Ozone loss In the Arctic winter 2014/2015
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Ozone loss in the Arctic winter 2014/2015


Objectives and Method

Quantification of chemical total ozone loss inside vortex by comparison between modelled passive ozone and measurements.

MEASUREMENTS

- 10 CTM initialized on December 1, 2014 from ECWMF ozone fields
- REPROBUS (ECWMF 1000 - 0.01 hPa)
- SLIMCAT (ECWMF 1000 - 0.03 hPa)
- 2 runs:
  - Passive Ozone
  - Full chemistry

MEASUREMENTS SAOZ

Total ozone:
- SAOZ/NDACC UV Visible network
- Two day of height

1- METEOREOLOGY

- T<sub>nat</sub> from Dec 10 to Dec 31 at 475K and 550K
- Large sunlit V<sub>esc</sub> from Dec 10 to Dec 31
- Sparse cooling below T<sub>nat</sub> and V<sub>esc</sub> in Jan-Mar until March 20

Comparison to previous winters

- Sunlit warming on Jan 1 followed by progressive cooling
- Cold period in March compared to other winters
- Final warming after March 20

2- SAOZ OBSERVATIONS

Ozone loss and denitrification

- Small ozone depletion rate of 0.3% / day between Jan 10 and Feb 10
- Stopped between Feb 10 and Feb 28
- Restarted to 0.5% / day between Mar 1-March 20
- Stopped on March 20
- NO2 diurnal increase and chlorine activation after March 10
- Total cumulated loss of 19 ± 2% close to Arctic Spring average

3- MIMOSA PV FIELDS AND REPROBUS 3D CTM SIMULATION (475 K)

- Small size vortex centered at the North Pole until late March
- Few PSC only in early and late Feb at the Pole
- Chlorine activated until mid-Feb, deactivated progressively
- Ozone loss start in early Feb only, propagating until end of March

SIMULATION (435 K)

- Much more PSC, chlorine activation and ozone loss up to 50% at lower altitude at 435 K in late illuminated vortex in March

4- MODEL LOSS ABOVE SAOZ STATIONS

REPROBUS: 17% ~ 89 DU

- REPROBUS mixing:
  - 0.15% day from Jan 1 up to March 1
  - 0.15% day from March 1 up to March 15
  - Stopped on March 20

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CONCLUSION WINTER 2014/2015:

- Long lasting vortex
- Total ozone loss of 19% close to average depletion in the Arctic
- 19% loss due to vortex duration until March 20
- Less de-activation at lower altitude (435 K)
- Maximum destruction at lower altitude (435 K) than usual (475-550 K)