**Atmospheric
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Discussions**
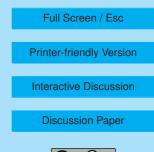
Interactive comment on "Ozone trends derived from the total column and vertical profiles at a northern mid-latitude station" *by* P. J. Nair et al.

Anonymous Referee #1

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The paper describes trends in total ozone as well as ozone profile changes derived from measurements of the Haute-Provence Observatory (OHP) or extracted from satellite data for OHP. OHP is located in Southern France (43.9oN, 5.7oE) representing northern mid-latitude changes. The measurements include total ozone data from Dobson and SAOZ instruments and ground-based profile ozone measurements from LI-DAR and ozone sondes and satellite data including SAGE, HALOE and MLS. The measurements are analyzed by multiple regression analysis and the time evolution (including recovery) is described by fitting EESC or by determining piecewise linear trends (PWLT). The paper convinces by the careful analysis of the effect of the individual proxies including their seasonal effects. Clear evidence was found for the recovery of the ozone layer (due to the effect of the Montreal Protocol, 1987) both for total ozone and for ozone profile changes. The unexplained total downward column ozone trends

(PWLT) for 1984-1996 are almost the same as those attributed to ODS described by EESC. However, the changes after start of the slow recovery seem to be affected by other process as (the unexplained) PWLT trends are substantially larger (particularly in the lower stratosphere) than when using EESC. This unknown factor does not seems to be connected with the enhancement of Brewer Dobson circulation as this influence should be described by the explanatory variable of heat flux. I support publication of very valuable study if the following questions are adequately addressed: Data and methods: 1. I suggest to produce an overview table containing the relevant information of the frequency and availability of the ozone measurements of the different instruments (including periods of instrumental failure, showing overlapping periods, etc.) 2. Page 7084, line 11: Which types of Dobson observations (direct sun, moon and zenith sky) are included in this study ? What was the fraction of the types of the measurements (e.g. direct sun vs. zenith sky) used in this study ? 3. What was the reason to merge total ozone measurements of Dobson and SAOZ instrument ? It is well known that SAOZ and Dobson total ozone show different seasonalities: Could this difference be completely removed by deseasonalisation of the measurements ? 4. Ozone vertical series: I miss some additional information on the quality of the combined ozone profile series over OHP based on LIDAR, ozone sonde and satellite measurements. On page 7091, line 3-4 the reader learns: "Since these data sets have different vertical resolution they are interpolated in 1 km vertical grid": Were the different uncertainties of the individual data series considered ? Finally the analysis is based on a series "by averaging the monthly mean anomalies (page 7091, line 12, f): Were possible drifts between the individual series checked ? Did you try to estimate uncertainties in the merged series ? Was weighting of the different types of measurements considered, possibly based on uncertainties of the measurements and on frequencies of measurements ? 5. Page 7091, line 19, f: Is there any plausible explanation why 5 month smoothing increased the correlation between ozone anomalies and model performance ? 6. Was it considered to include ENSO as an additional explanatory variable ?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 7081, 2013.

Interactive
Comment