Title: Evaluation of factors affecting TOC and its trend at three Antarctic stations in the years 2007–2023
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In this study, the authors present the annual and springtime trends of total column ozone at three Antarctic ozone monitoring stations (Marambio, Troll, and Concordia) over the period 2007-2023. They also discuss the impact of several dynamical processes on Total Column Ozone variability at the three monitoring stations and over the Antarctic more broadly, using the MERRA-2 reanalysis. They present trends derived using the LOTUS (Long-term Ozone Trends and Uncertainties in the Stratosphere) multi-linear regression model for the first time on ground-based and satellite overpass datasets in Antarctica. They found an increasing trend, significant only at the Marambio station, which is at the polar vortex edge. Troll and Concordia in the interior of the continent were not found to have a trend statistically different from zero. From the results of the coefficients of the explanatory variables in the model (which served as proxies for dynamical and natural variability), they found that the lower stratosphere (100mb) temperature had the largest influence on total column ozone variability, with the Qusai-Biennial oscillation and the eddy heat flux (as a proxy for the Brewer-Dobson Circulation) also had statistically significant influence at the stations.

The trend estimates derived using the same model, but with datasets from the Ozone Monitoring Instrument (OMI) satellite overpass and the MERRA-2 reanalysis, were consistent with the ground-based trend estimates, with minor deviations. The LOTUS model was also run on each MERRA-2 grid point over the Antarctic continent to derive the spatial distribution of the factors influencing total column ozone variability. They found that the temperature in the lower stratosphere is the strongest influence on the entire content; eddy heat flux is mostly significant; and the El Niño/Southern Oscillation and Indian Ocean Dipole were found to have insignificant (at the 95% confidence level) influence on total column ozone.

Finally, the authors offer a detailed analysis of TCO variability during the 2019 and 2020 ozone holes, finding that the exceptional sudden stratospheric warming event in 2019 significantly increased total column ozone over Antarctica. They conclude that the ozone layer is thickening and recovering at the continent’s edge, but polar vortex dynamics and declining stratospheric temperatures are complicating efforts to detect ozone recovery in the Antarctic interior. They rightfully highlight the need to continue long-term monitoring of stratospheric ozone.

I think this is a very wonderful and timely study, as complications surrounding the identification of ozone hole recovery in Antarctica due to dynamic variability are still being discovered and actively discussed, and it is perfectly appropriate for publication in ACP. The authors have addressed all of my concerns and questions in their revised manuscript, and I recommend publication as-is with this revised submission.