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Interactive comment on “The influence of the North Atlantic Oscillation and El Niño–Southern Oscillation on mean and extreme values of column ozone over the United States” by I. Petropavlovskikh et al.

Anonymous Referee #2

Received and published: 12 September 2014

In the paper the concept of Extreme Value Theory (EVT) is applied to analyze five long-term column ozone series measured by Dobson spectroscopy in USA assisted by STL (Seasonal Trend Decomposition of time series based on Locally wEighted Scatterplot Smoothing (LOESS)) analysis. The series belong to the world longest series (started in the early 1960s) and those with highest data quality. EVT allows to set thresholds for determination of (daily) High Ozone Values (EHOs) and Low Ozone Values (ELOs). Particular emphasis is given to the documentation of the effects of North Atlantic Oscillation (NAO) and El Niño Oscillation (ENSO). These main findings are in line with those

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obtained by applying similar techniques to European long-term Dobson series. Finally simple linear trends are calculated for winter and spring for all data and those excluding EHOs and ELOs for the periods 1970-2000 and 1990-2010. Before I can support publication I recommend the following revisions.

General comments

1. Abstract p. 21067, line 9-12: I object the statement: The Loess smoothed trend components show a decline of total ozone between the 1970s and 2000s and a “stabilization” at lower levels in recent years which is confirmed by linear trend analysis (see below)

2. p. 21073, line 12: “Our main interest in this study lies in the trend component of the STL-decomposition”: I see the values using STL plots to illustrate the relations between ozone time series and fingerprints (such as in the figures 5 and S5) but the scientific interpretation of “trend component” of total ozone time series analysis is obscure to me (see below) as the procedure leads to smoothing over the effects of many different processes (see below)

3. p. 21075, line 13 ... “Fingerprints” of NAO and ENSO in the frequency distribution of extreme events: “The NAO fingerprints ... are in broad agreement with those for European sites and satellite data, and p. 21076, line 6 “. . . are in good agreement with findings for European sites and satellite data”: please provide more specific statements

4. p. 21077, line 12ff: I cannot follow the arguments: “... show that the strong decrease during 1980s and 1990s came to a halt around the turn of the century”: I see the Fig 5 for Boulder is a decreasing tendency until 1996 followed by sort of a “jump” and a new “decreasing tendency” starting again around 1997 which is similar for Wallops Island (Fig S5) whereas Bismark might show a tendency for an upward trend after 1993, less pronounced in Nashville. Because of the subjectivity of such statements I recommend to avoid STL plots for statements regarding “trend analyses” whereas the plots can be used to illustrate the relation between fingerprints and ozone

time series. Additionally I find it difficult to interpret the “trend component” from STL plots as the procedure basically “smoothes” over different processes, e.g. the Pinatubo effect.

5. p. 21078, line 18 ff: I cannot see the rational of the selection of the periods of linear trends analyses, namely 1970-2000 and 1990-2010: I don't believe that maximum ODS was “around 2000”: What means “maximum ODS”: emissions or EESC ? To my knowledge EESC for mid-latitude was peaking around the middle of the last decade (1997 ?). The start of the second period in 1990 includes the low ozone values generally attributed to the volcanic eruption of Pinatubo and therefore these low values are expected to contribute to the upward trends. If a statement in connection with anthropogenic ozone destruction is attempted I recommend to use linear trend analysis for 1970-1995 and 1995-2010. leading to a more positive trend.

6. P. 21079, , line 17.: I suggest to mention here again that the record low values in total ozone in northern mid-latitudes are commonly attributed to the effect of Pinatubo aerosols.

7. P. 21082, line 5-8: please explain how the changes in frequencies of ELOs and EHOs are connected with the expansion of tropical belt and the contraction of the of the northern polar band

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 21065, 2014.

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