

Initial Comparison between START08 and WACCM

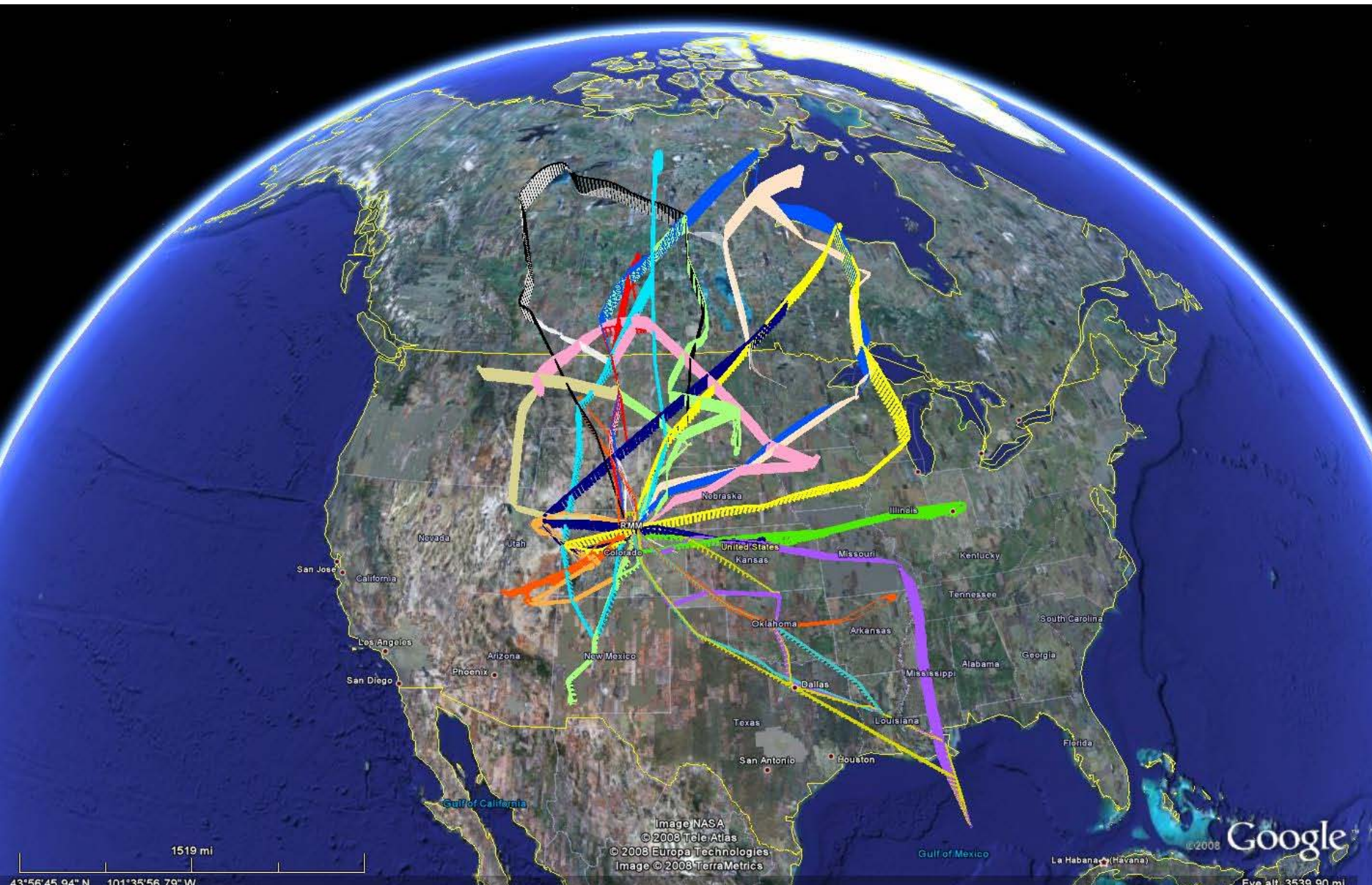
Simone Tilmes, Doug Kinnison, Laura Pan, START08 team

- START08 Data for Model Evaluation (CCMVal)
 - **Case studies for different meteorological situations, using an offline model simulation**
 - Statistical comparison of characteristic transport pathways using offline and online model simulations

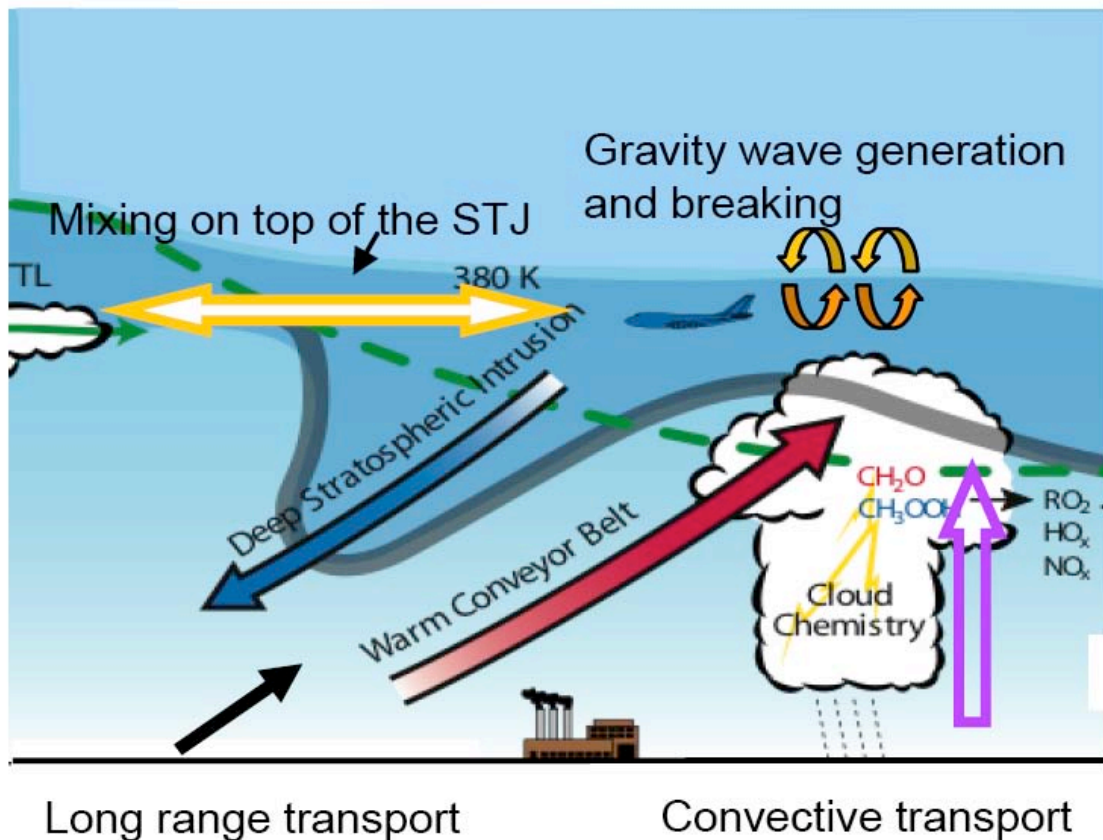
- Whole Atmosphere Climate Community Model - global perspective
 - Seasonal differences of tracer behavior
 - Regional differences of tracer behavior
 - Statistical relevance of the START08 (and ARCTAS) aircraft campaigns



Flight Tracks START08/PreHippo



Sampling Major Transport Pathways in the Ex-UTLS



1. **Extratropical UT/LS Survey** (RF 03, 09, 14, 17, 18)
2. **Stratospheric Intrusion (Tropopause Fold)** (RF 04, 06, 11, 12)
3. **Tropospheric Intrusion** (RF 01, 07, 08, 09, 14)
4. **Convective Influence** (RF 08, 13, 14, 18)
5. **Gravity Wave** (RF 02)
6. **HIPPO** (RF 05, 07, 08, 10, 13, 15, 16)

MODEL Framework	Meteorological Fields	Tracer Advection	Emissions	Chemistry
<p>WACCM3 Extension the Community Atmospheric Model, Version 3 (CAM3)</p> <p>Current Version: V3_5_48_08</p>	<p>Fully-interactive, i.e., dynamics consistent with model derived : O₃, CO₂, CH₄, N₂O, H₂O, CFC-11, CFC-12, O₂, NO</p> <p>-----</p> <p>Specified Dynamics: GEOS-5.1 (starting 2004)</p>	<p>Flux Form Finite Volume (Lin, 2004)</p> <hr/> <p>Resolution</p> <hr/> <p>Horizontal: 1.9° x 2°, Vertical: 66 levels (online), 80 levels (offline) (0-150 km)</p>	<p>Anthropogenic emissions: representative of 2006 (David Streets)</p> <p>Fire emissions based on MODIS daily fire counts for 2008 (Christine Wiedinmyer)</p>	<p>Trop-MLT Mechanisms</p> <ul style="list-style-type: none"> • 125 species mechanism includes the necessary Ox, HOx, NOx, BrOx, and ClOx species for the Middle Atmosphere (MA). • Plus NMHCs to represent tropospheric chemistry • Heterogeneous Chemistry on STS, NAT, ICE

Thanks to the WACCM team!!!



Vertical model resolution: ~ 1km



Case studies: Tropospheric Intrusion

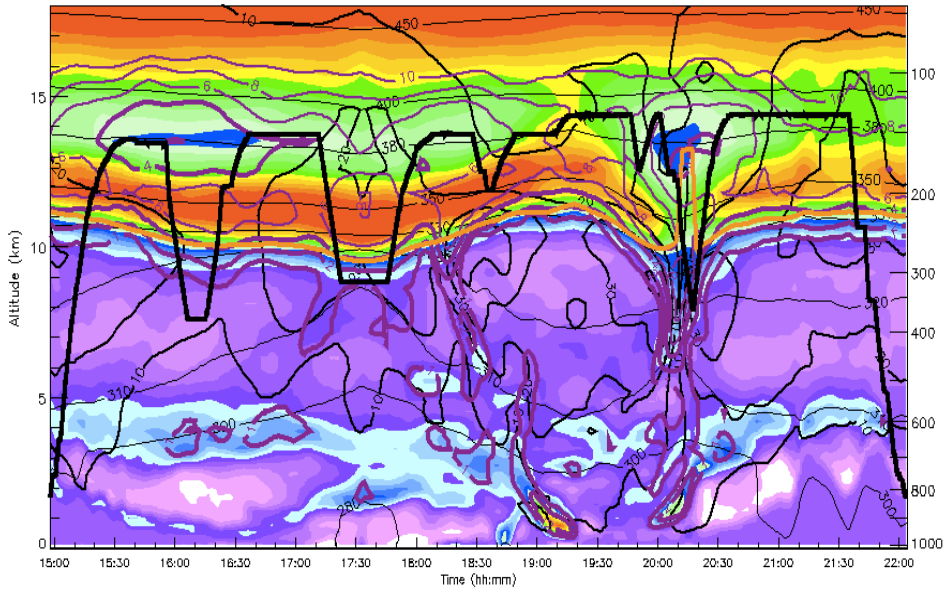
RF01: April 18, 08

RF01 Flight Curtain 20080418

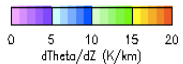
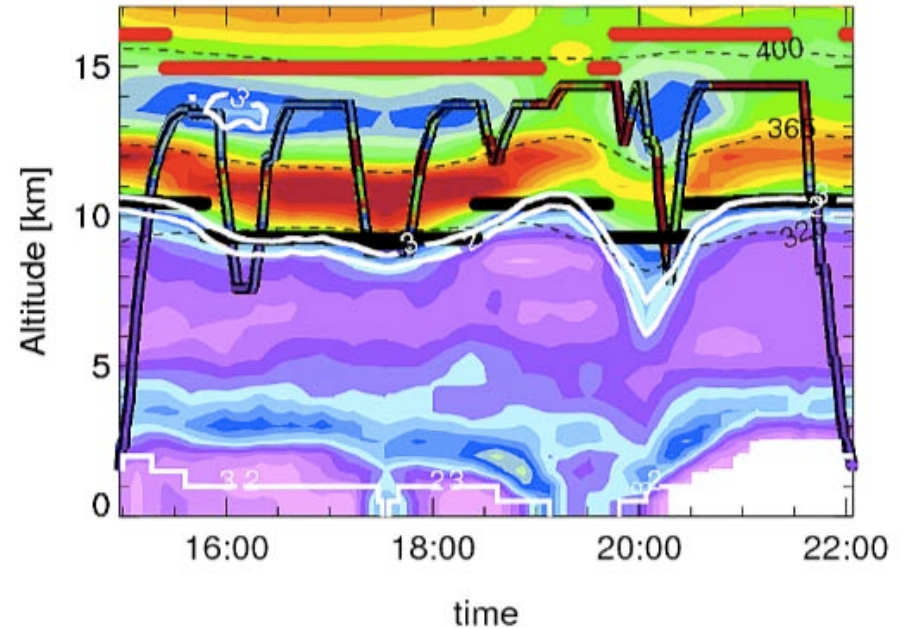
GFS 0.3x0.3
6 hour output

Interpolation from a 3 hour output

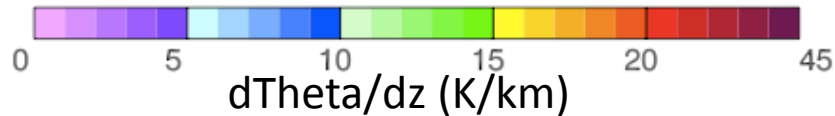
-105.10	-103.39	-99.98	-96.27	-91.83	-87.84	-87.89	-89.24	-88.50	-89.85	-94.39	-99.23	-103.84	-108.07	-105.05
39.68	43.30	46.69	49.46	52.50	55.81	52.87	49.25	45.50	42.39	41.23	40.60	39.98	39.21	39.79
Longitude (degrees) / Latitude (degrees)														



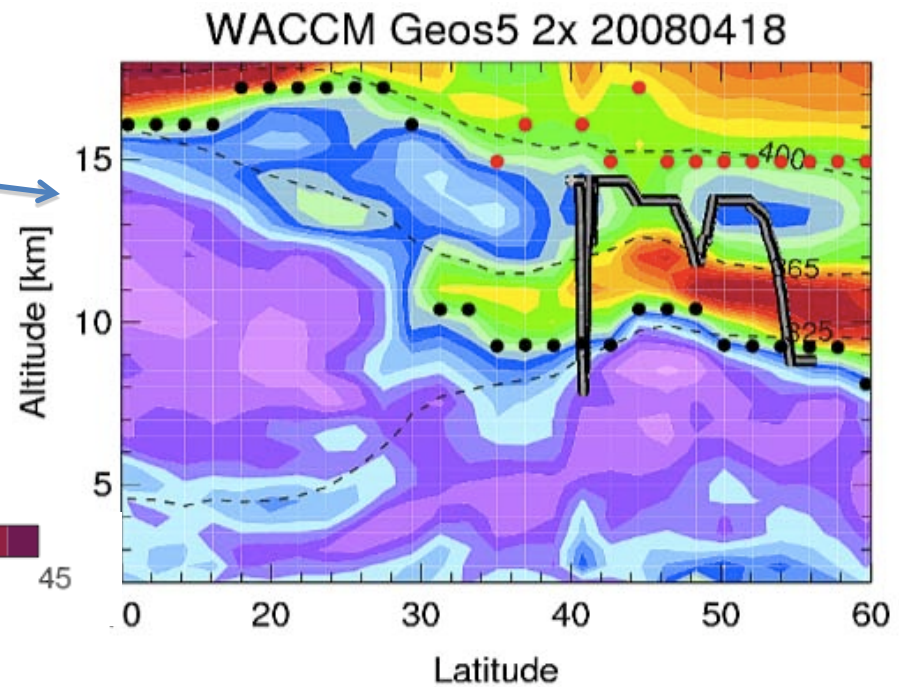
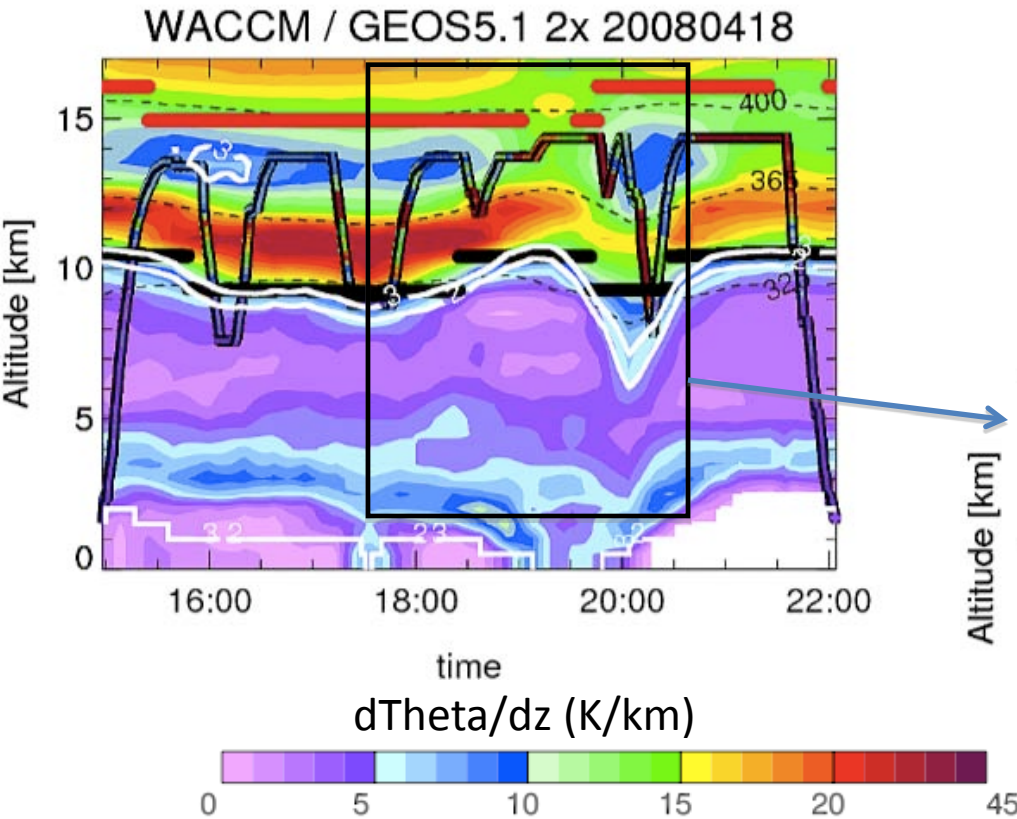
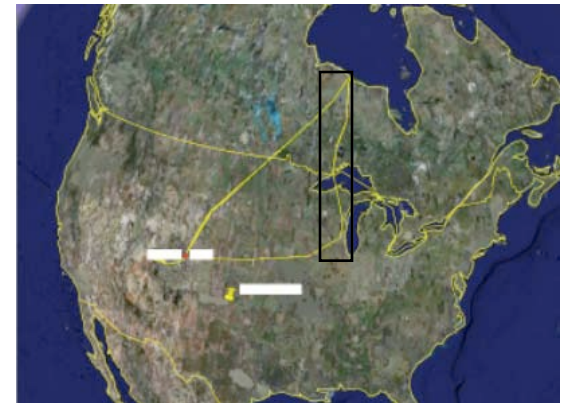
WACCM / GEOS5.1 2x 20080418



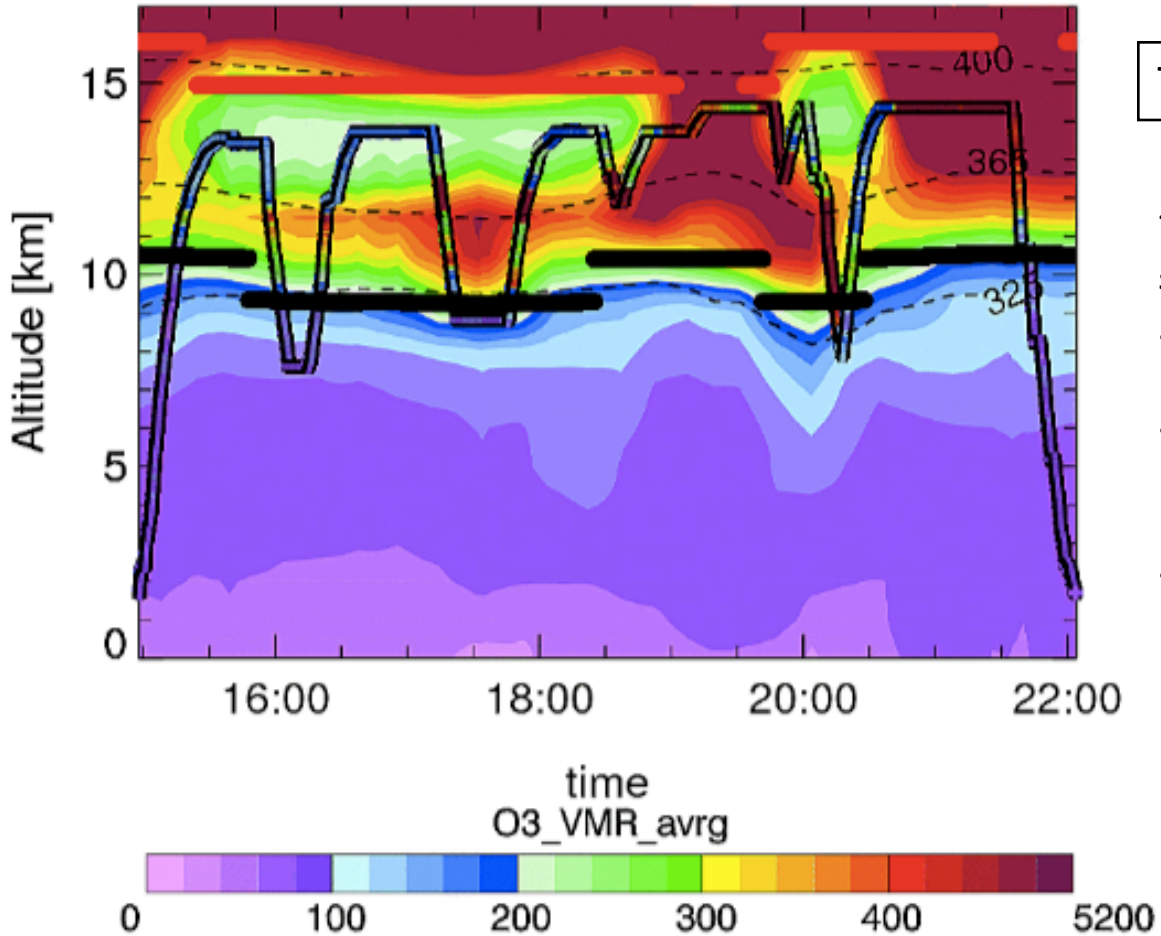
Potential Temperature (K)
Potential Vorticity (pvu)
Wind Speed (m/s)
Tropopause Height



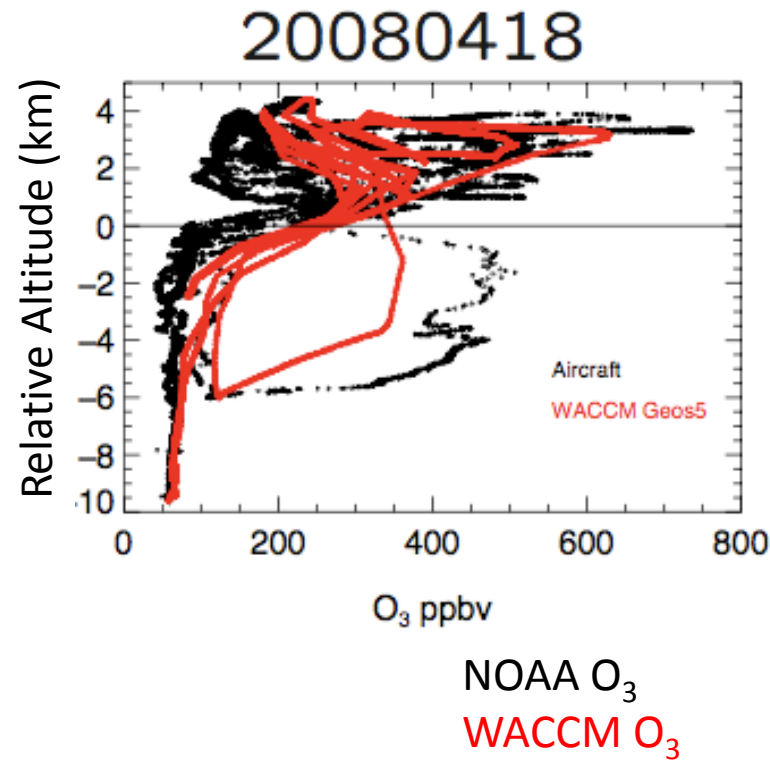
Case studies: Tropospheric Intrusion



WACCM / GEOS5.1 2x 20080418



Tropopause taken from GFS analysis

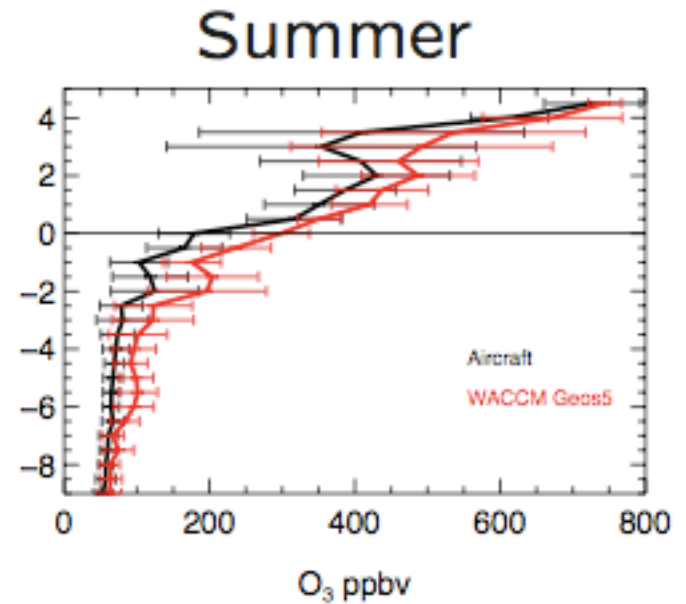
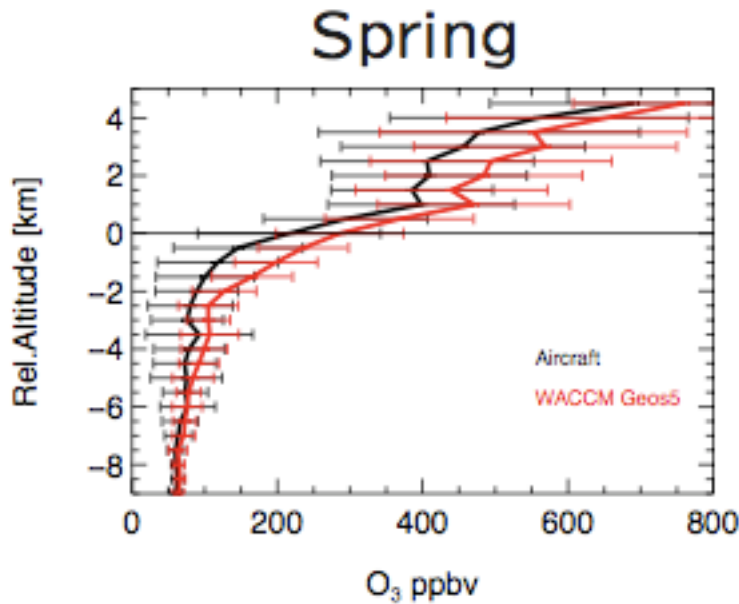


NOAA O₃
WACCM O₃

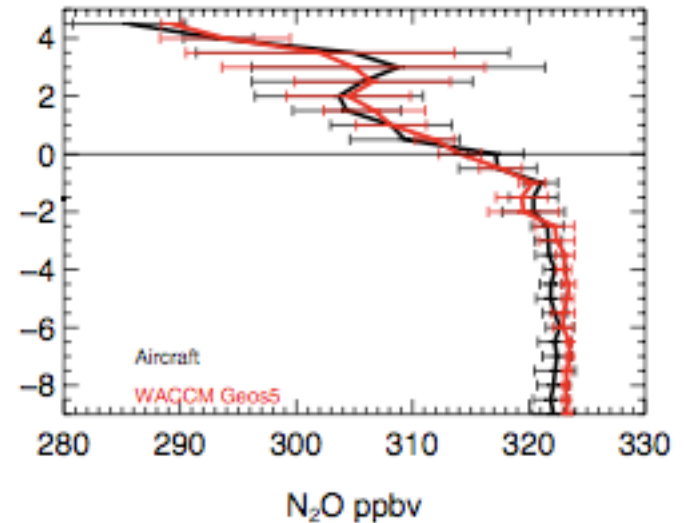
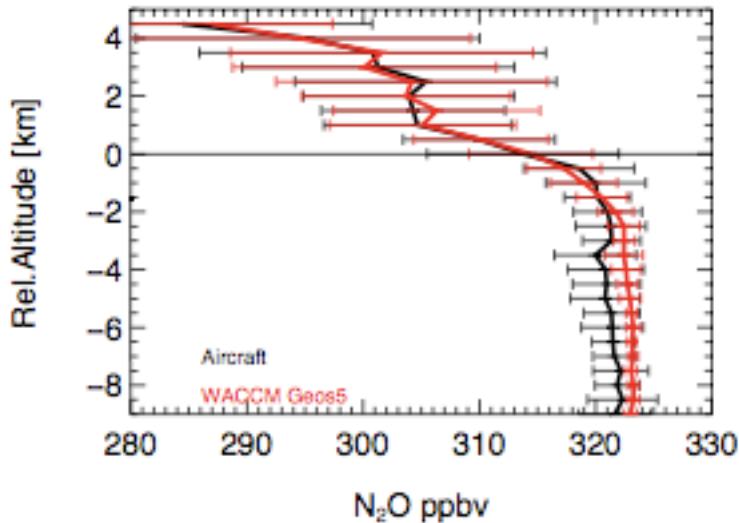


Comparison of all START08 Aircraft Data vs. WACCM on Flight Tracks

NOAA O₃
WACCM

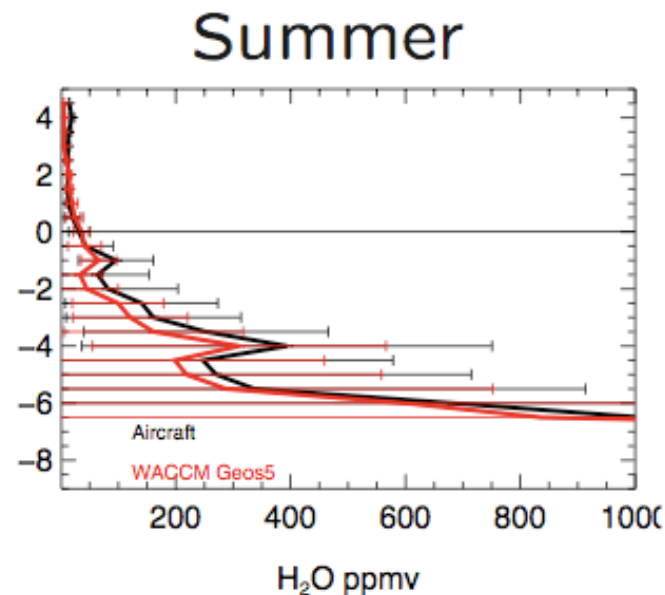
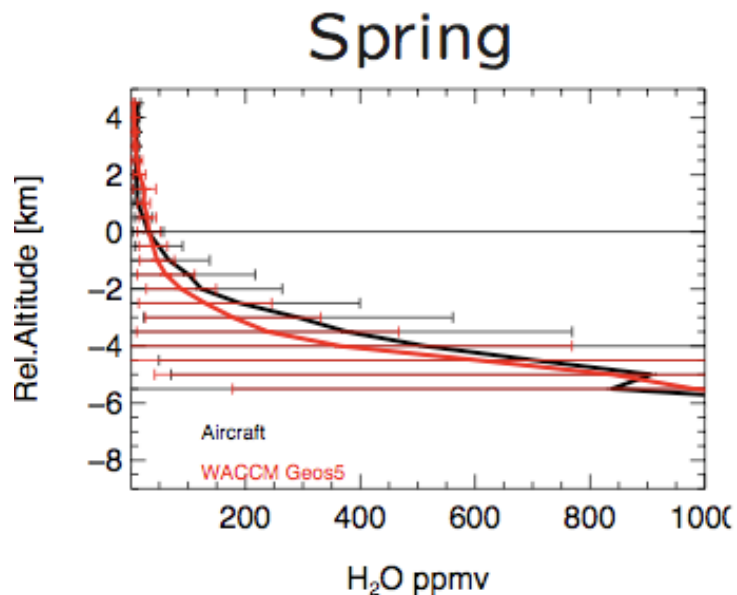


UCATS N₂O
WACCM

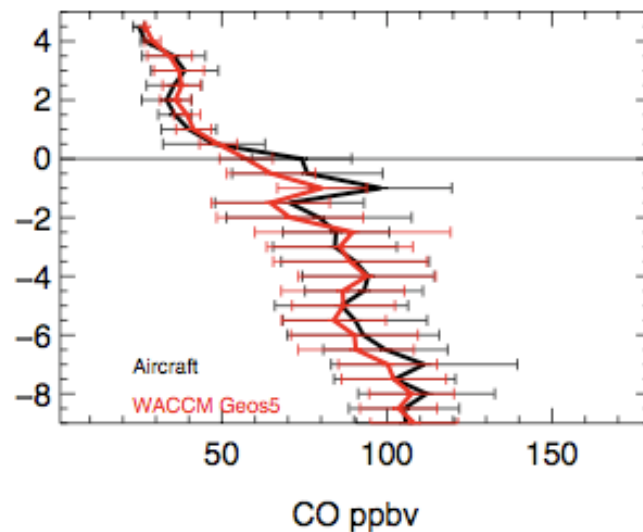
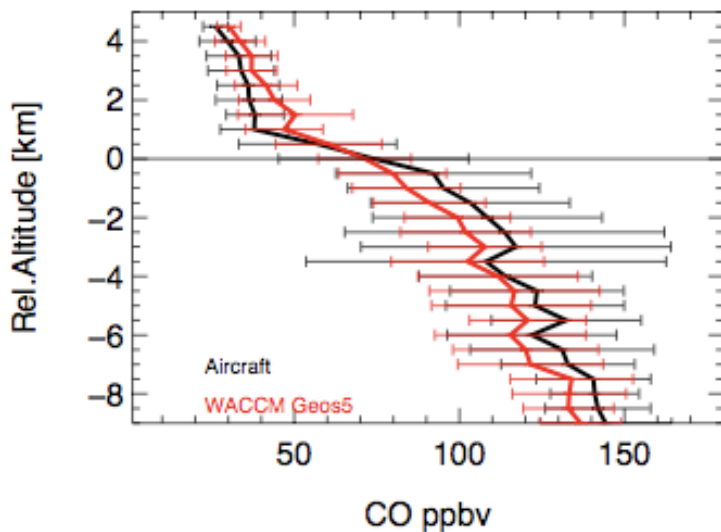


Comparison of all START08 Aircraft Data vs. WACCM on Flight Tracks

VXL H₂O
WACCM

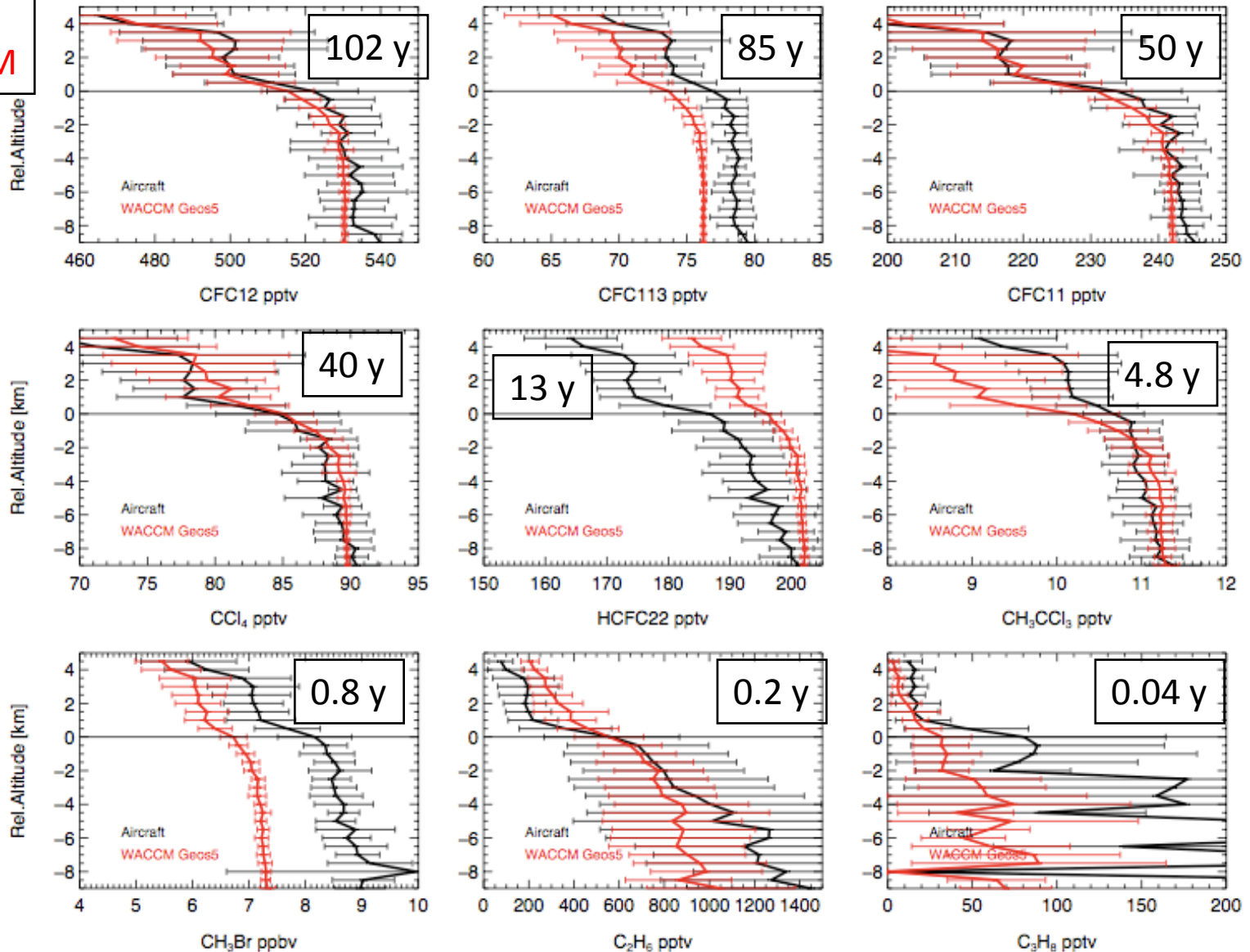


UCATS N₂O
WACCM



Comparison of all START08 Aircraft Data vs. WACCM on Flight Tracks

AWAS
WACCM



Conclusions

- WACCM model results agree very well with START08 aircraft data
- Fine structure of the aircraft data cannot be simulated using a 1.9x2.5 deg. resolution model
- Statistical analysis of transport pathways will give further insight in the model behavior
- Tracer behavior of different lifetimes needs to be further investigated

