

The Atmospheric Chemistry Experiment (ACE): Current Validation Results

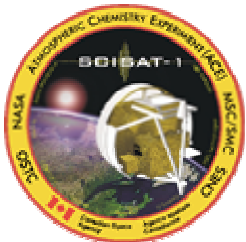
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C. Thomas McElroy, Meteorological Service of Canada
Cora Randall, LASP, University of Colorado
Chip Trepte, NASA Langley

November 10, 2005

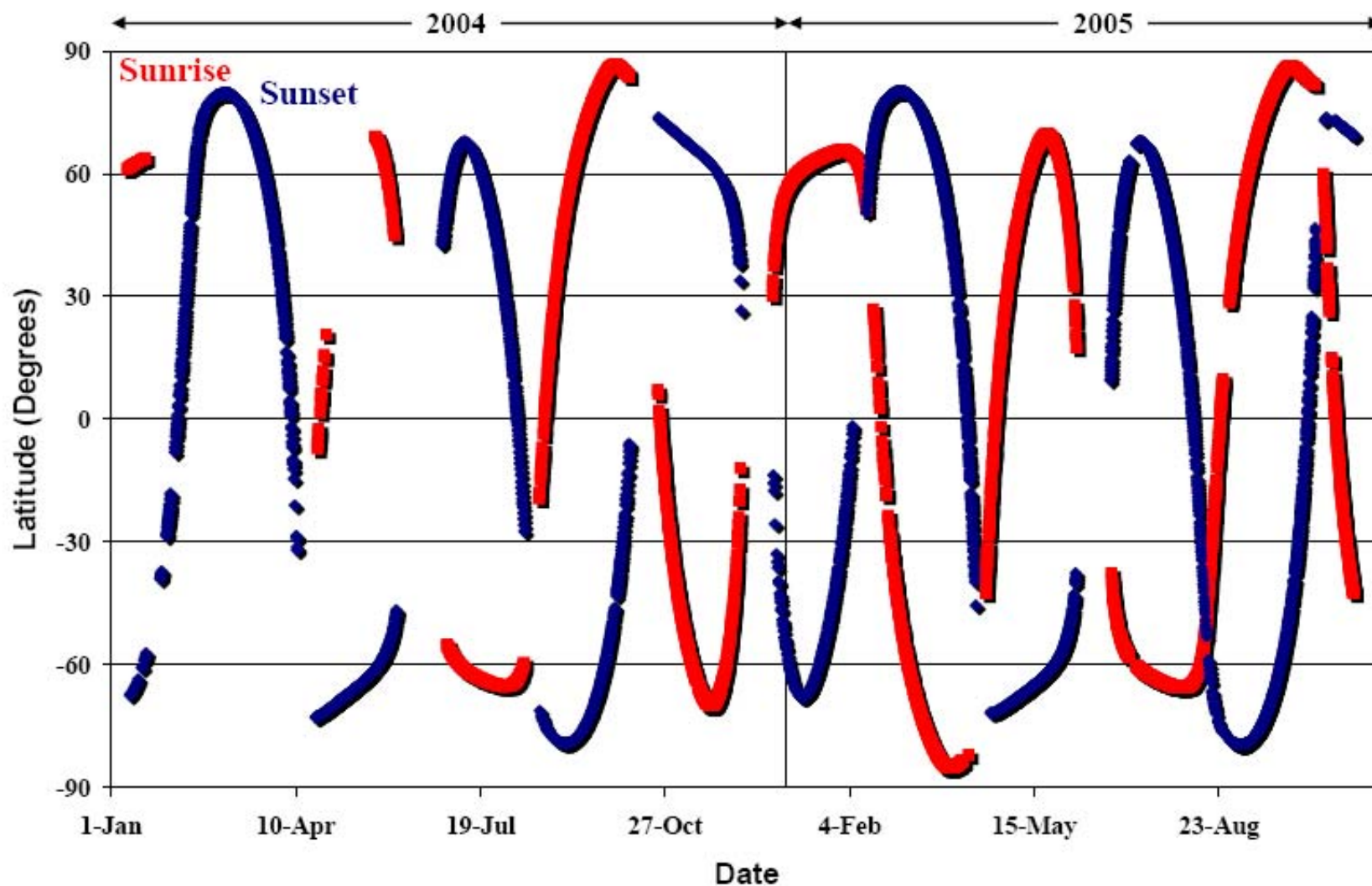


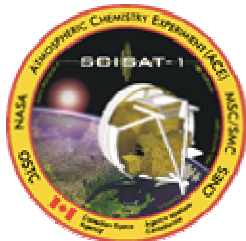
ACE Mission Status

- Satellite and instrument operations are nominal
- Both instruments have been acquiring as much data as possible
 - ~7600 occultations recorded since January 2004
- Atmospheric profiles (for sunrises and sunsets) are being produced for all instruments
 - ACE-FTS – O_3 , H_2O , CH_4 , N_2O , NO_2 , NO , HNO_3 , HCl , HF , CO , $CFC-11$, $CFC-12$, N_2O_5 , $ClONO_2$, plus 20 more molecules, **temperature** and pressure
 - ACE-MAESTRO – O_3 and NO_2 (atmospheric extinction)
 - IMAGERS – extinction profiles at 0.5 and 1.02 microns

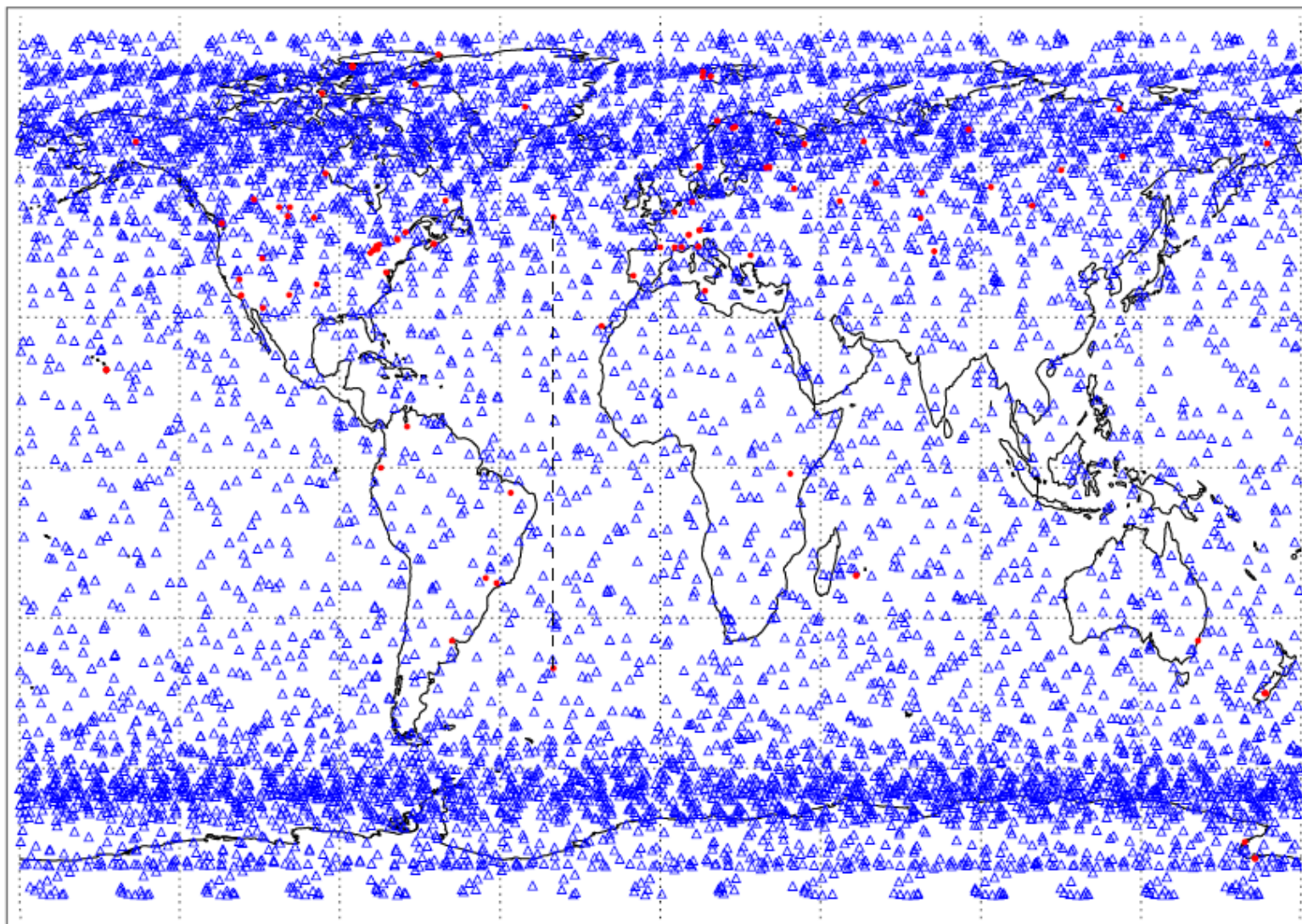


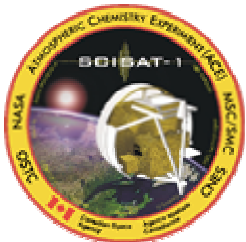
All ACE measurements to Nov. 4





Global Distribution of Occultations

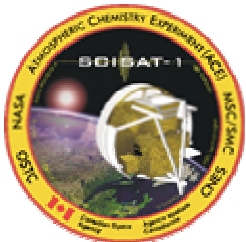




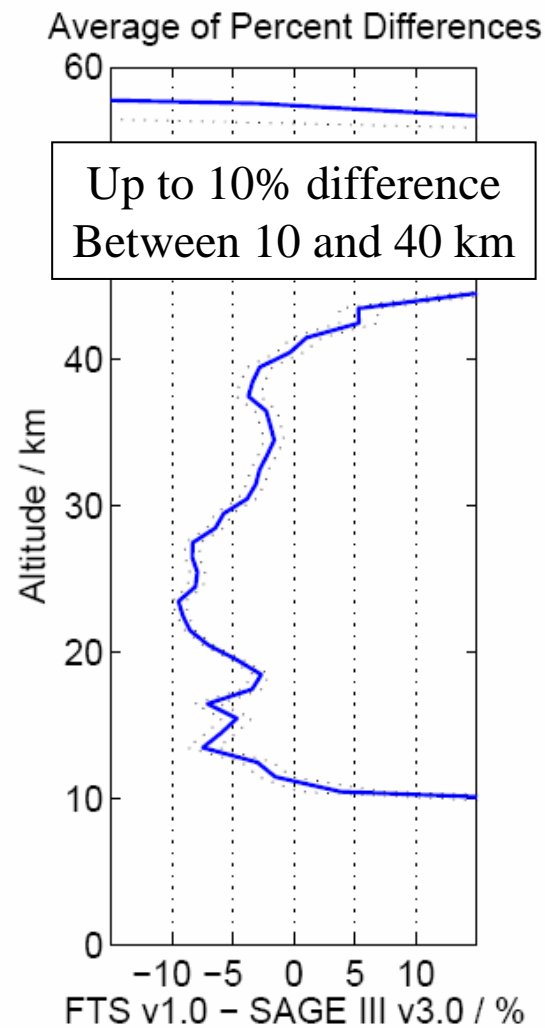
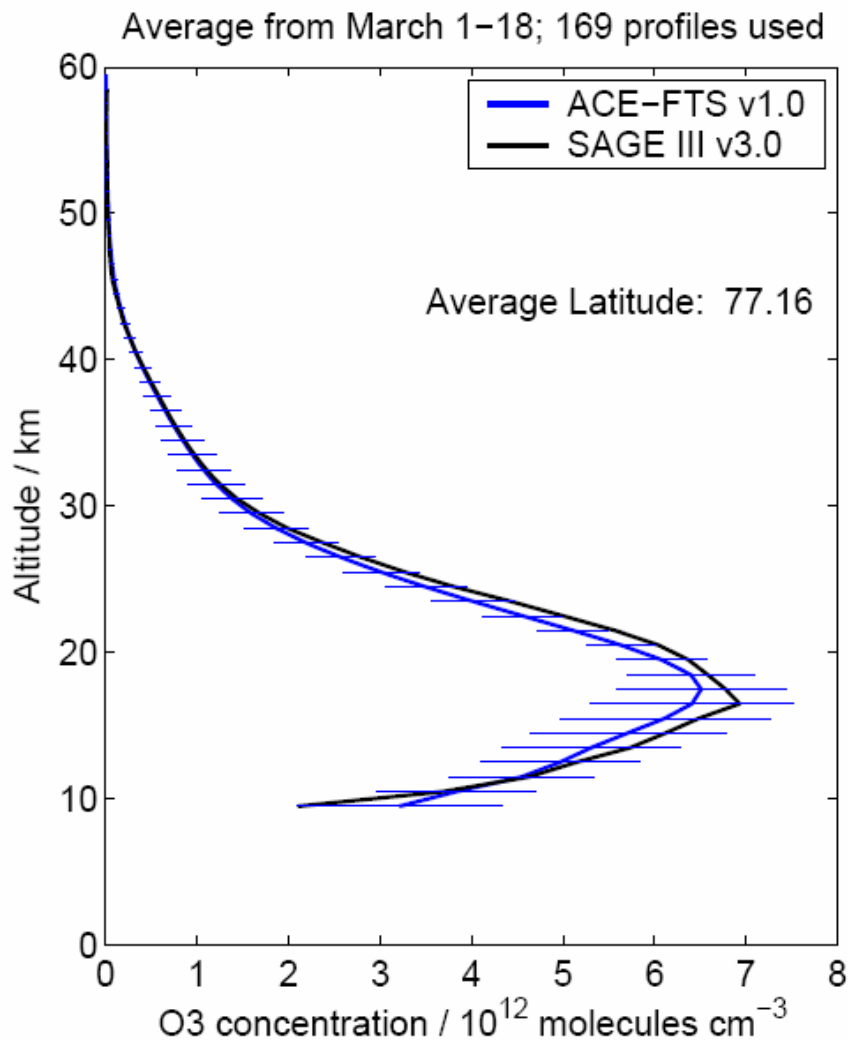
ACE Ozone Data

ACE ozone profiles are available from three sources (occultation mode measurements):

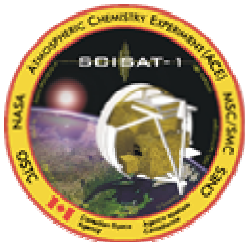
- ACE-FTS v2.2
 - Retrievals cover range from ~5 to 95 km
 - Microwindows used:
 - 32 between 1022 – 1168 cm^{-1}
 - 22 between 1803 – 2121 cm^{-1}
- ACE-MAESTRO v1.1
 - One profile produced from each spectrometer - UV and VIS
 - Retrievals from <10 km up to ~100 km
 - Currently, p and T profiles from ACE-FTS are used in MAESTRO retrieval



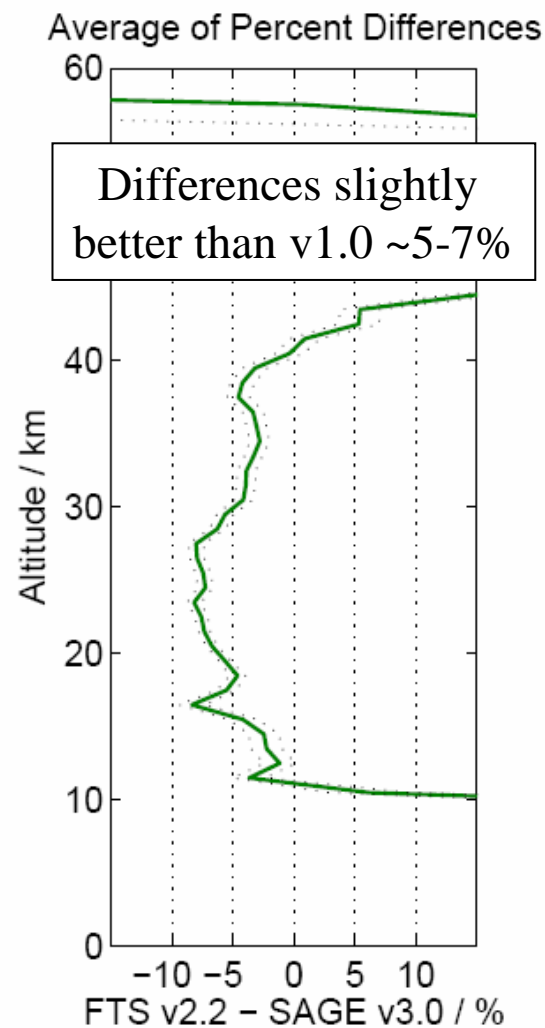
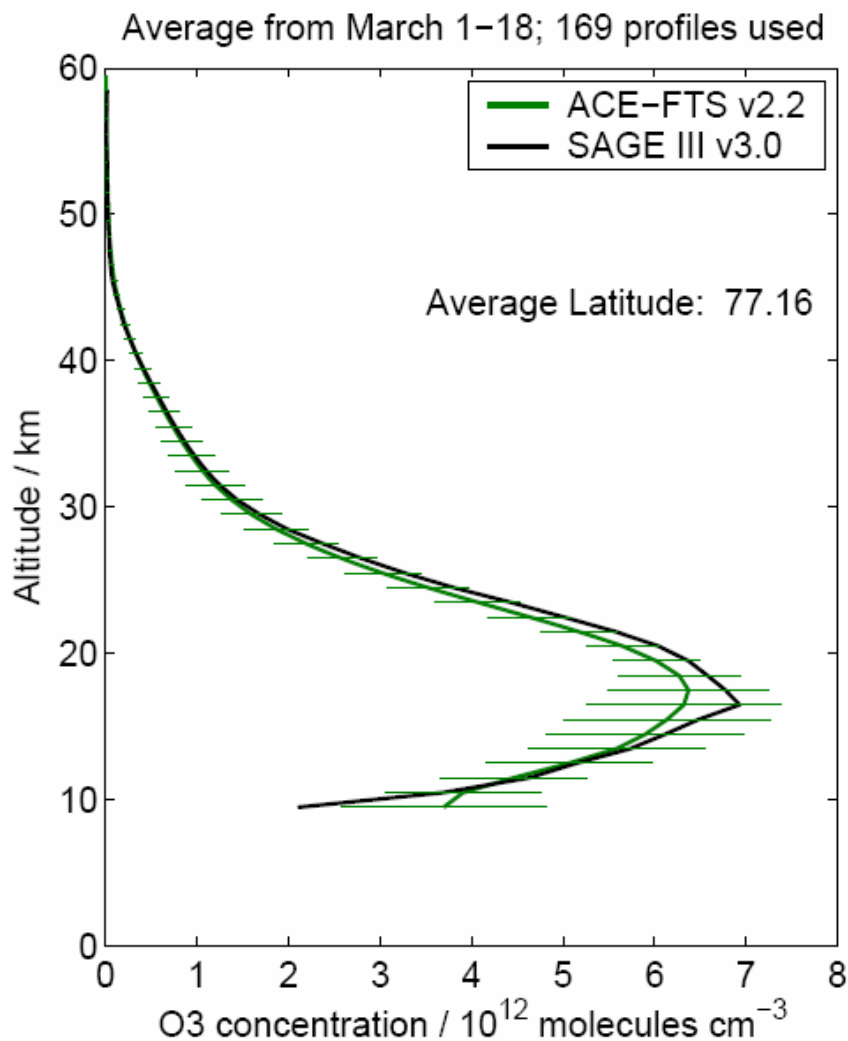
ACE-FTS v1.0 (GRL paper)

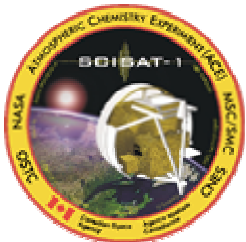


Profiles within 500 km and 2 hours; ACE-FTS v 1.0, SAGE III v 3.0 data



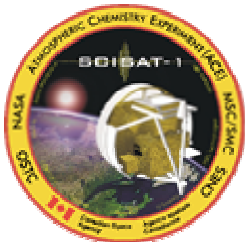
Version 2.2 – More Stable Process



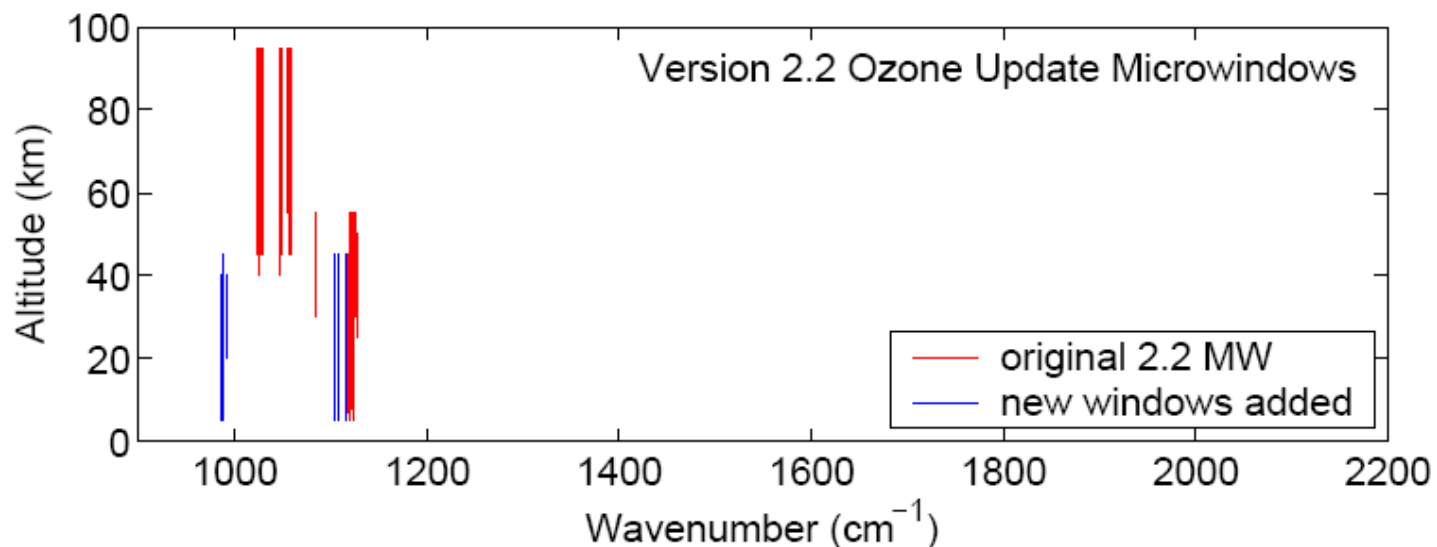
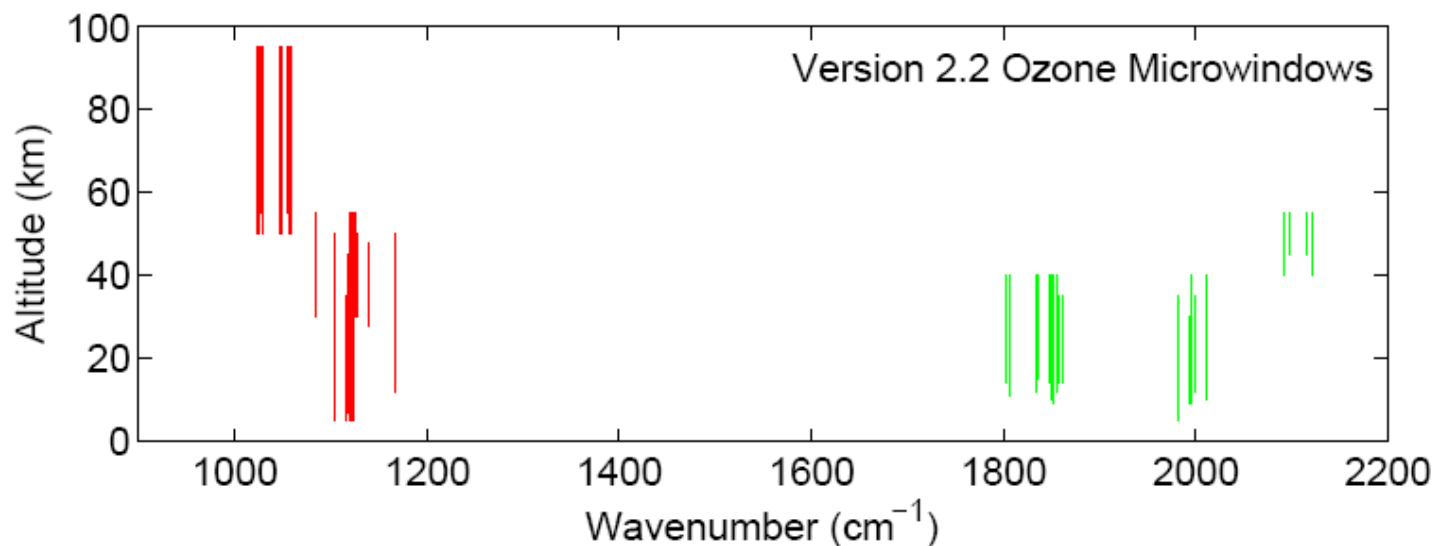


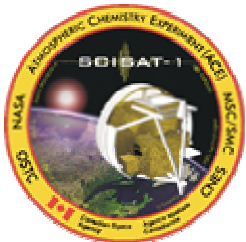
ACE-FTS O₃ - Version 2.2 Update

- Issue found with ACE-FTS microwindows
 - Inconsistent results between the two microwindow ranges with HITRAN2004 (10 micron vs. 5 micron)
- New retrievals for ozone only – 2.2 “Ozone Update”
 - Uses a consistent set at ~10 micron – the most well known region
 - 36 between 985 – 1129 cm⁻¹ (added 4 near 987 cm⁻¹)
 - (ones between 1803 – 2121 cm⁻¹ have been removed)

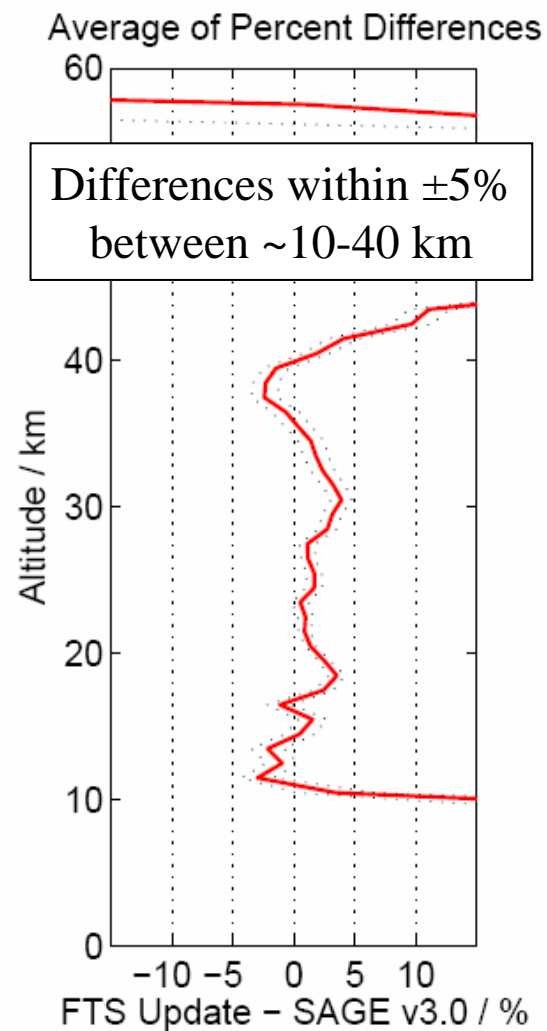
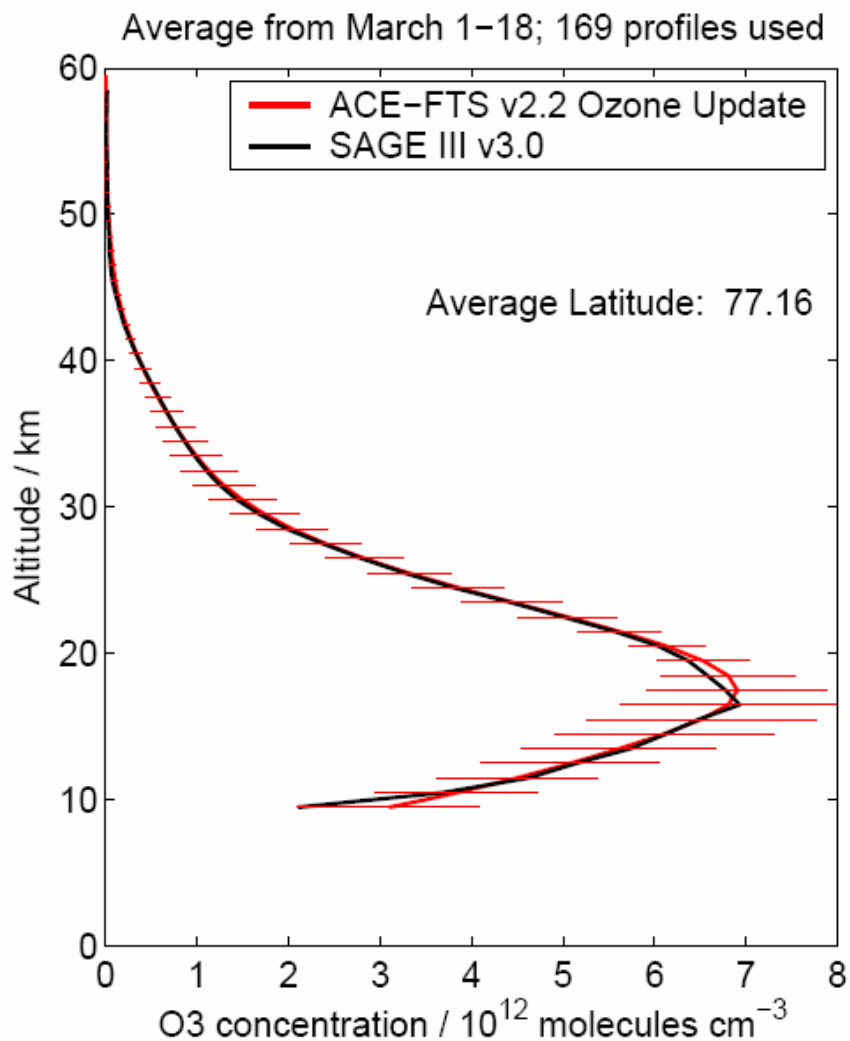


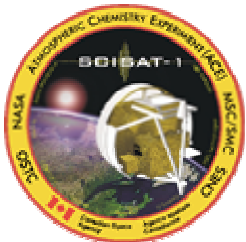
ACE-FTS Ozone Microwindows



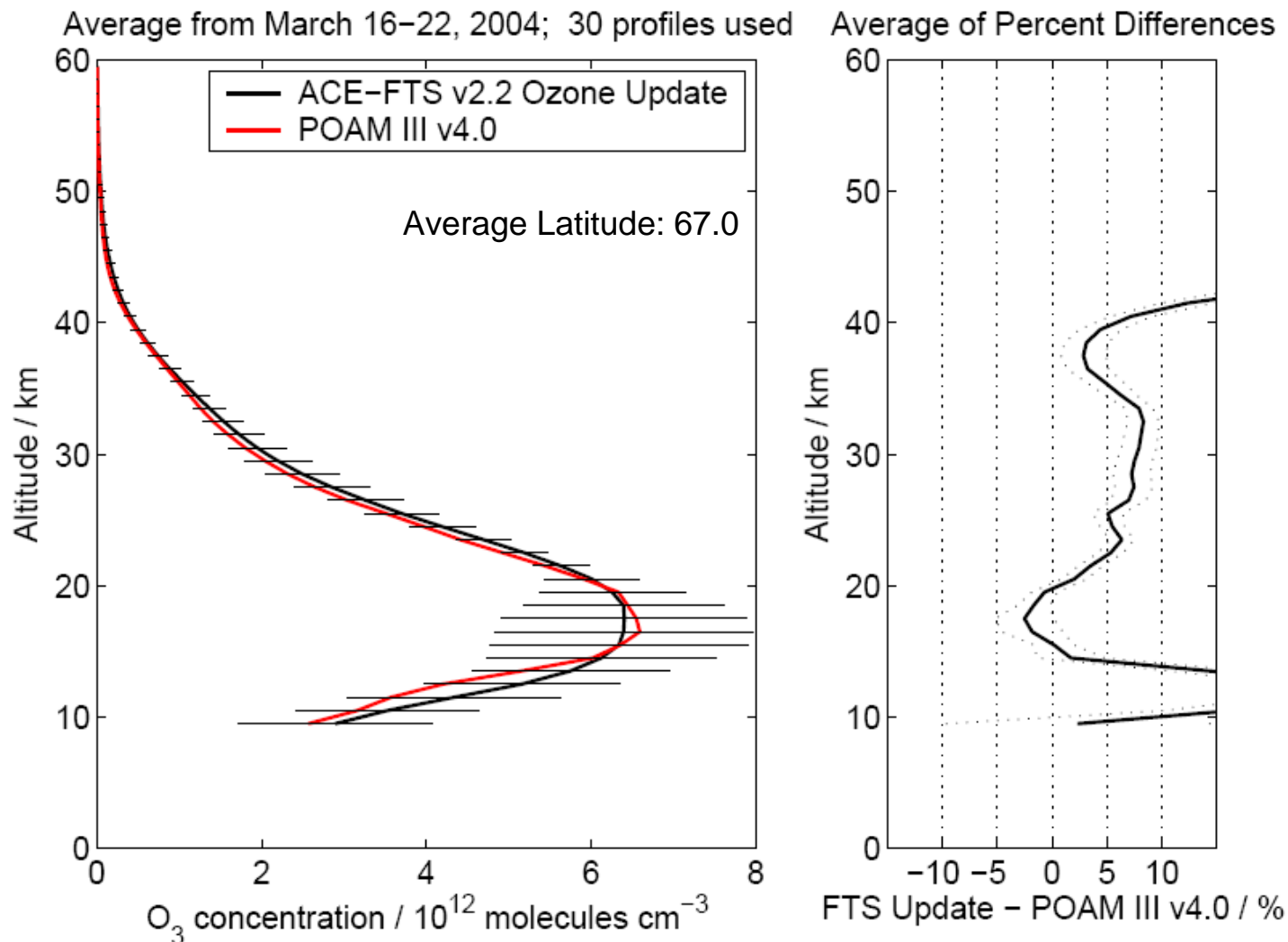


ACE-FTS Ver2.2 Ozone Update

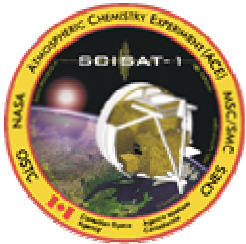




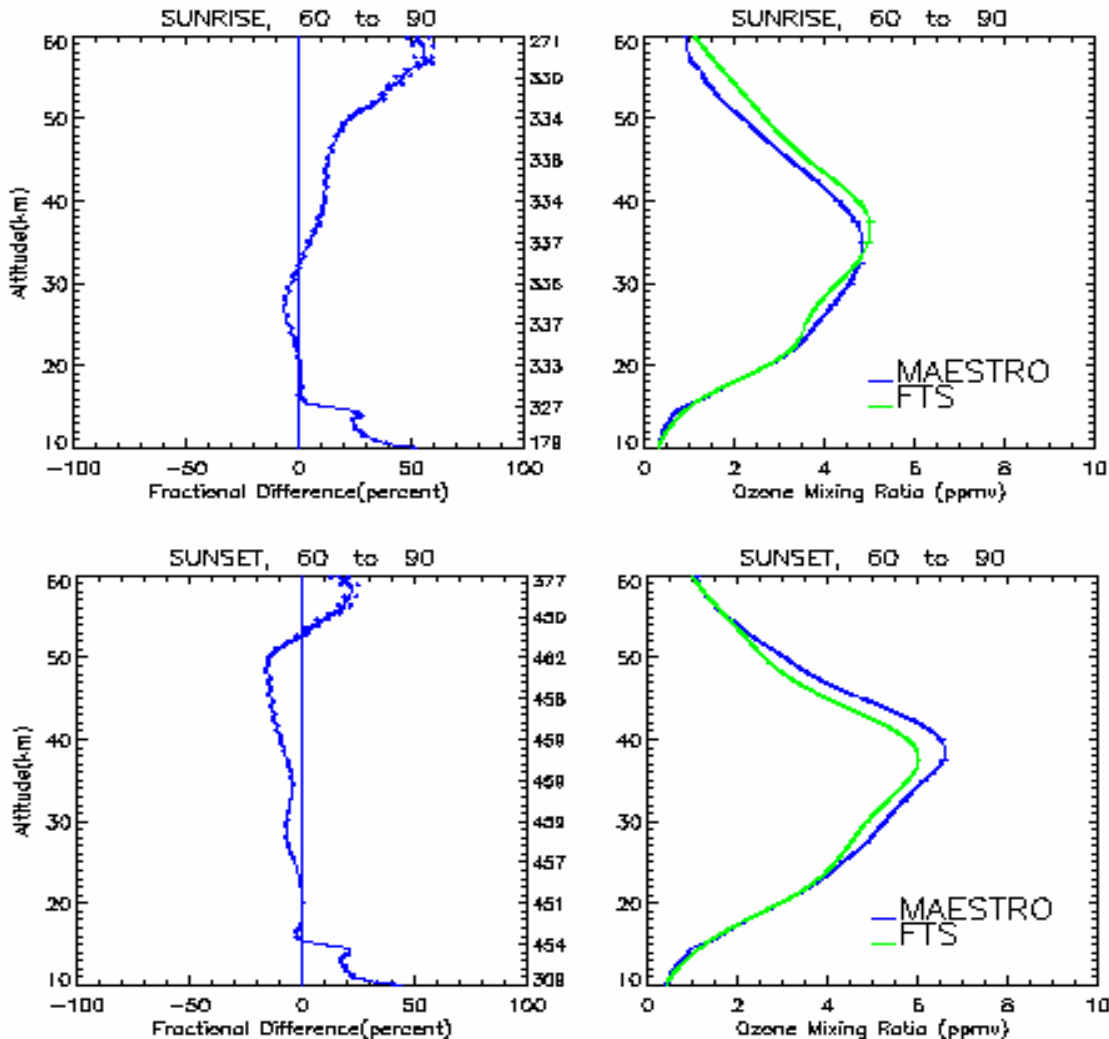
O₃: ACE-FTS vs. POAM III



Profiles within 500 km and 2 hours; using POAM III version 4.0 data



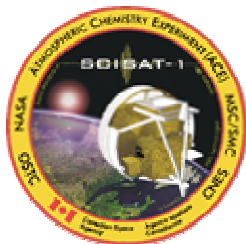
ACE-FTS vs. ACE-MAESTRO O₃



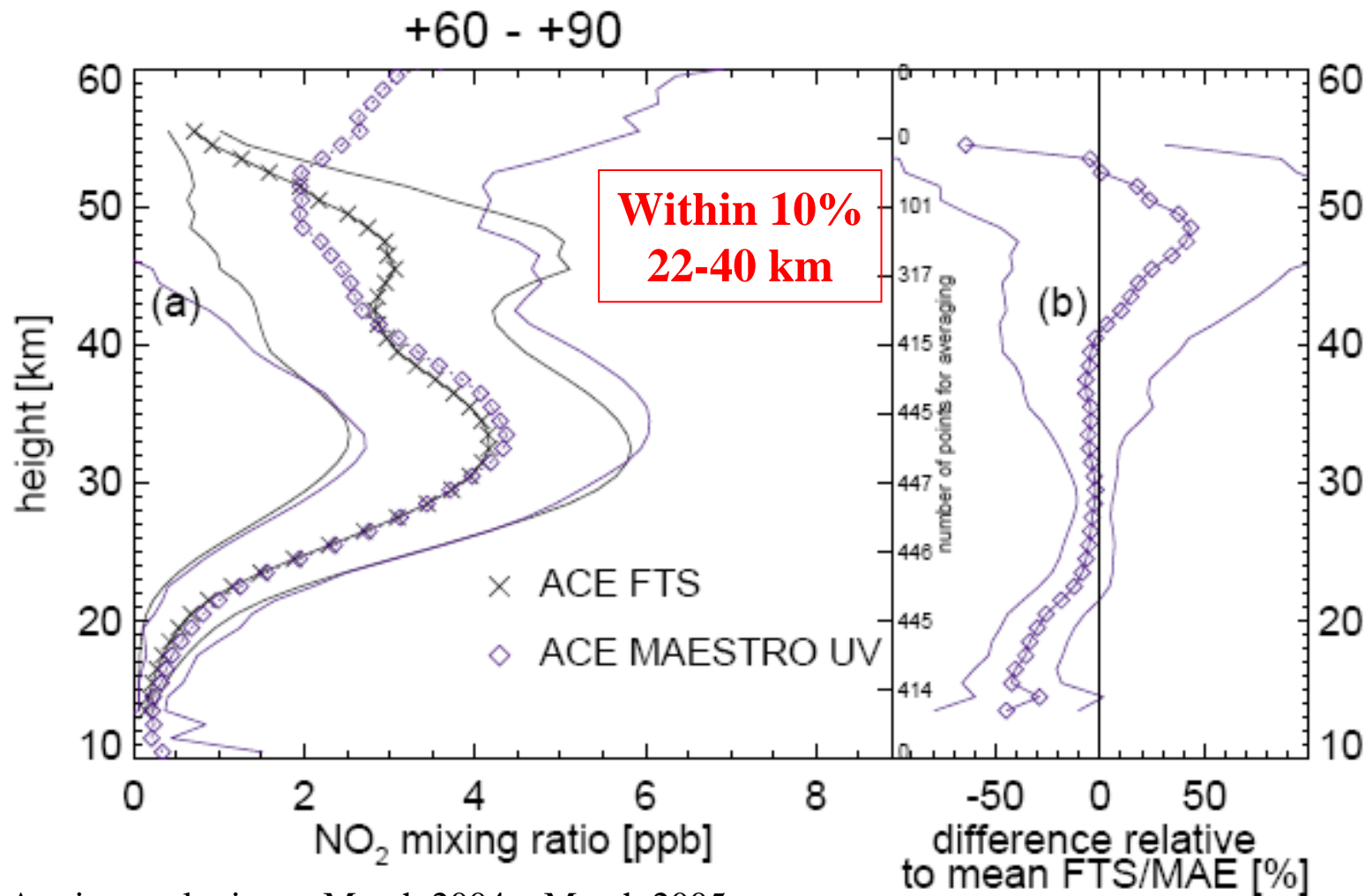
FTS ozone higher than MAESTRO at sunrise but reverses at sunset

MAESTRO uses T and p from FTS

Sunrise and sunset having opposite offsets suggests that there is a residual timing discrepancy



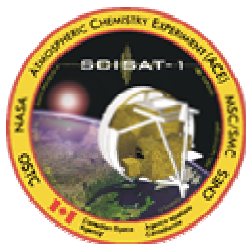
NO₂: ACE-FTS – ACE-MAESTRO



1 year of Arctic occultations: March 2004 – March 2005

ACE-FTS v2.2; ACE-MAESTRO v1.1 – 447 profiles

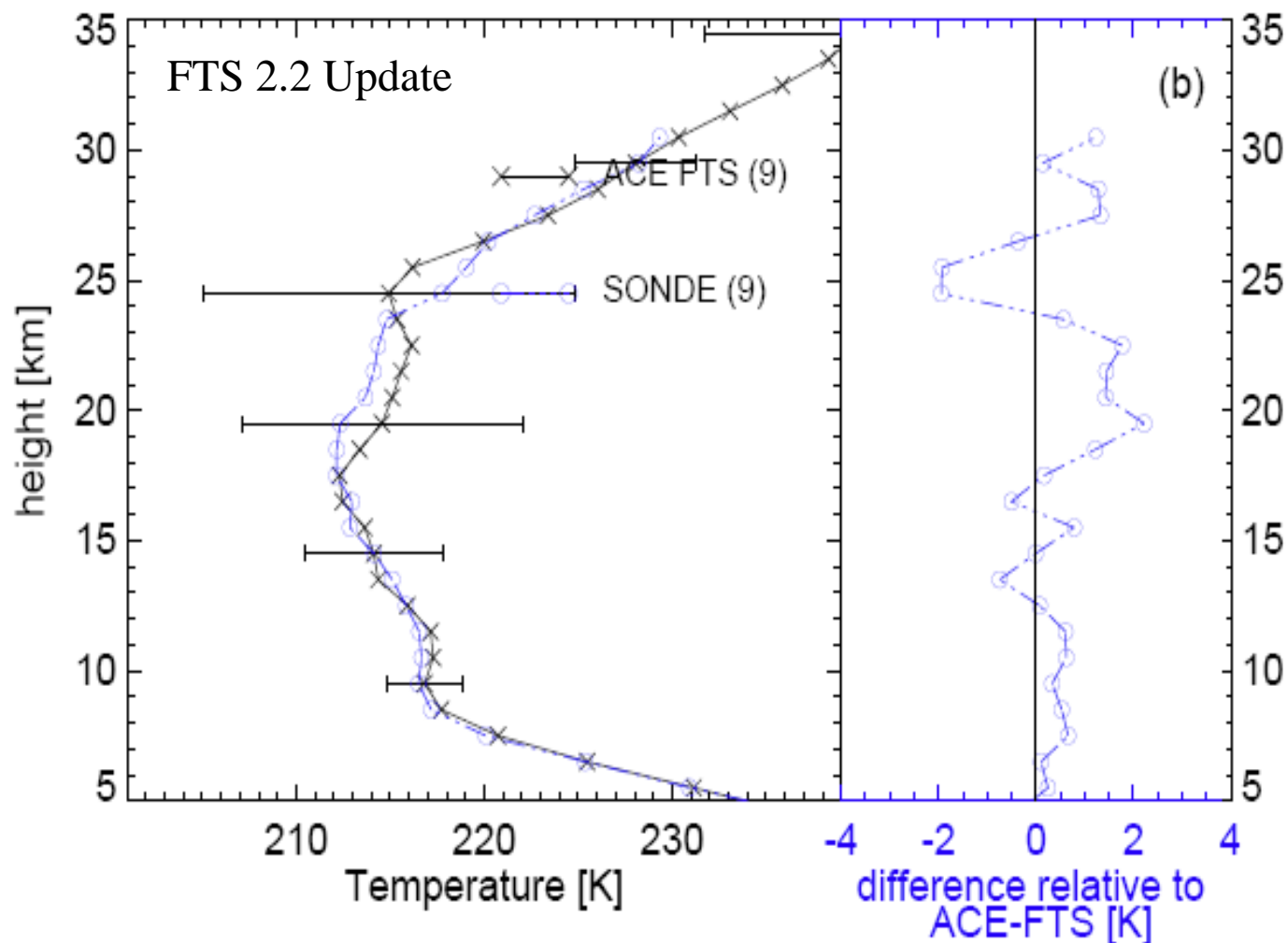
Tobias Kerzenmacher



ACE-FTS & Radiosonde - Eureka

Using 9 profiles:
ACE-FTS
temperatures
within ± 2 K of
sonde to 30 km.
No smoothing.

Similar to results
with MLS:
FTS temperatures
agree to within
 ± 2 K from 15 –
60 km



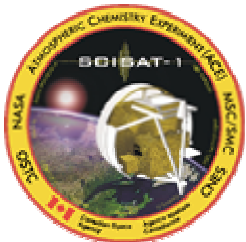
Coincidence criteria: 200 km and 3 hours of sonde launch

Tobias Kerzenmacher



Summary

- New ACE-FTS Ozone – version 2.2 Update uses more consistent set of microwindows
 - Comparisons with SAGE III, POAM III (& ozonesondes)
 - Will be put into AVDC soon (next week)
 - ACE-FTS v2.2 and ACE-MAESTRO v1.1 are there now
- ACE-FTS and ACE-MAESTRO ozone and NO₂ comparisons
 - Difference between sunrise and sunset occultations show residual timing discrepancy between instruments
- ACE-FTS and radiosonde temperature comparisons
 - ± 2 K difference is consistent with comparisons to MLS and SABER



ACE Validation Program

Will be starting very, very soon!

- We would like to involve as many different groups as possible so if you would like to work with us, contact me:

validate@acebox.uwaterloo.ca

- Efforts are organized by subgroups:
 - O_3 , H_2O , CH_4 , CO , NO_y+N_2O , Cl_y/F_y , p/T , aerosols
 - We will put you in contact with the appropriate subgroup