

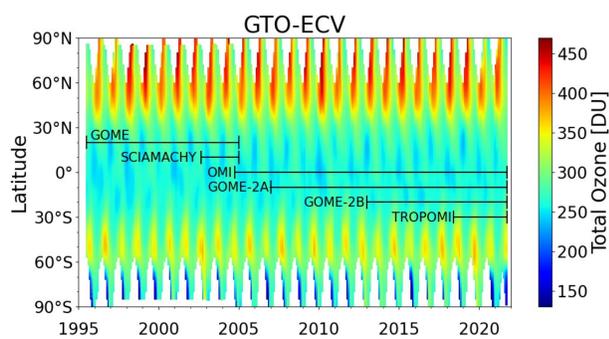
M. Van Roozendael, C. Lerot, J.-C. Lambert, D. Hubert, A. Keppens, J. Vlietinck, D. Balis, K. Garane, M.-L. Koukouli, P.-F. Coheur, C. Wespes, D. Loyola, M. Coldewey-Egbers, K.-P. Heue, M. Dameris, R. Siddans, B. Kerridge, B. Latter, V. Sofieva, R. van der A, O. Tuinder, M. van Weele, A. Rozanov, M. Weber

The Ozone_cci+ project concentrated on the generation of harmonized long-term ozone data sets suitable to investigate the variability and changes in atmospheric ozone. We exploit the combination of a large number of space nadir sensors complemented by limb-type instruments allowing to characterize the ozone vertical distribution at various horizontal scales. Products developed within CCI+ are subsequently integrated in C3S for operational processing. This poster illustrates the status of main ongoing activities and highlights recent science achievements.

Inclusion of TROPOMI/S-5p in merged GTO-ECV data record

The GOME-type Ozone ECV (GTO-ECV) data record was extended with ozone data from TROPOMI.

The TROPOMI instrument was launched on board of Sentinel-5 Precursor in October 2017. The operational off-line total ozone product is based on the CCI algorithm (GODFIT v4) which allowed smooth integration in the merged GTO-ECV CDR.



Coldewey et al., AMT, 13, 1633–1654, 2020

Multi-sensor ozone re-analysis since 1957

The Multi-Sensor Reanalysis (MSR) ozone column dataset has been upgraded to allow assimilation of filtered Dobson observations from 1957 to 1978 alongside satellite observations. The resulting MSR time series covers 6 decades and is available at the resolution of $1^\circ \times 1^\circ$.

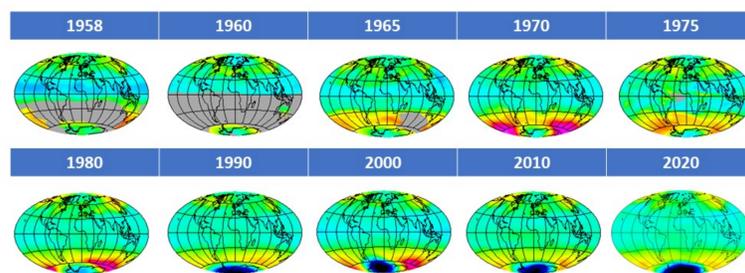
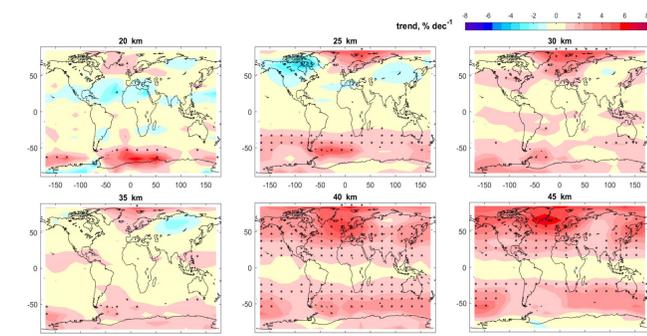


Image © R. van der A, KNMI

Regional trends in ozone profiles from 2001 to 2020

The Merged GRidded Dataset of Ozone Profiles (MEGRIDOP) combines data from 6 limb-viewing satellite instruments (MIPAS, SCIAMACHY, GOMOS, OSIRIS, OMPS-LP, MLS). Monthly means are gridded in latitude-longitude bins of $10^\circ \times 20^\circ$ and cover altitudes from 10 to 50 km.

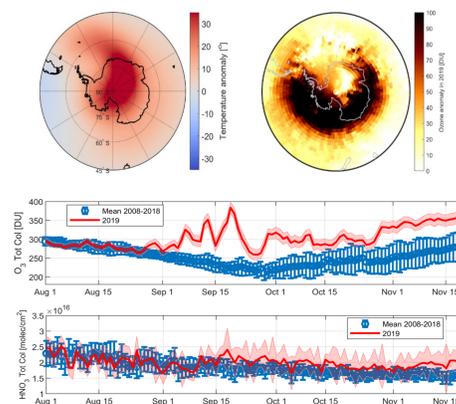
- Positive significant trends in the upper stratosphere
- Longitudinal structure at NH middle and high latitudes, with enhanced trends over Scandinavia/Atlantic ocean.



Sofieva et al., Atmos. Chem. Phys., 21, 6707–6720, 2021

2019 sudden stratospheric warming event over the Antarctic

Using temperature, O_3 and HNO_3 from IASI, increase in stratospheric temperature of 34.4° is found on 20 September in the $60^\circ\text{--}90^\circ\text{S}$ latitude band. Dynamical parameters suggest locally reversed and weakened zonal winds and a shift in the location of the polar jet vortex. This leads to air masses mixing, reduced formation of polar stratospheric clouds and lower O_3 depletion.

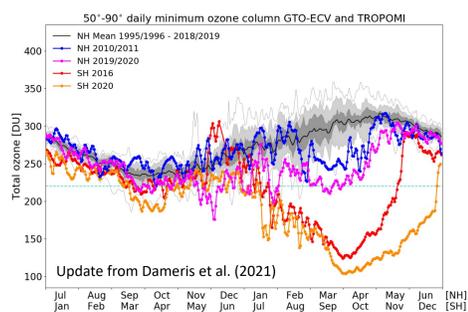


Safieddine et al., GRL 47, 2020 <https://doi.org/10.1029/2020GL087810>

Contribution to BAMS 'State of the Climate 2020' annual report

- ozone increase in upper stratosphere since 2000
- near zero trends in the lower stratosphere

- Record ozone depletion in Arctic winter 2019/20
- Prolonged Antarctic ozone hole season in 2020



M. Weber et al., Stratospheric ozone [in "State of the Climate in 2020"]. Bull. Amer. Meteor., 102 (8), S92-S95, <https://doi.org/10.1175/BAMS-D-21-0098.1>

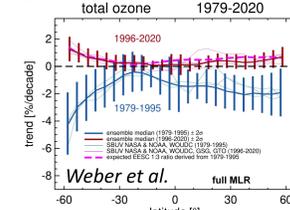
Contribution to Quadrennial Ozone Symposium (QOS 2021)

Major contribution from Ozone_cci team to QOS 2021 (Oct 3rd-9th)

- 10 presentations addressing :
- Long-term trends
 - Validation
 - Polar ozone events
 - Stability of ozone CDRs
 - Uncertainty assessment
 - GCOS compliancy
 - Etc

Total ozone trends from 5 merged datasets

- Ozone recovery at SH and NH middle latitudes
- Zero trends after 1996 in the tropics
- Observed recovery trends are in agreement with stratospheric halogen evolution → Montreal Protocol works!



Validation of CCI total ozone datasets

- Mean biases range between +0.5 % and +2 %
- Mean standard deviations: 3 – 3.7 %
- Excellent consistency between OMI and OMPS, within $\pm 0.5\%$. TROPOMI is reporting lower TOCs by $\sim 0.5\%$.

