Initial Comparison between START08 and WACCM

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- 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)
<table>
<thead>
<tr>
<th>MODEL Framework</th>
<th>Meteorological Fields</th>
<th>Tracer Advection</th>
<th>Emissions</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>WACCM3 Extension the Community Atmospheric Model, Version 3 (CAM3)</td>
<td>Fully-interactive, i.e., dynamics consistent with model derived: O₃, CO₂, CH₄, N₂O, H₂O, CFC-11, CFC-12, O₂, NO</td>
<td>Flux Form Finite Volume (Lin, 2004)</td>
<td>Anthropogenic emissions: representative of 2006 (David Streets)</td>
<td>Trop-MLT Mechanisms</td>
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<td>Resolution</td>
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<td>Horizontal: 1.9° x 2°, Vertical: 66 levels (online), 80 levels (offline) (0-150 km)</td>
<td>Fire emissions based on MODIS daily fire counts for 2008 (Christine Wiedinmyer)</td>
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<td>Specified Dynamics: GEOS-5.1 (starting 2004)</td>
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</table>

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

WACCM / GEOS5.1 2x 20080418
Case studies: Tropospheric Intrusion

WACCM / GEOS5.1 2x 20080418

Altitude [km]

0 5 10 15

16:00 18:00 20:00 22:00

time

dTheta/dz (K/km)

0 5 10 15 20 25 30 35 40 45

START08 Workshop March 4-5, 2009
Comparison of all START08 Aircraft Data vs. WACCM on Flight Tracks

NOAA O$_3$
WACCM

UCATS N$_2$O
WACCM
Comparison of all START08 Aircraft Data vs. WACCM on Flight Tracks

VXL H$_2$O
WACCM

UCATS N$_2$O
WACCM
Comparison of all START08 Aircraft Data vs. WACCM on Flight Tracks
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