EGU21-12805
https://doi.org/10.5194/egusphere-egu21-12805
EGU General Assembly 2021

Evaluation of interannual variability of Arctic and Antarctic ozone loss since 1989

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Ozone depletion over Polar Regions is monitored each year by satellite and ground-based instruments. The first signs of healing of the ozone layer linked to the decrease of ozone destructive substances (ODSs) were observed in Antarctica using different metrics (ozone mean values, ozone mass deficit, area of the ozone hole) and simple or sophisticated models. Chemistry climate models predict that climate change will not affect expected ozone recovery over Antarctica but will accelerate recovery in the Arctic due to the possible enhancement of the Brewer Dobson circulation. However, ozone loss observations by SAOZ UV-Vis spectrometers do not show a clear sign of recovery in the latter region. In addition, a record of 38% ozone loss in 2010/2011 and 2019/2020 was estimated.

In this study, the vortex-averaged ozone loss in the last three decades will be evaluated for both Polar Regions using the passive ozone tracer of two chemical transport models (REPROBUS and SLIMCAT CTMs) and total ozone observations from SAOZ and satellite observations (IASI/METOP and Multi-Sensor Reanalysis (MSR-2)).

The tracer method allows us to determine the evolution of the daily rate of ozone destruction, and the amplitude of the cumulative loss at the end of the winter. The cumulative ozone destruction in the Artic varies between 0-10% in relatively warm winters with short vortex duration to up to 25-38% in colder winters with longer vortex persistence, while in Antarctica it is mostly stable, around 50%.

Interannual variability of 10-days average rate will be analyzed and compared between both hemispheres as well as the timing to reach different thresholds of absolute ozone loss values.

Finally, linear trend of ozone loss and temperature since 2000 will be estimated in both Polar Regions in order to evaluate possible ozone recovery.