

# Ozone CCI / C3S Climate Data Records

## Portfolio and recent science results



Climate  
Change Service

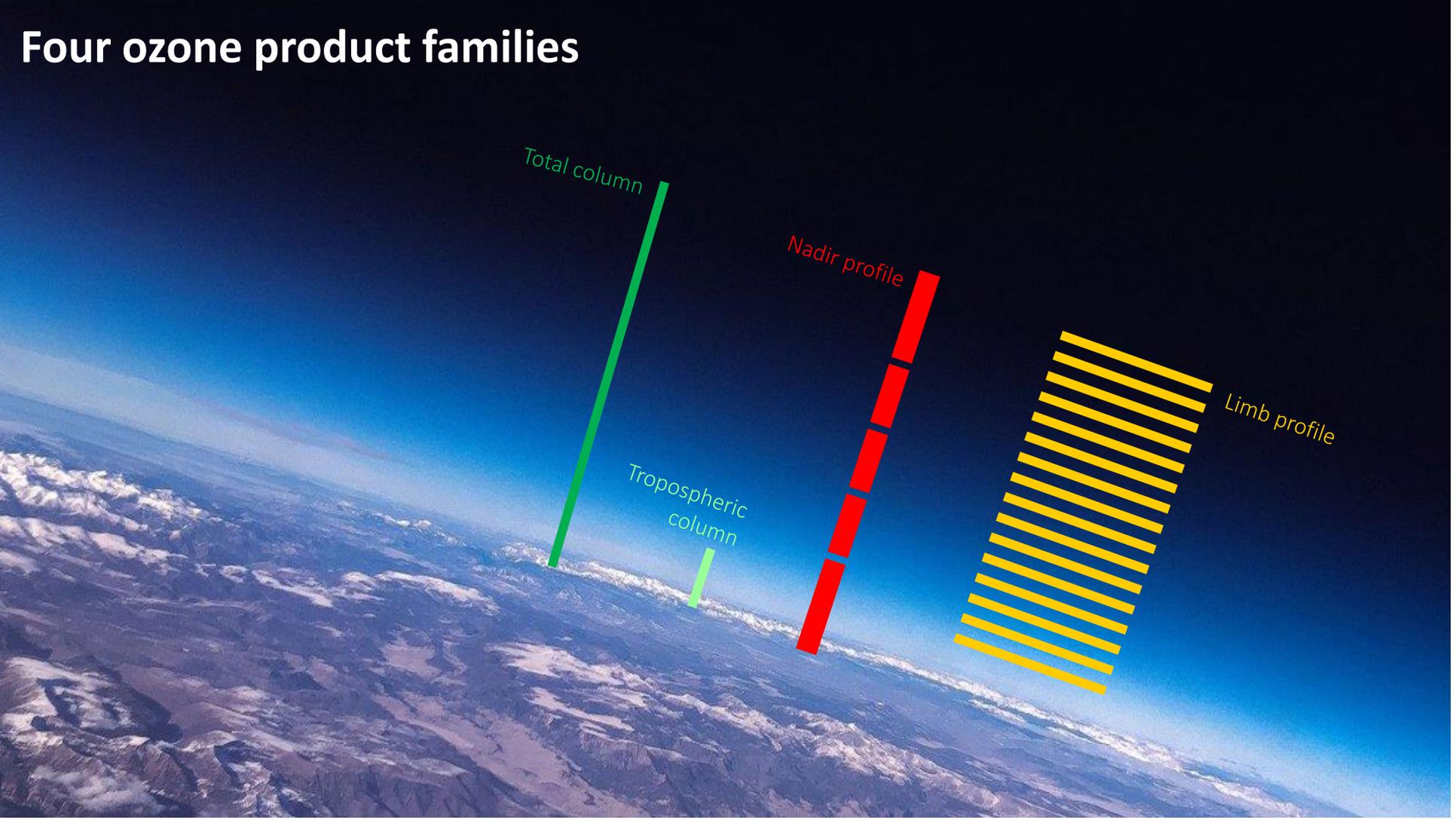
[climate.copernicus.eu](http://climate.copernicus.eu)

D. Hubert & A. Keppens for the CCI & C3S teams

C. Arosio, D. Balis, P.-F. Coheur, M. Coldewey-Egbers, J. de Laat, K.-U. Eichmann, M. Eisinger, K. Garane, K.-P. Heue, D. Hurtmans, B. Kerridge, M.L. Koukouli, J.-C. Lambert, B. Latter, D. Loyola, A. Rozanov, R. Siddans, V. Sofieva, M. Szlag, R. van der A, M. Van Roozendaal, M. van Weele, T. Verhoelst, J. Vlietinck, M. Weber and C. Wespes



# Four ozone product families



Total column

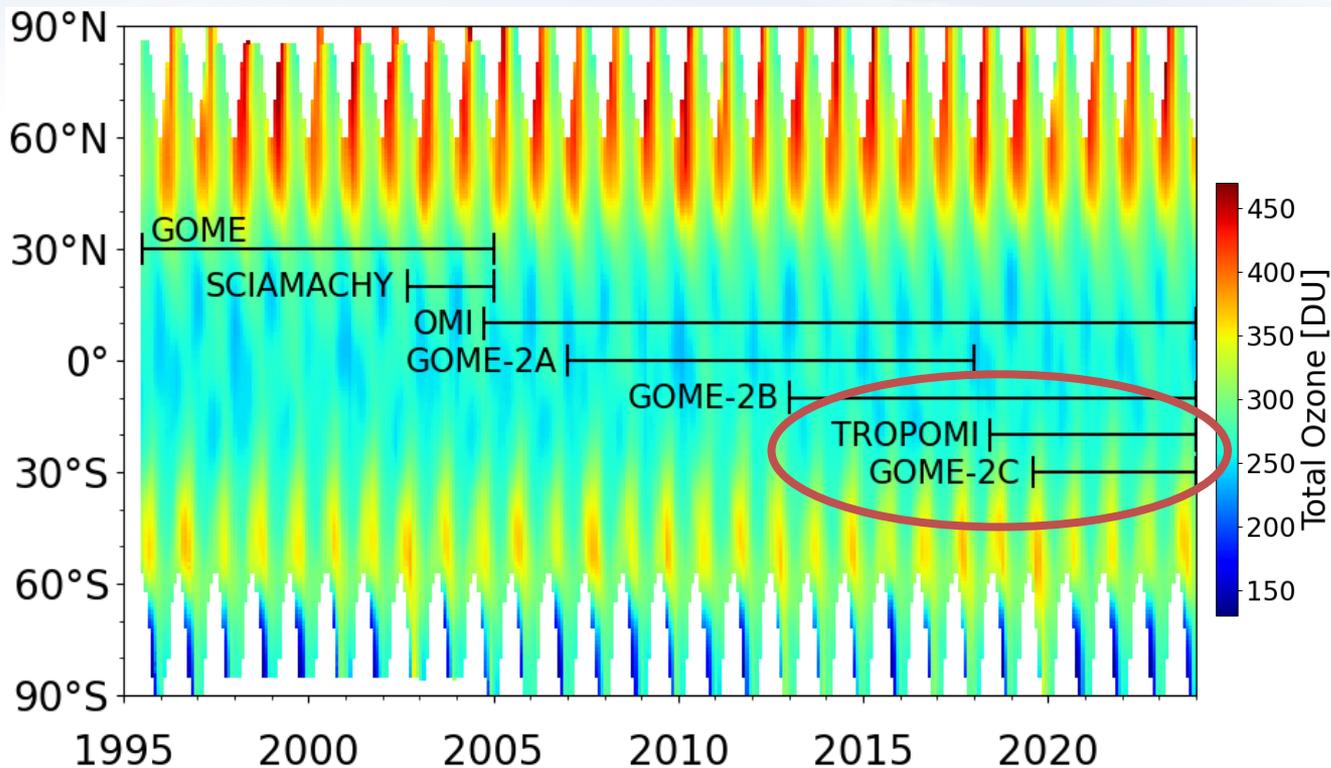
Nadir profile

Limb profile

Tropospheric column

# Total ozone : GTO-ECV

(1° x 1° x month, since 1995, daytime)

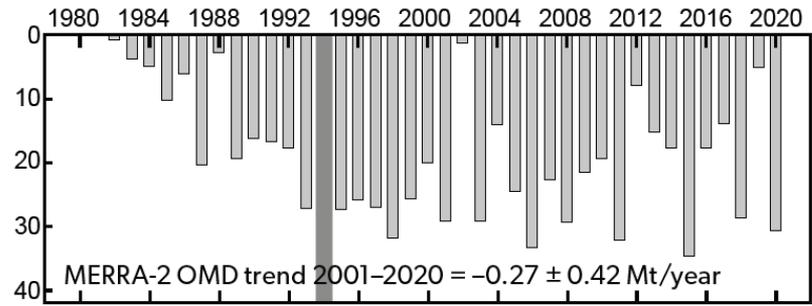
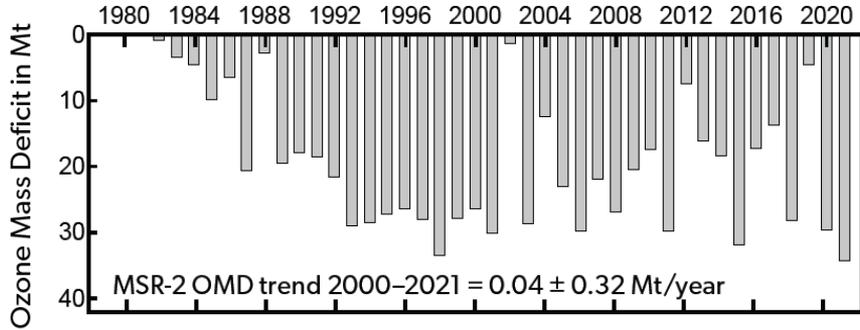
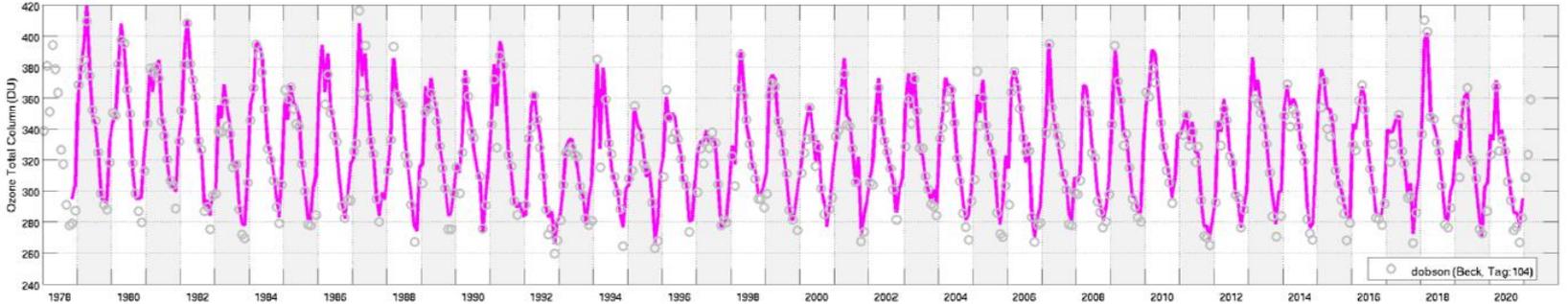


More details and applications: Coldewey-Egbers et al. (2014, 2015, 2020, 2022), Loyola et al. (2009), Loyola and Coldewey-Egbers (2012), Chiou et al. (2014), Lerot et al. (2014), Koukouli et al. (2015), Weber et al. (2018, 2022), Chipperfield et al. (2018), Garane et al. (2018), Eleftheratos et al. (2019), Dameris et al. (2021), WMO/UNEP (2018, 2022)



# Total ozone : MSR-2

(0.5° x 0.5° x month, since 1960)



1-14 October average

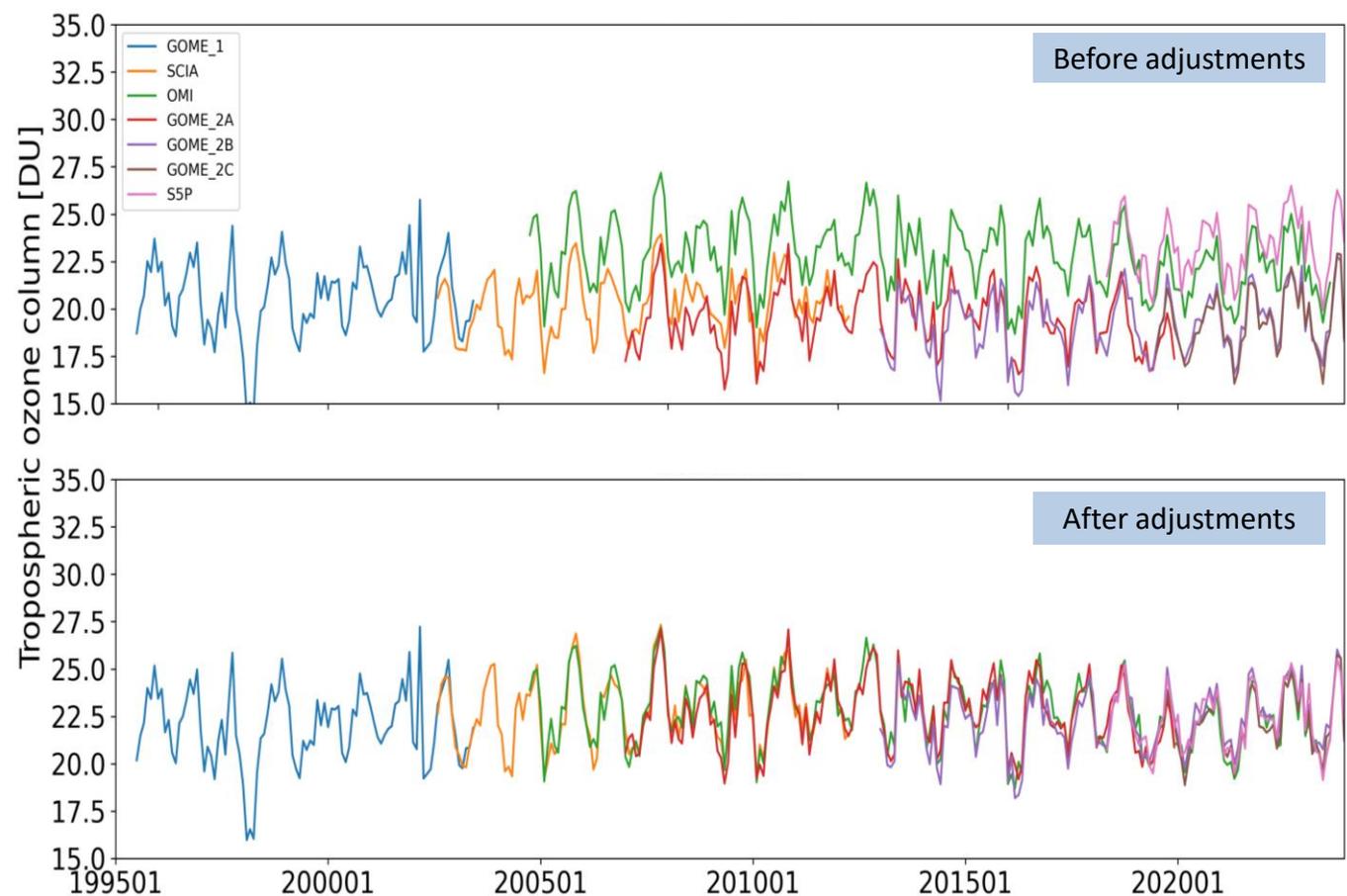
# Tropospheric ozone – CCD : GTTO-ECV

(1° x 1° x month, since 1995)



**\*NEW\***

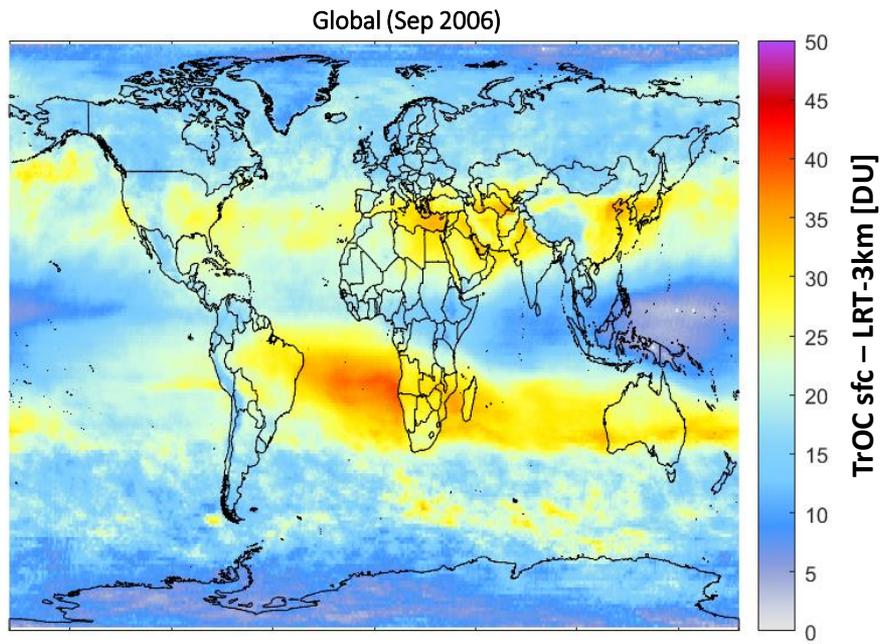
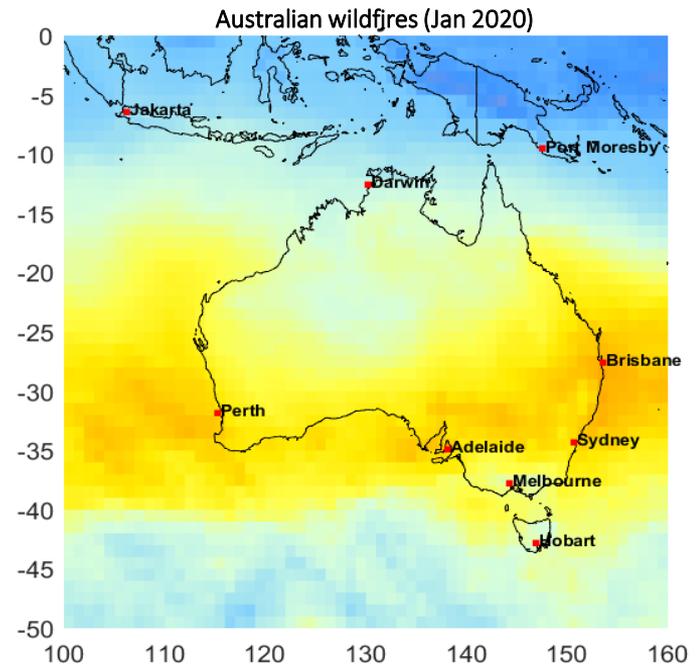
Poster 5.4 by  
**K.-P. Heue**



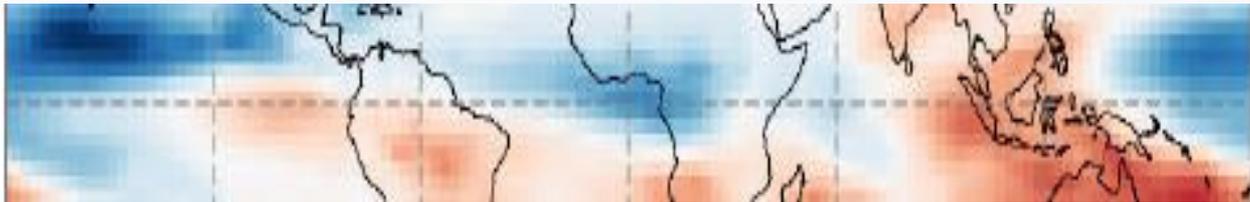
# Tropospheric ozone – LNM : OMI/GTO-LIMB (1° x 1° x month, since 2004)



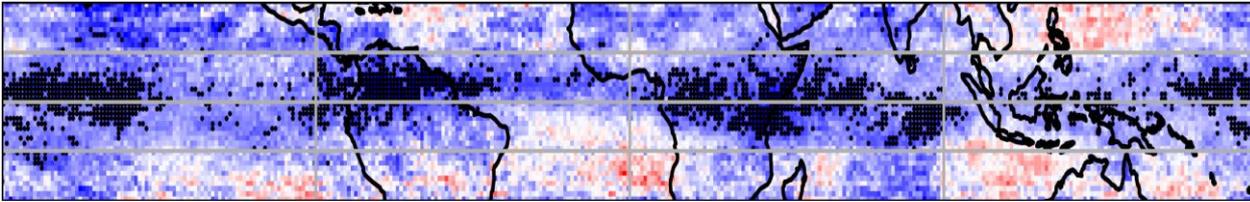
\*NEW\*



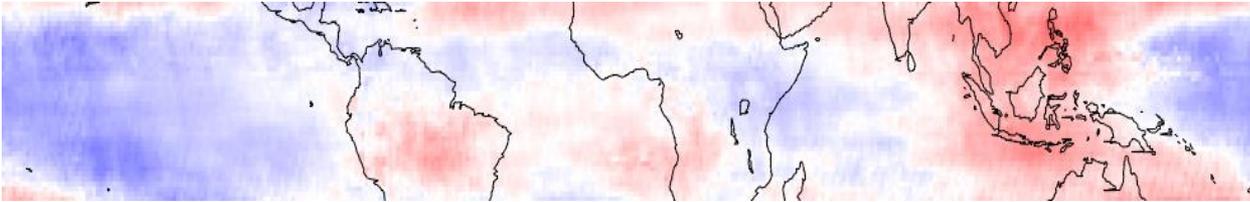
# Tropospheric ozone : simulated vs. observed trend 2008-2019



EMAC RD1SD  
sfc – 200 hPa



GTTO-ECV  
sfc – 200 hPa



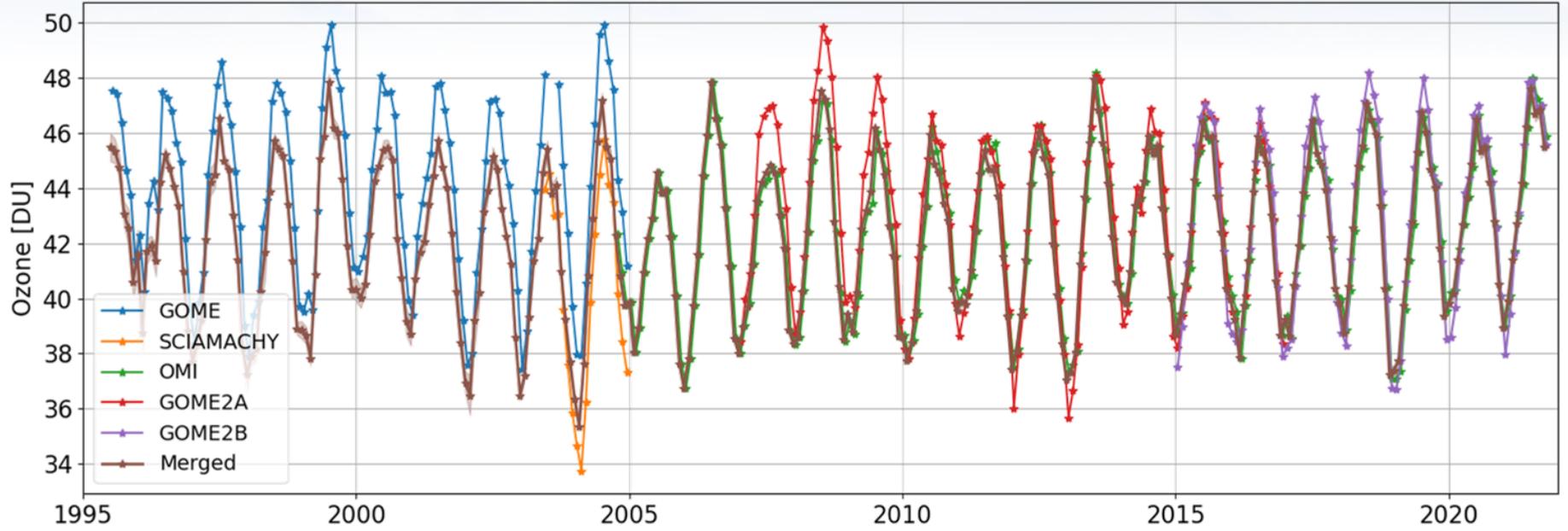
OMI-LIMB  
sfc – LRT-3km

# Ozone profile – nadir : GOP-ECV

(5° x 5° x month, since 1995, day)



Latitude: 10°-15°N, longitude: 0°-5°E, altitude: 20-24km



**\*NEW\*** Oral 5.1.2 by M. Coldewey-Egbers

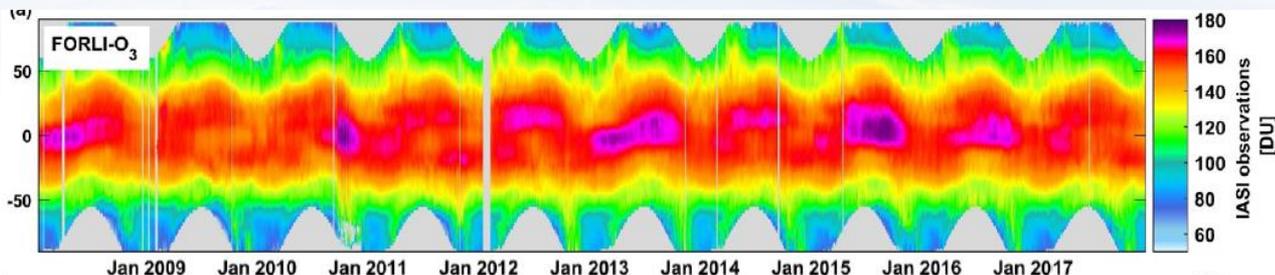
# Ozone profile – nadir : merged IASI

(1° x 1° x day, since 2008, day+night)

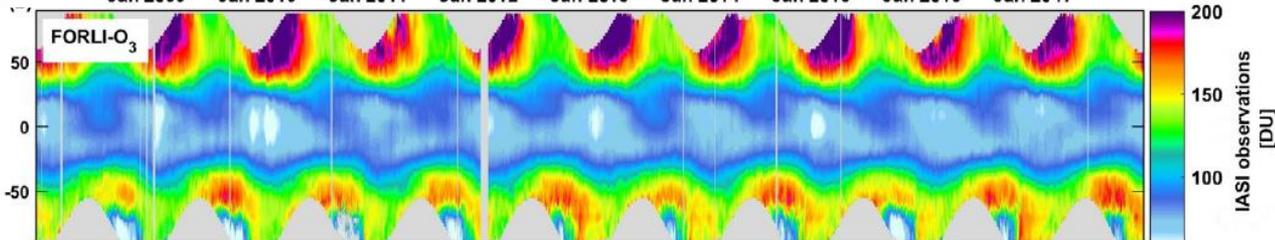


**\*NEW\***

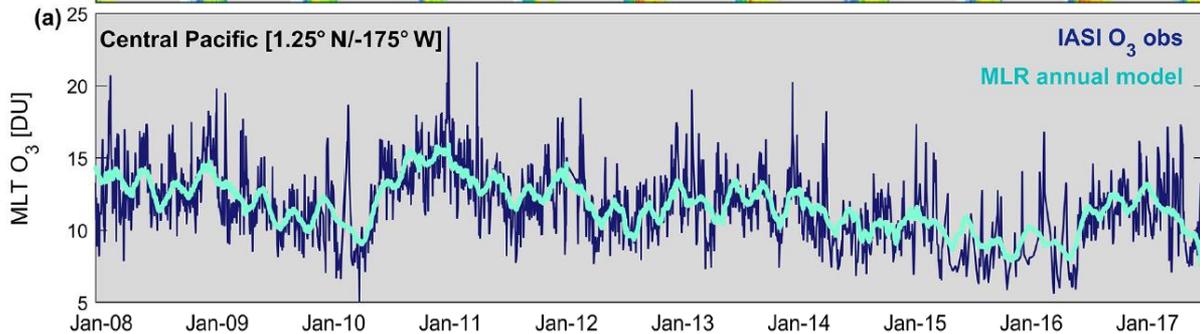
Mid-Upper Strato  
25 hPa - TOA



Lower Strato  
150-25 hPa



Mid-Lower Tropo  
sfc-300 hPa



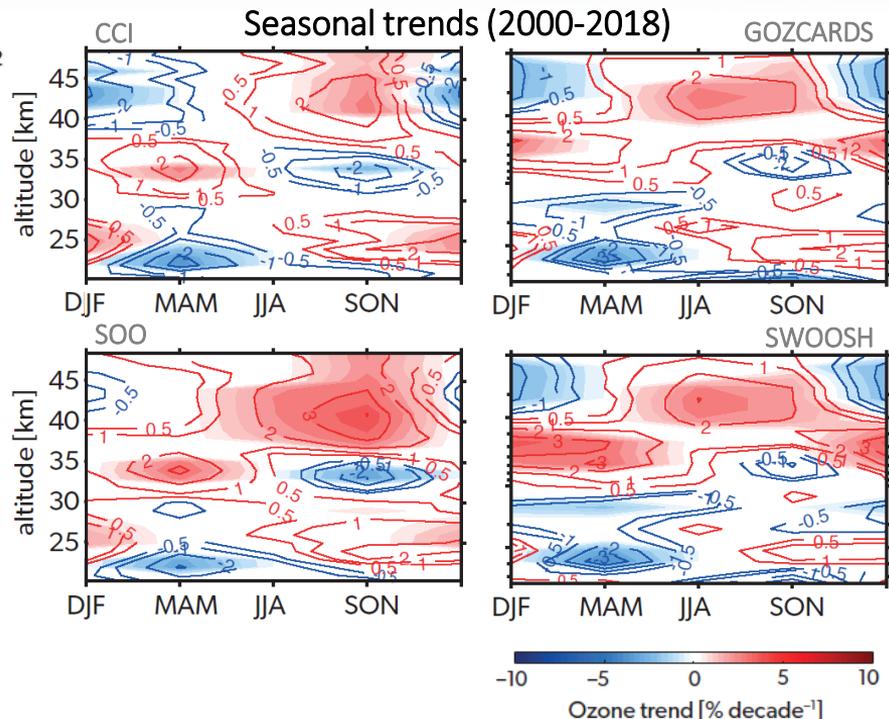
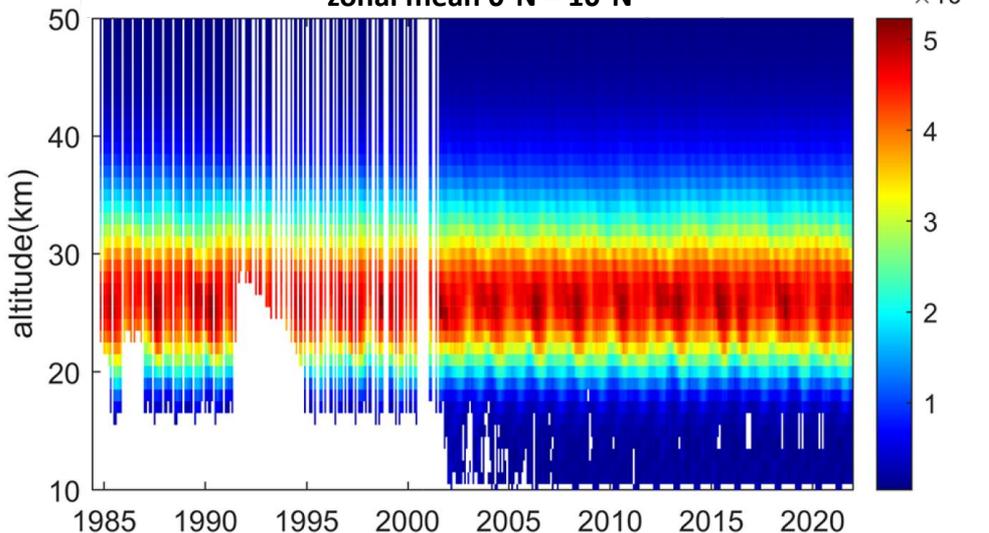
# Ozone profile – limb : SAGE-CCI-OMPS+

(10° x month, since 1984)



Oral 5.1.6 by V. Sofieva

zonal mean 0°N – 10°N

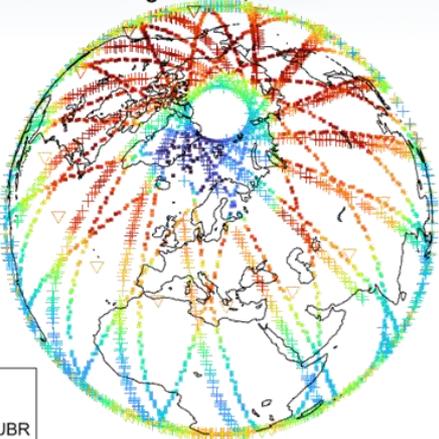


# Ozone profile – limb : HIRES

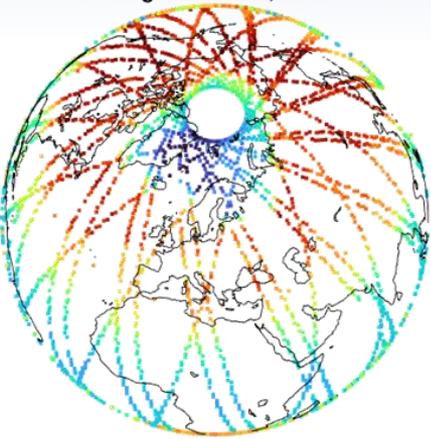
(1° x 1° x day, since 2001)



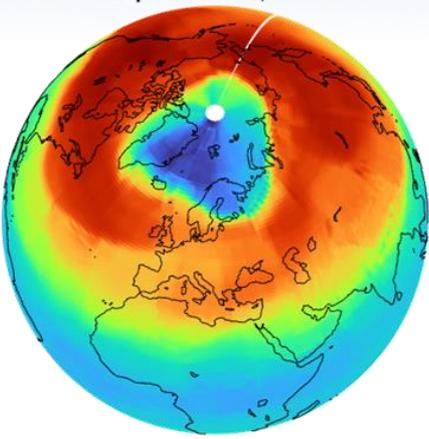
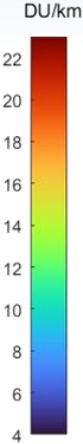
Original data, 50 hPa



Homogenized data, 50 hPa



Interpolated data, 50 hPa



6 Apr 2020  
• MLS  
\* OSIRIS  
+ OMPS UBR  
▽ SAGE III

**\*NEW\*** Oral 5.1.6 by V. Sofieva



# CCI / C3S Ozone Data Distribution

Level-2 and some Level-3 ozone data products generated within CCI are freely accessible from the ozone CCI web page (ftp site) <https://climate.esa.int/en/projects/ozone>

Most Level-3 ozone data products are distributed via the Copernicus Climate Data Store (CDS) <https://cds.climate.copernicus.eu/>

The screenshot shows the ESA Climate Office website for the Ozone project. The header includes the ESA logo and navigation links for Home, Projects, and Ozone. The main content area features a large blue image of the Earth with the text: "The Ozone project focuses on the generation of multi-decadal time series of harmonised and consistent ozone data suitable to assess long-term changes in total ozone, as well as its vertical distribution." Below this, there is a section titled "About the project" with a brief description of the project's goals.

The screenshot shows the Copernicus Climate Data Store (CDS) website for Ozone data. The header includes the Copernicus and ECMWF logos. The main content area features a large blue image of the Earth with the text: "Ozone monthly gridded data from 1970 to present derived from satellite observations". Below this, there is a section titled "Data Description" with a table of data characteristics.

DATA DESCRIPTION	
Data type	Gridded (Global)
Horizontal coverage	Global
Horizontal resolution	1° x 1° for main products 10° latitude bands for long products (zonal averages) 10° x 20° for the gridded limb-imagined product
Vertical resolution	Profile and total column data (depending on the product)
Temporal coverage	1970 to present, but shorter for some sensors
Temporal resolution	Monthly



# Final thoughts



- The CCI/C3S ozone team reaches out to **help you work with the CCI / C3S data products.**  
Don't hesitate to contact [daan.hubert@aeronomie.be](mailto:daan.hubert@aeronomie.be)
- New / improved ozone CCI **CDRs will be released in Fall 2024.**  
Not all CCI/C3S ozone Climate Data Records were presented here
- ESA's **Climate-Space** program continues. Next ozone CCI phase will start in Fall 2024.



- 2021-R5 Community activities on tropospheric ozone:** Substantial team contributions to IGAC Tropospheric Ozone Assessment Report II and to CEOS VC-20-01 harmonisation of tropospheric ozone constellation.
- 2021-R36 Support for ground-based Cal/Val observations:** Ongoing efforts to harmonize reference data and uncertainties across networks (FRM...) are helpful. However, ground-based ozone monitoring is under pressure, at key stations and even for entire networks (SAOZ)  $\Rightarrow$  we are gradually losing essential validation capabilities for O<sub>3</sub> CDR compliance with GCOS requirements, Brewer-Dobson Circulation...
- 2021-R42 Limb sounding capability:** ALTIUS is greatly appreciated as a gap filler for O<sub>3</sub> and a few other species. The EE-11 CAIRT limb mission (in Phase A) remains highly recommended to measure all other O<sub>3</sub> relevant species (sources, reservoirs, Montreal Protocol...), to better understand (changes in) circulation and waves and their impacts on ozone and climate, and to understand the tension between observations and CCM simulations in the lower stratosphere.



# Backup

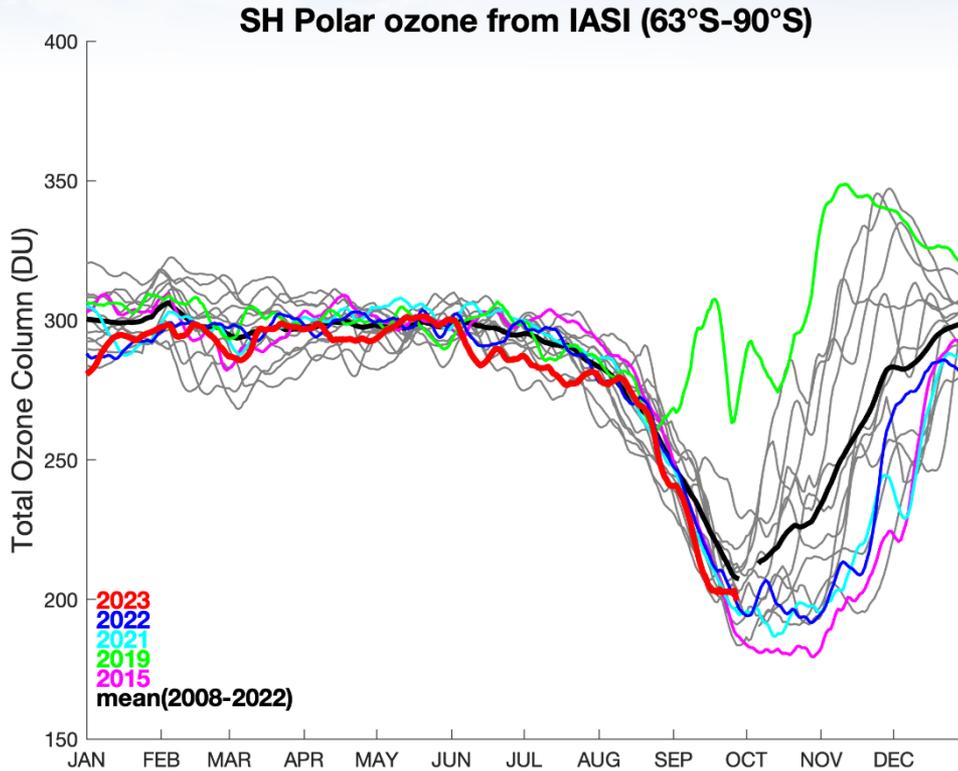
# ESA'S CLIMATE CHANGE INITIATIVE



GCOS defined **55** Essential Climate Variables | **36** benefit from space observations | **27** generated by ESA Climate Change Initiative

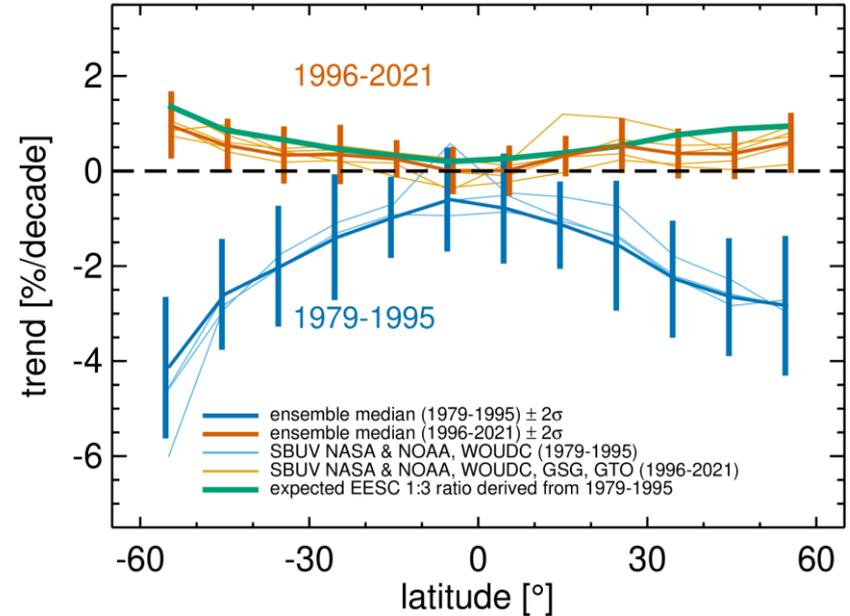
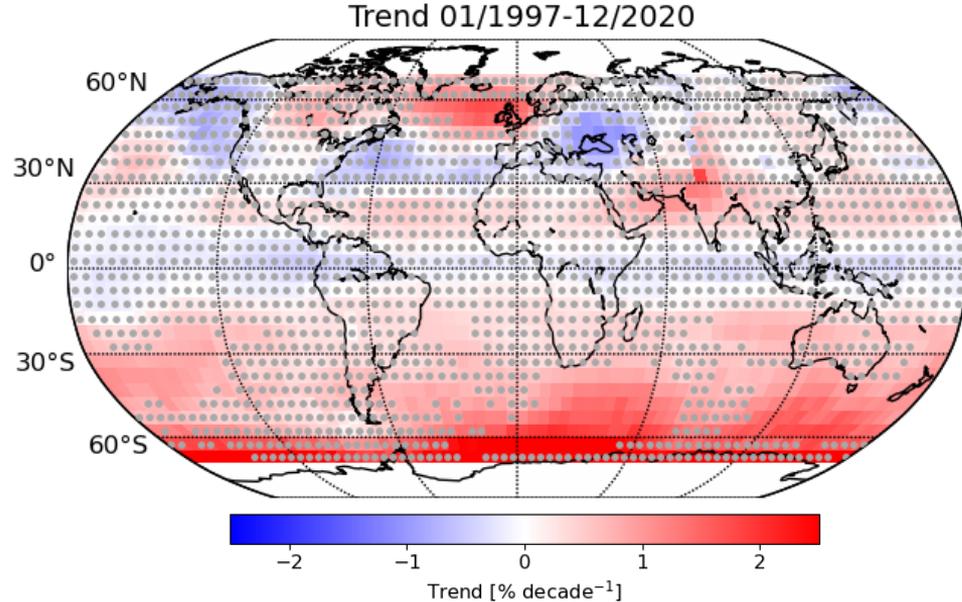


[www.climate.esa.int](http://www.climate.esa.int)





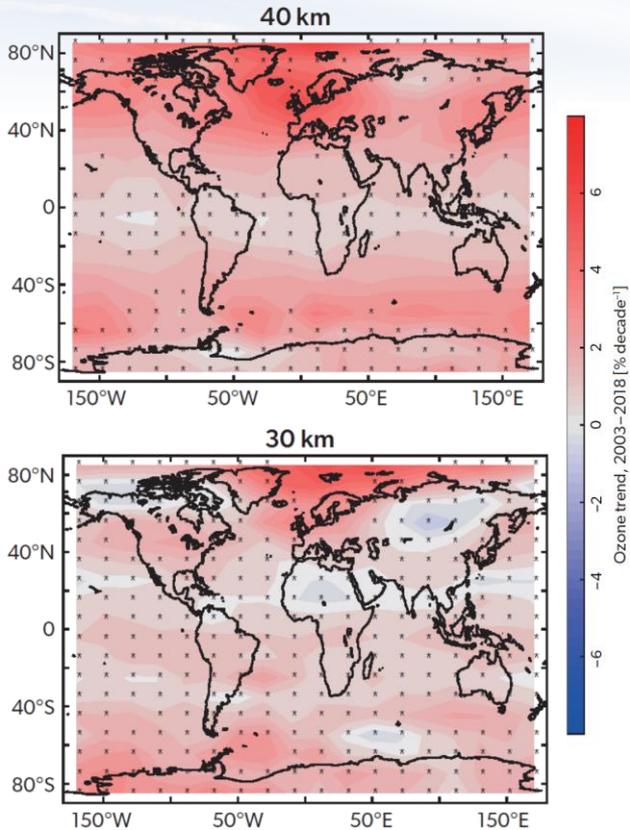
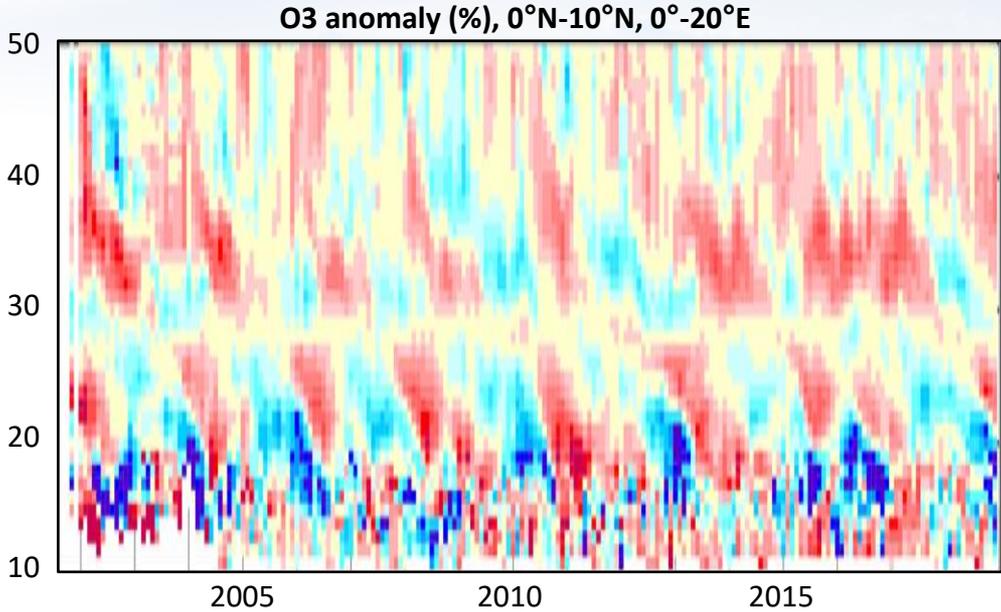
# Total ozone trends



More details and applications: Coldewey-Egbers et al. (2014, 2015, 2020, 2022), Loyola et al. (2009), Loyola and Coldewey-Egbers (2012), Chiou et al. (2014), Lerot et al. (2014), Koukouli et al. (2015), Weber et al. (2018, 2022), Chipperfield et al. (2018), Garane et al. (2018), Eleftheratos et al. (2019), Dameris et al. (2021), WMO/UNEP (2018, 2022)

# Ozone profile – limb : MEGRIDOP

(10° x 20° x month, since 2001)



Oral 5.1.6 by V. Sofieva

Sofieva et al (2021), WMO/UNEP (2022)

