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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 1: Statistical models and spatial fingerprints of atmospheric dynamics and chemistry" *by* L. Frossard et al.

Anonymous Referee #1

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General comments. The authors describe and evaluate the EVT (Extreme Value Theory) and ARMA (Autoregressive Moving Average) statistical models used for analyses on contribution of the key chemical, dynamical and geo covariates to the long-term changes of total ozone in the NH and SH mid-latitudes. This very topical scientific theme is linked both to impacts of the Montreal Protocol on recovery of the ozone layer and to the ozone-climate interactions in the latitudes concerned. The paper presents two basic valuable scientific contributions, among others. The first consists in adaptation of the EVT and ARMA models on the yearly and seasonal high-resolution grid

cell basis applications. This allows assessment of the temporal and spatial total ozone changes and their attribution (finger prints) to the particular covariates in the Long./Lat. geographical scale. The second key contribution lies in utilization of the assimilated and homogenized satellite total ozone input data set that has been validated by the ground observations. Therefore, the instrumental signal in the data subsets due to different calibration scales and technical parameters of the particular instruments has been maximally eliminated. The input data sets of the covariates come from the most recent and reliable international data bases. The paper is well written by a team of experienced scientists on the statistics and atm. sciences. The article brings evidences that global changes of total ozone in the mid latitudes have significant geographical variability documented by space and time distribution of the regression coefficients and p-values of the particular covariates. The ozone recovery in these belts will be thus regionally different. The presented statistical apparatus that partially comes from the previous per-reviewed publications of authors (e.g. Rieder et al. 2010, 2011) is widely explained and documented by a number of relevant properly cited publications and studies. It is surely an interesting topic for the consequent discussion among the interested scientific community and the ACPD readers. The statistical models and outputs on the fingerprints of the atm. dynamics and chemistry presented in the article are further extensively applied and results discussed in the consequent ACPD paper (Rieder et al. 2012).

Specific comments. Several minor specific comments and recommendations are addressed to the authors: P13163, L16: to adjust : . . . ozone distribution function . . . so that statistical distribution is not confused with the spatial one P13163, L23: the global decrease of total ozone should be dated later than since 1970 P13163, L21: to exclude . . . erythemal . . . or to replace it by . . . biologically active UV radiation. . . as the UV radiation generally is the subject of the interest P13180, L11: to adjust . . . circumpolar vortex. . . P13182, L5: to replace ODS by EESC Figures 4-9: in the figure captions the full designation: Pointwise regression coefficient estimates . . . instead of Coefficient estimates. . . is recommended.

ACPD

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Technical comments. The manuscript of the paper is well prepared according to the publication rules of the ASPD. Only a few corrections are needed. P13180, L9: delete "-" in . . .mid and high latitudes. . . Table 1 correct . . . NCAR/UCAR Climate and Global Dynamics . . . correct . . . NASA Goddard Institute for Space Studies . . .

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 13161, 2012.