

# 21st century trends in stratosphere-to-troposphere transport

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For more information on this work, please refer to:

**Abalos, M., Orbe, C., Kinnison, D. E., Plummer, D., Oman, L. D., Jöckel, P., Morgenstern, O., Garcia, R. R., Zeng, G., Stone, K. A., and Dameris, M.:**

**Future trends in stratosphere-to-troposphere transport in CCMI models,  
*Atmos. Chem. Phys., in press.***

|| → <https://www.atmos-chem-phys-discuss.net/acp-2019-581> ← ||

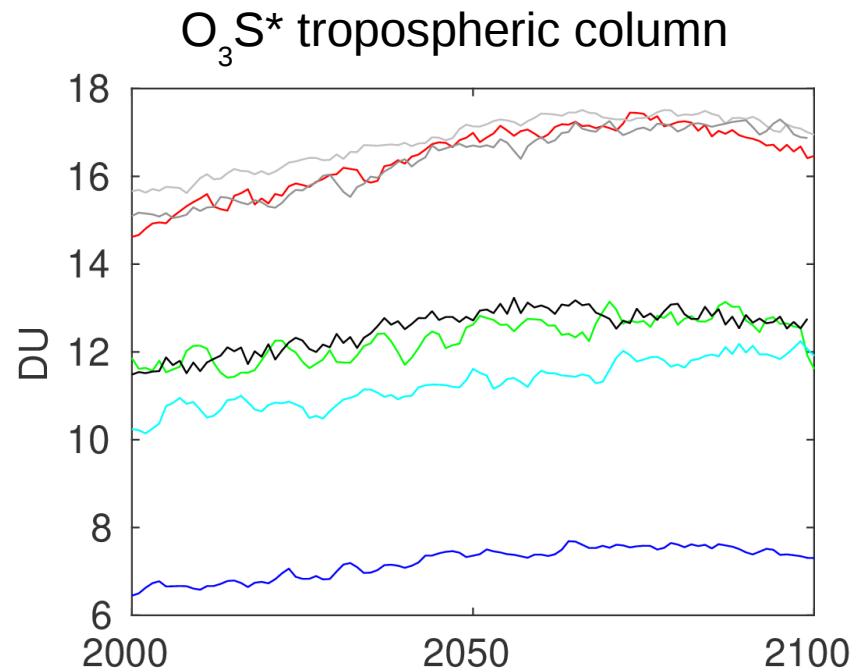


# Key points

- 1- Robust increase in stratosphere-to-troposphere transport (STT) across CCMI models.**
- 2- Subtropical upper troposphere maxima in stratospheric tracers due to enhanced advection by strengthened shallow branch BDC and upper part of Hadley cell.**
- 3- Changes in STT due to GHG. ODS decrease contributes to enhanced STT of ozone by enlarging the lower stratosphere reservoir.**

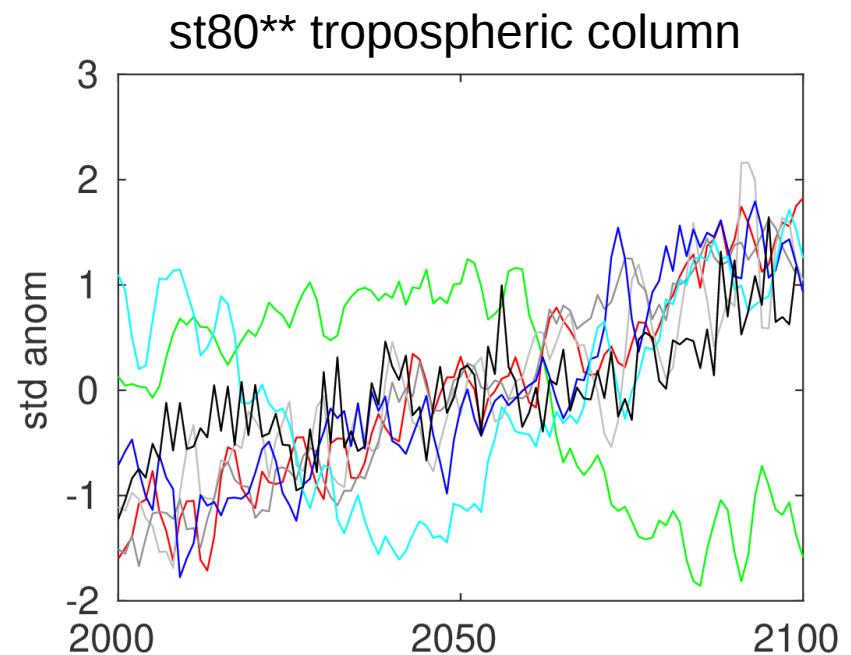


# 1- Robust increase in stratosphere-to-troposphere transport (STT) across CCMI models.



\* stratospheric ozone (no production in the troposphere)

- ACCESS
- CMAM
- EMAC-L47MA
- EMAC-L90MA

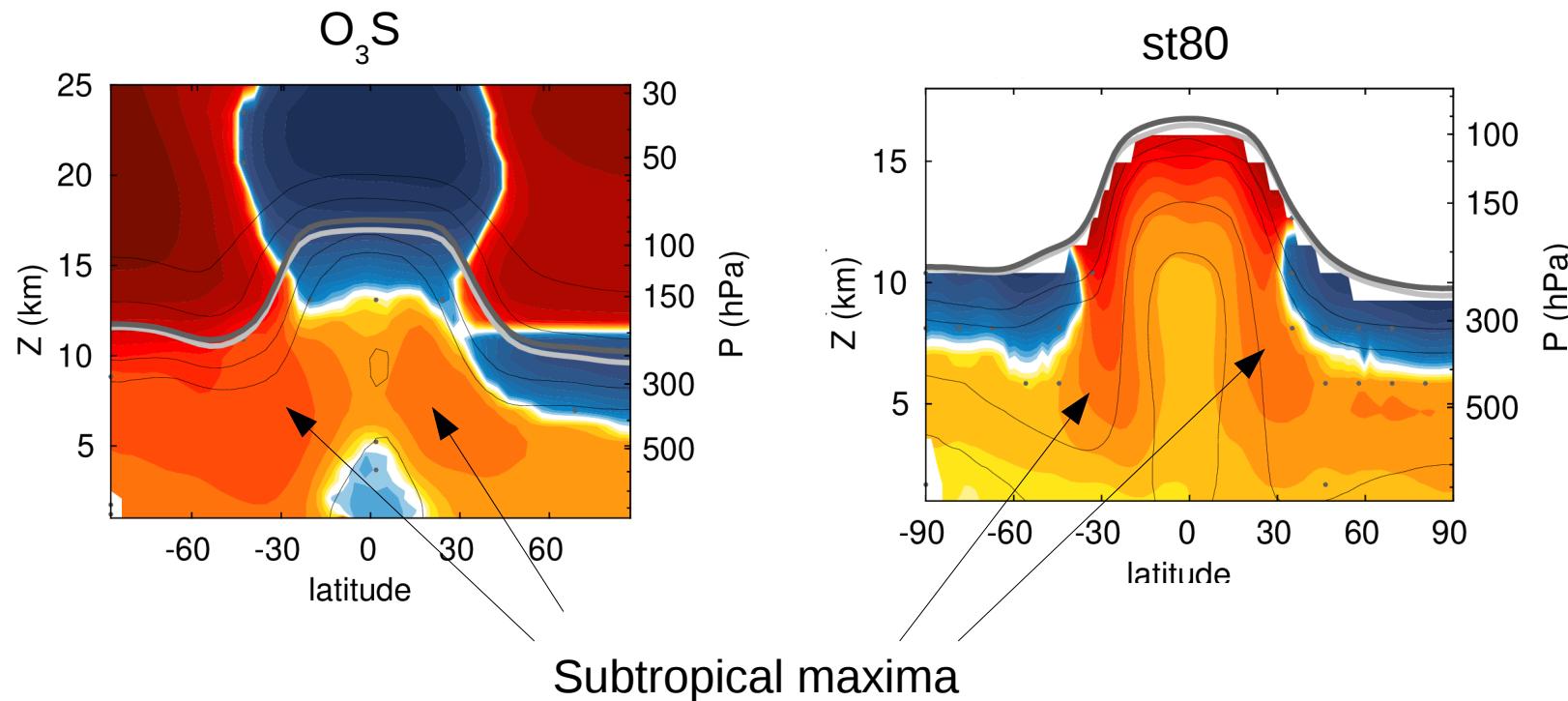


\*\* stratospheric passive tracer

- GEOSCCM
- NIWA
- WACCM

## 2- Subtropical upper troposphere maxima in stratospheric tracers due to enhanced advection by strengthened shallow branch BDC and upper part of Hadley cell.

2000-2099 trends

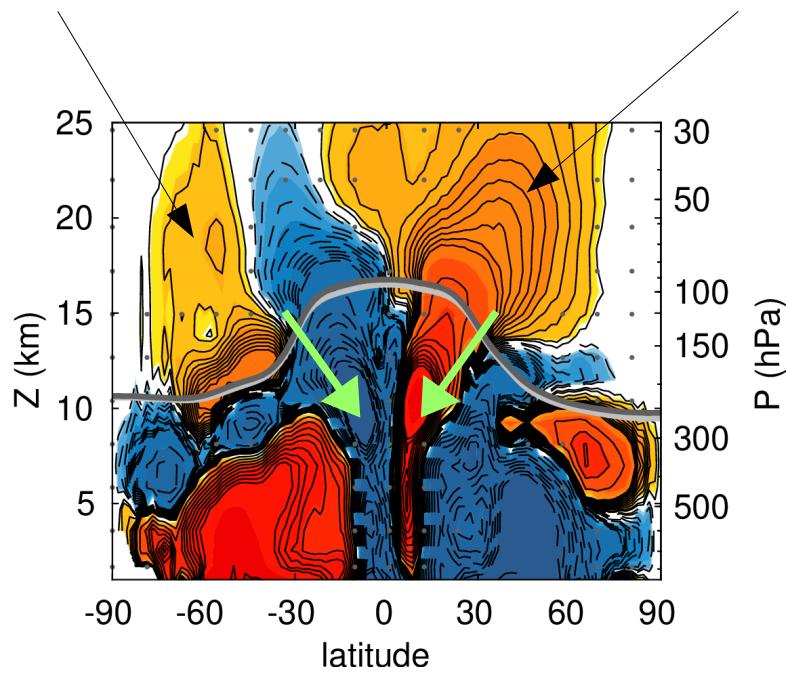


\* negative band around extratropical tropopause linked to tropopause rise



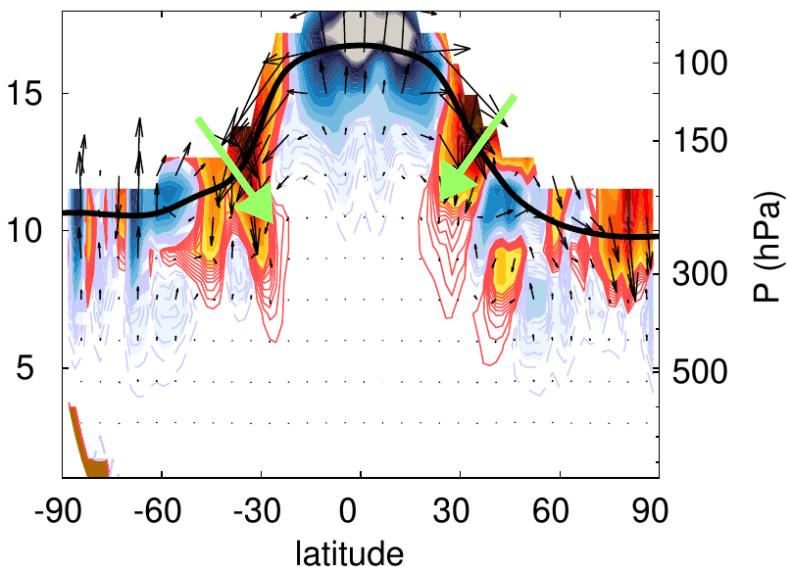
## 2- Subtropical upper troposphere maxima in stratospheric tracers due to enhanced advection by strengthened shallow branch BDC and upper part of Hadley cell.

Dynamical impact of ozone hole recovery  
(Polvani et al. 2018, 2019)



Brewer-Dobson circulation (BDC) acceleration

2000-2099 trends



Residual circulation streamfunction

Advective transport of st80 by the residual circulation



### 3- Changes in STT due to GHG. ODS decrease contributes to enhanced STT of ozone by enlarging the lower stratosphere reservoir.

2000-2099 trends

