



Online | 2021-02-24

Stratospheric WG report

to the GEOS-Chem Steering Committee

GEOS-Chem v13 stratospheric benchmark

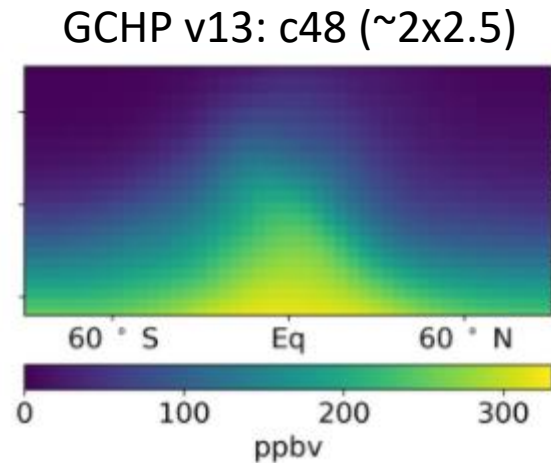
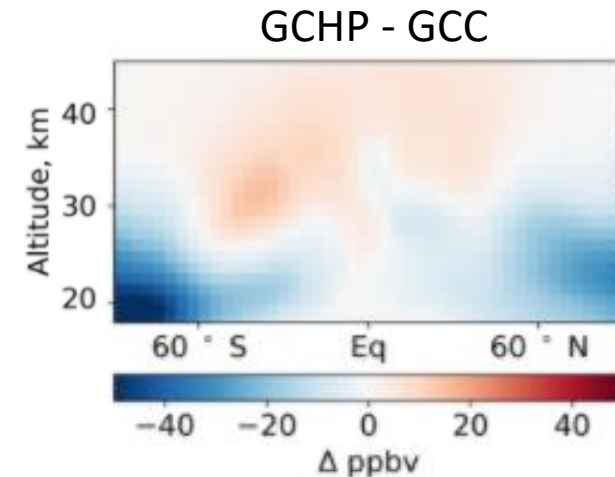
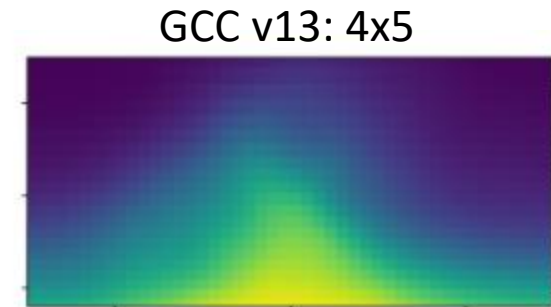
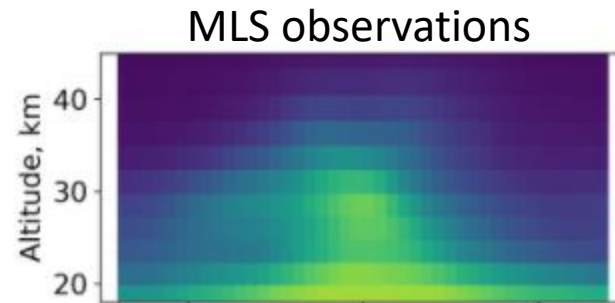
- Overall assessment: positive!
- Notable discrepancies and differences
- Recommendations



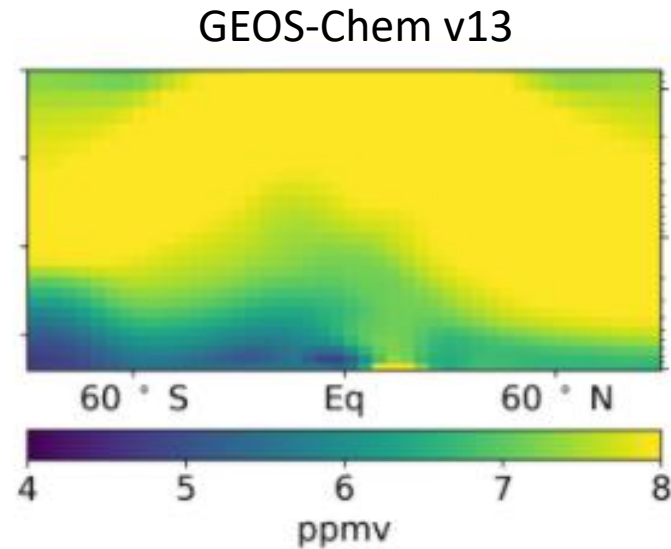
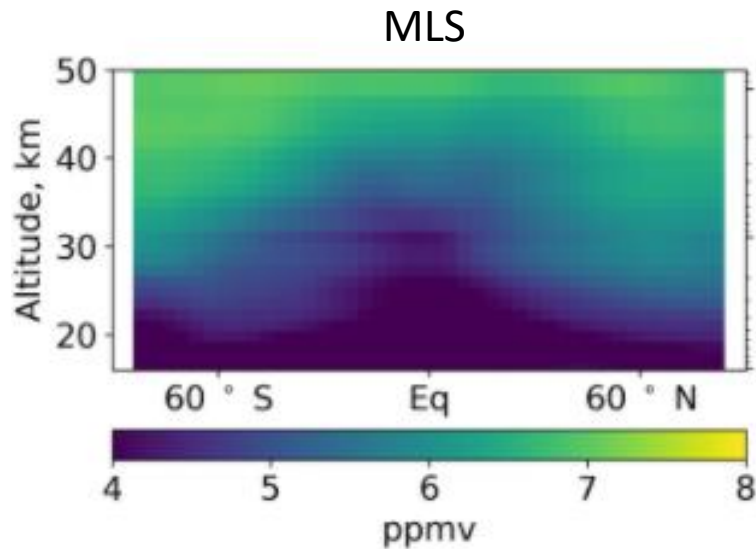
GCv13 stratospheric benchmark: transport

Resolution dependency

- Evidence of excessive horizontal transport for long-lived species
- Error greater in GCC than GCHP benchmark
- Differences likely due to resolution ($\sim 2x$)



GCv13 stratospheric benchmark: water



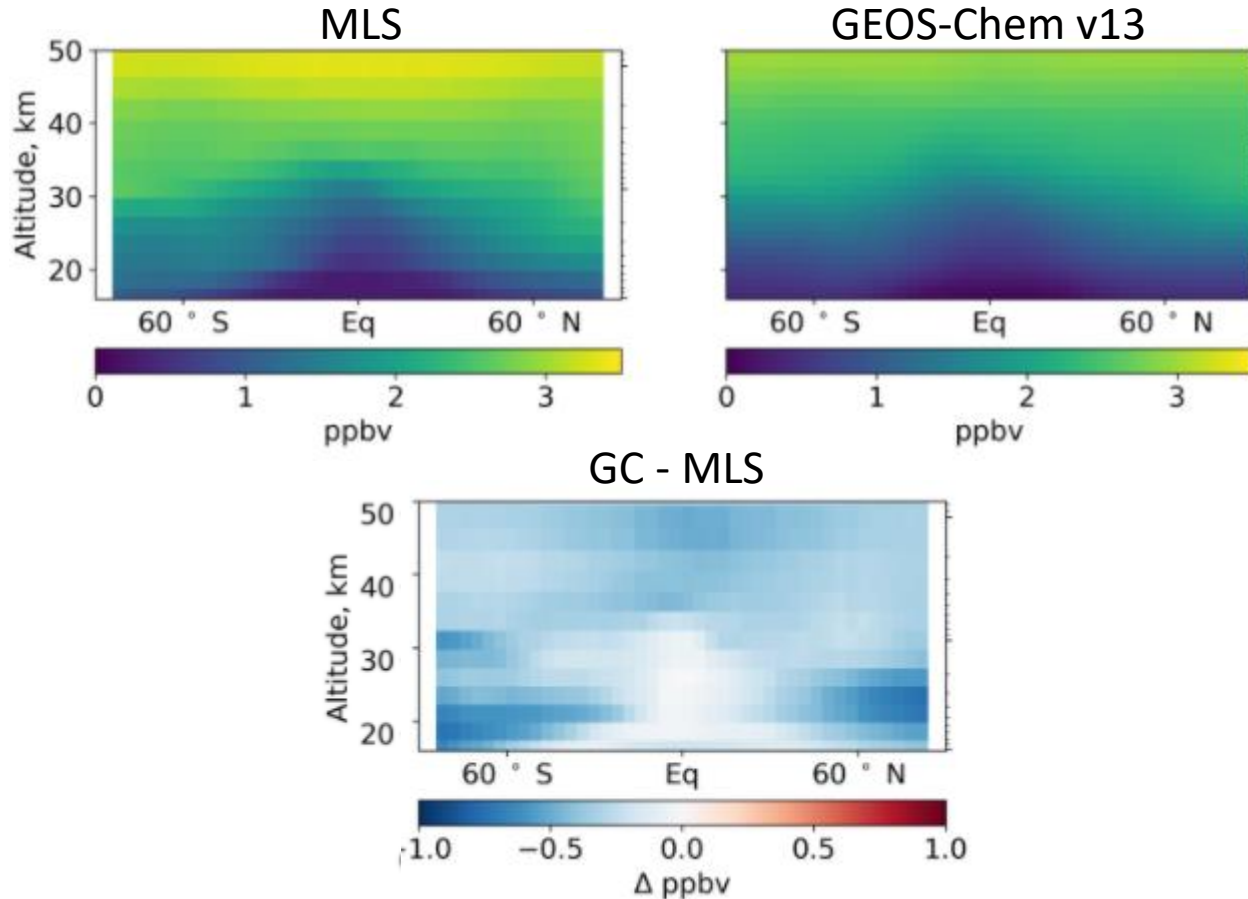
Stratospheric monsoon

- Discovered some confusion over stratospheric water vapor setting – will be resolved in upcoming GC version
- Current stratosphere **floods over time** – work is needed to fix the boundary condition

GCv13 stratospheric benchmark: chlorine

Chlorine deficit?

- Most chlorine species seem low in GEOS-Chem compared to MLS
- May be evidence of an emissions deficit
- GEOS-Chem also finding ClO **excess** during Antarctic spring



GCv13 stratospheric benchmark: recommendations

Immediate actions

- **Water:** Remove option to set initial stratospheric water vapor to meteorology [*done*]
- **Long-lived species:** Need GCHP age-of-air results to diagnose transport issues [*WIP?*]
- **Chlorine:** Extend stratospheric benchmark to include comparison to new GMI estimates of polar chlorine partitioning [*available soon*]

Research actions (requests/suggestions)

- Investigate resolution-dependency of stratospheric transport biases
- Improve stratospheric water vapor boundary condition

Long-term: if a 47-layer full-chemistry option is made available: please benchmark!

Other updates to the stratosphere

Near-term

- Online methane fluxes (Marais group, UCL)
- Mesospheric chemistry (Marais group, UCL)
- Stratospheric chemistry in the adjoint (LAE, MIT)

Longer-term

- Stratospheric adjustment for radiative forcing (LAE, MIT)
- Extended diagnostics for RRTMG (Jonathon Moch, Harvard)