for the work done by the authors in trying to re-evaluate the historical total ozone data.

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 1371, 2002.