



Assimilation of OMI Ozone for Air Quality Prediction

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1. NOAA NESDIS

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3. US Environmental Protection Agency

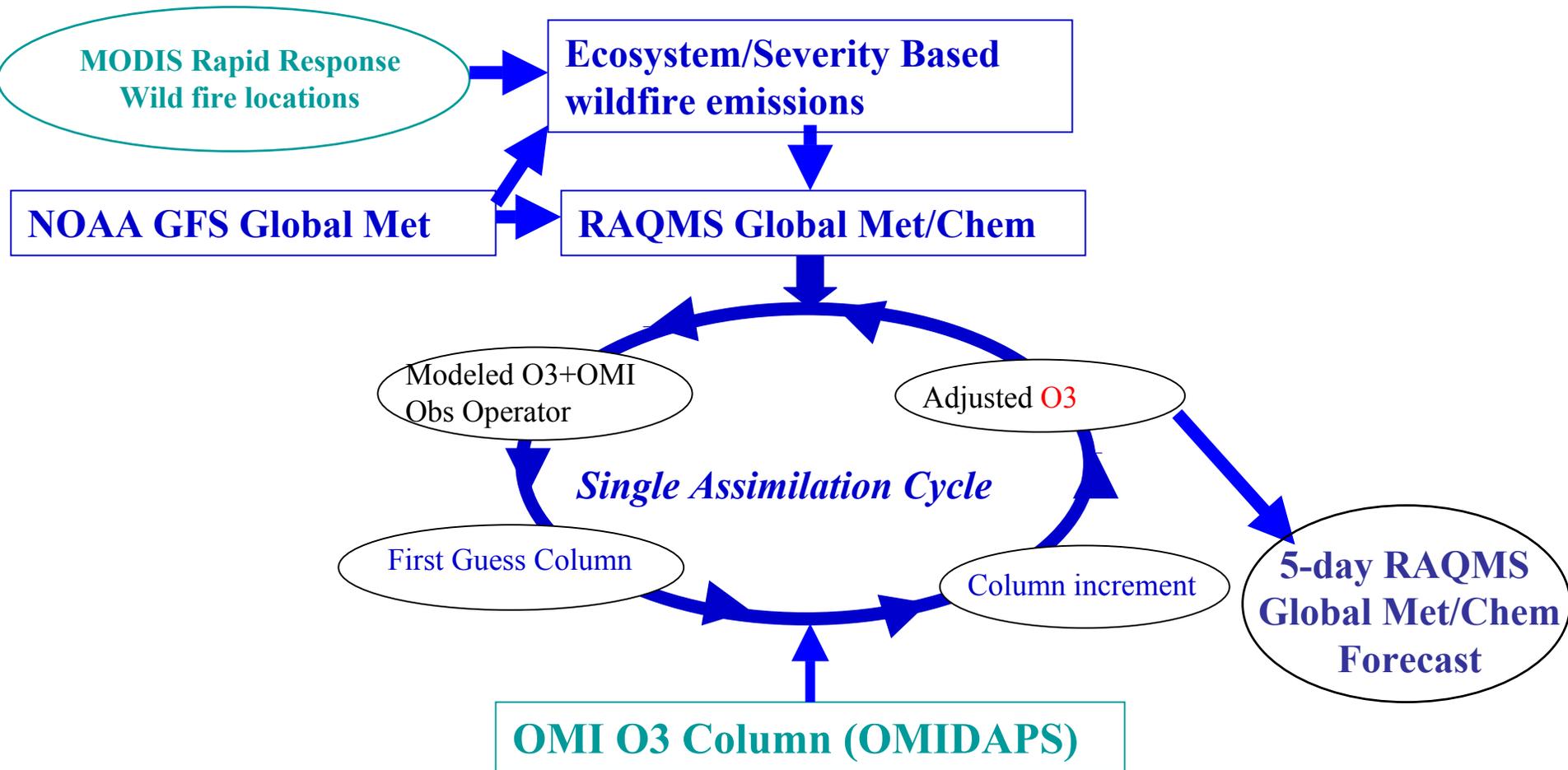
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5. NASA GSFC

6. Penn State University

Presented by Jay Al-Saadi

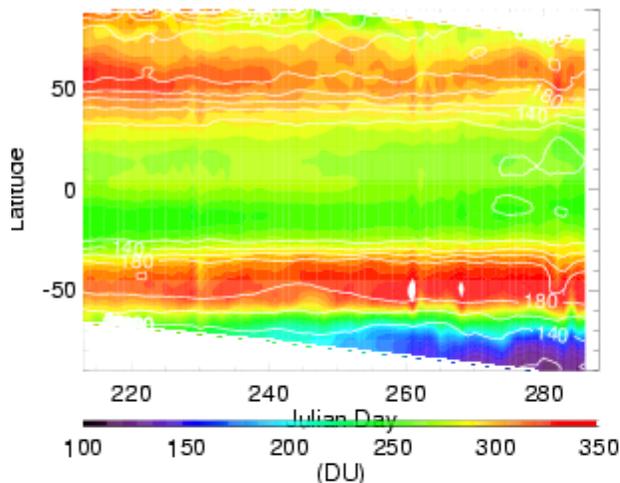
RAQMS_{global} (2x2) 2006 Ozone Assimilation/Forecast Procedure



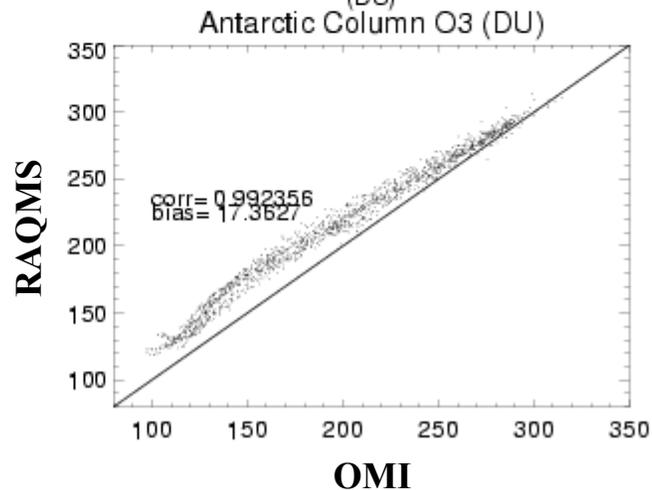
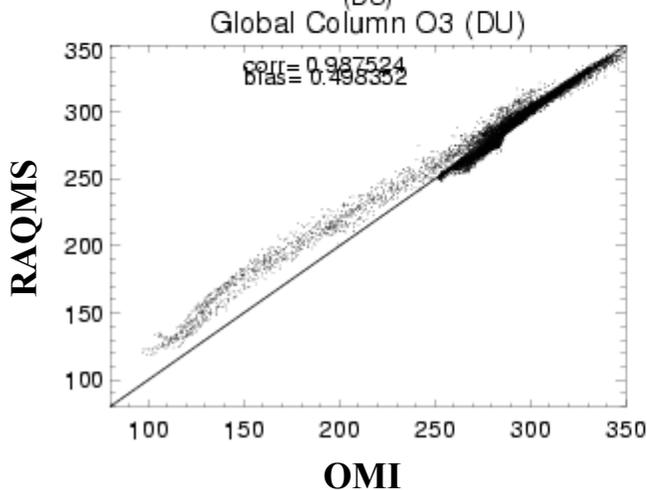
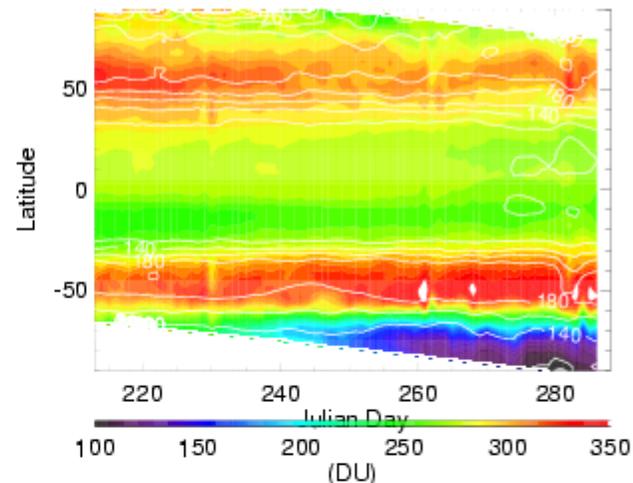
Real-time OMI Cloud-cleared column OI assimilation conducted at 2x2 degrees for Feb 01-Oct 15, 2006. Analysis increment applied as percentage adjustment to mixing ratio resulting in minimal impact on troposphere.

Total Column Ozone Timeseries August 01- October 15, 2006

RAQMS Column O3 Analysis Aug 01- Oct 15, 2006



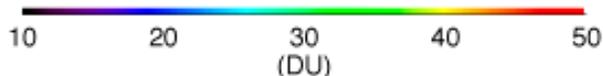
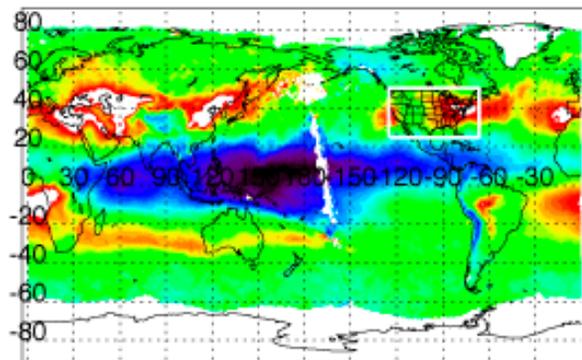
OMI Column O3 Observations Aug 01- Oct 15, 2006



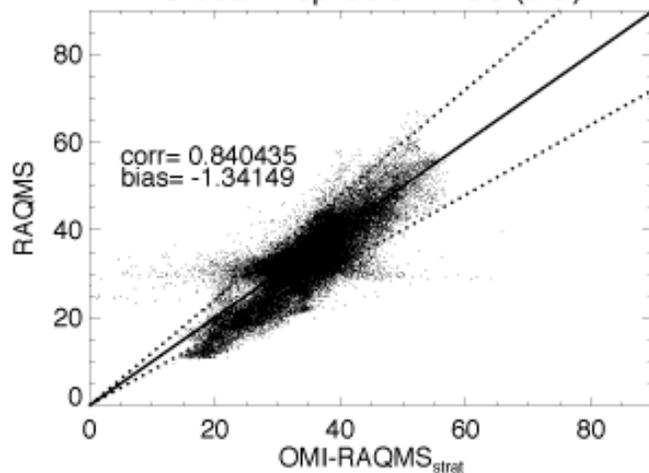
Assimilation of cloud-cleared OMI ozone column captures observed mid-latitude temporal and latitudinal variations. RAQMS analysis underestimates mid-September through mid-October (Julian day 260-290) Antarctic ozone loss by 17%

Tropospheric Ozone Column (subtracting RAQMS stratosphere) August 2006

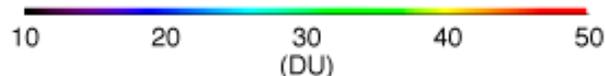
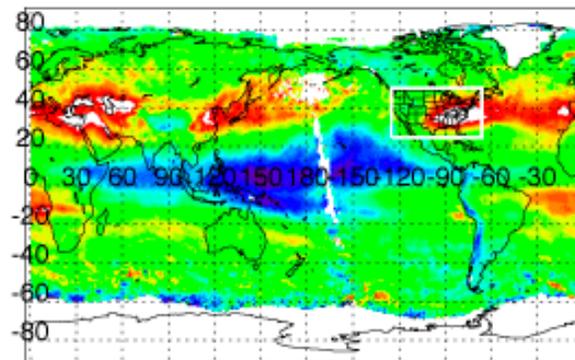
RAQMS_{NRT} Trop O₃ (CLD Cleared) Column
August 2006



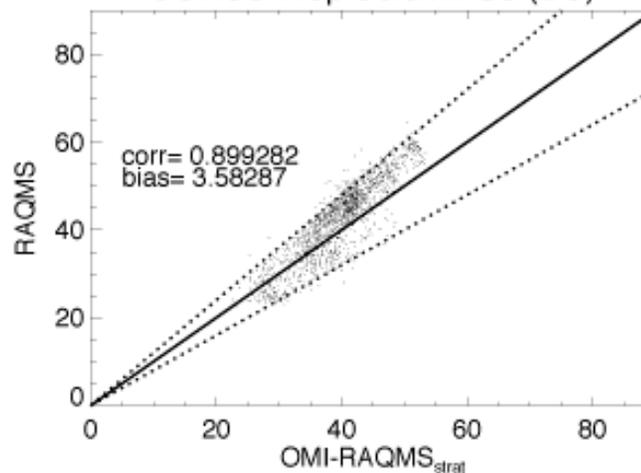
Global Trop Column O3 (DU)



OMI-RAQMS_S Trop O₃ (CLD Cleared) Column
August 2006



CONUS Trop Column O3 (DU)

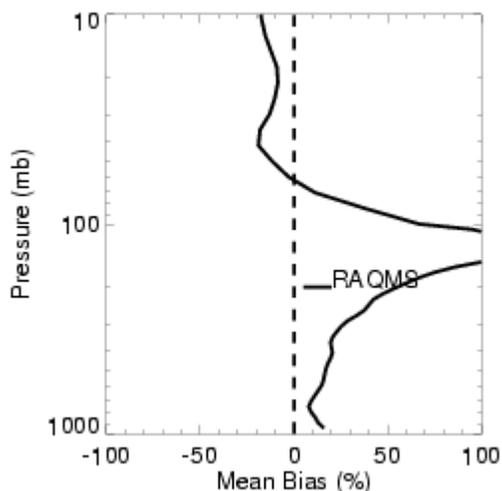
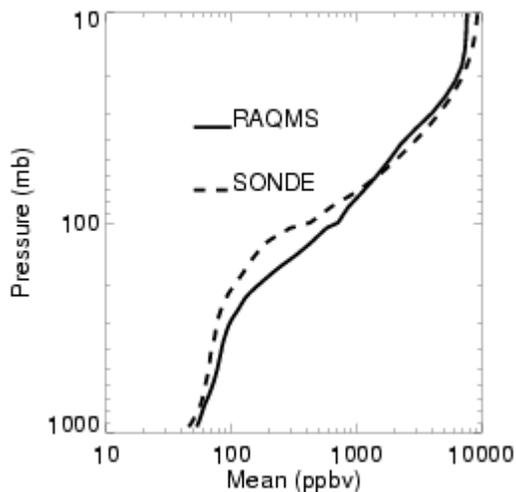


Analyzed Tropospheric Ozone Column (TOC) well correlated with OMI - RAQMS_{STRAT} ($r=0.84$ globally, 0.90 CONUS). TOC median high bias of 3.6 Dobson Units over CONUS. Globally, median bias is negative due to low tropical values.

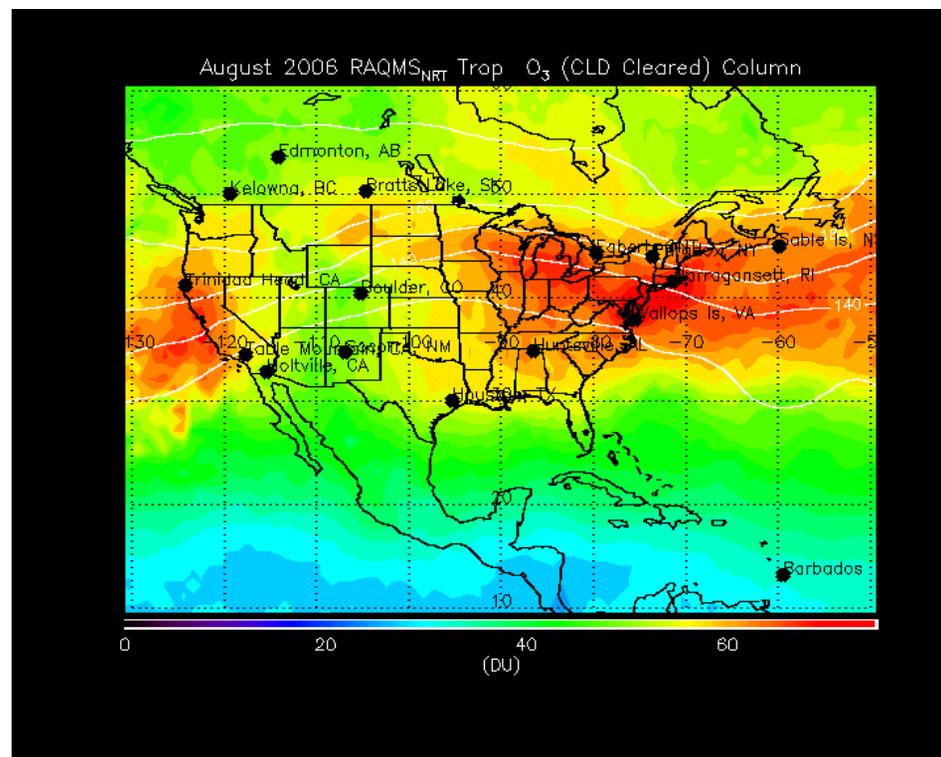
Comparison of RAQMS NRT OMI analysis with IONS ozonesondes (373 sondes, August, 2006)



PI: ANNE M. THOMPSON
Penn State

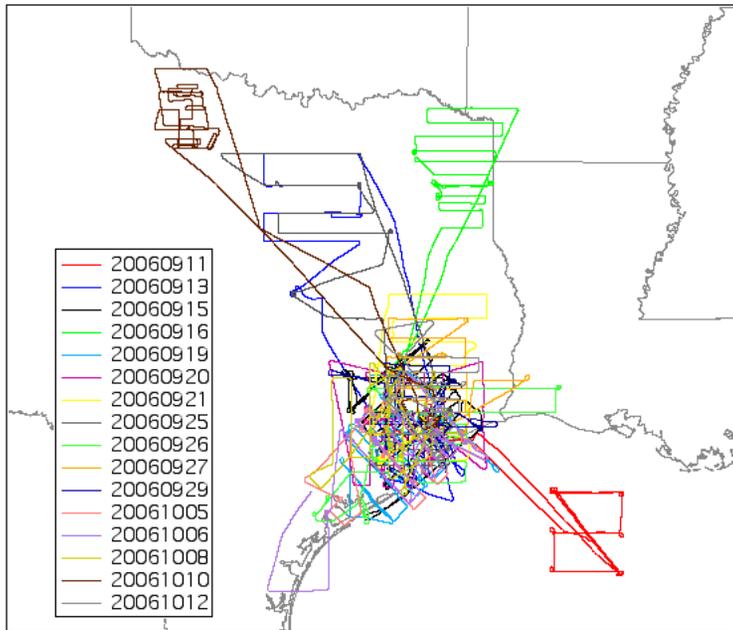


RAQMS NRT OMI Tropospheric Ozone Column (August 01-31, 2006)



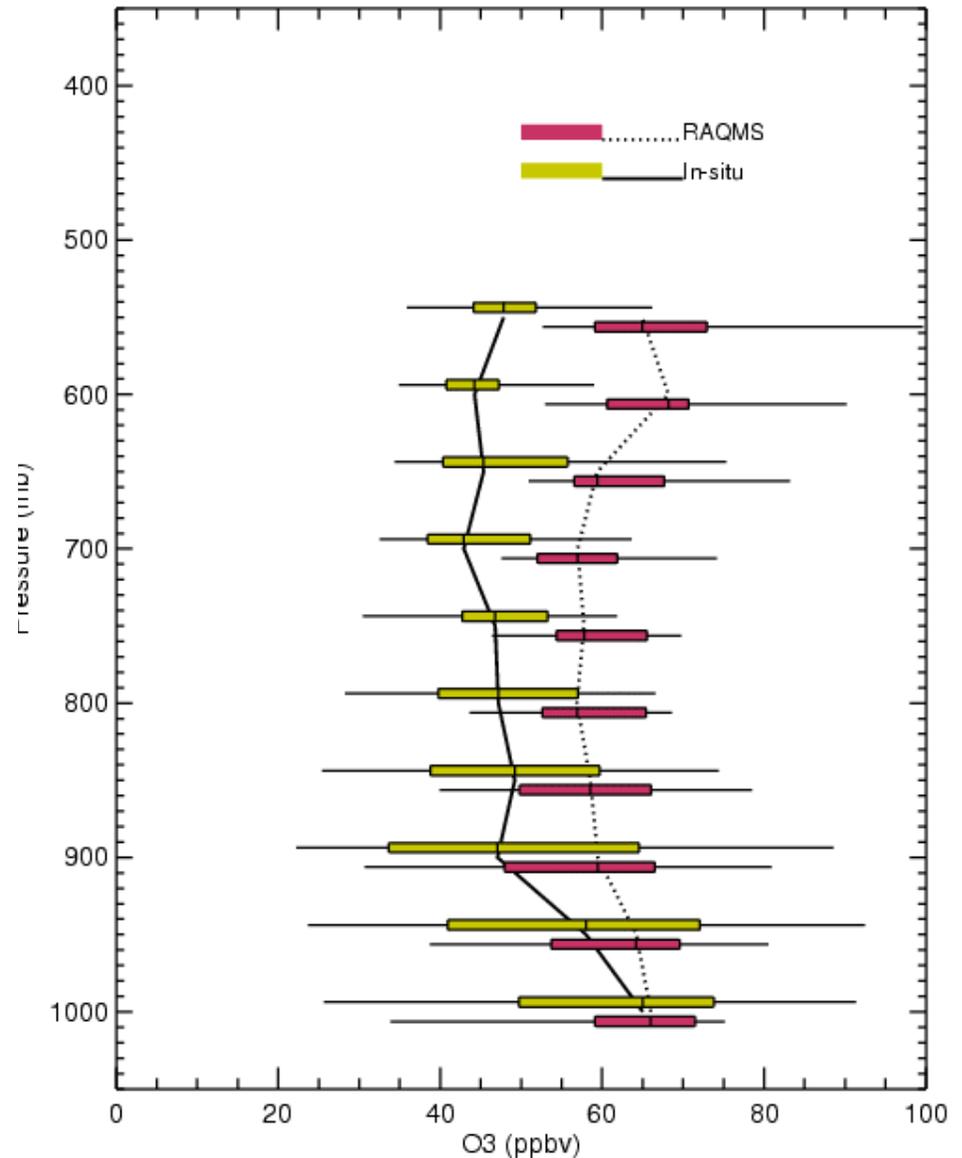
Large high bias (50-100%) in upper troposphere/lower stratosphere

TexAQS 2006: RAQMS O₃ vs NOAA P3 all flights

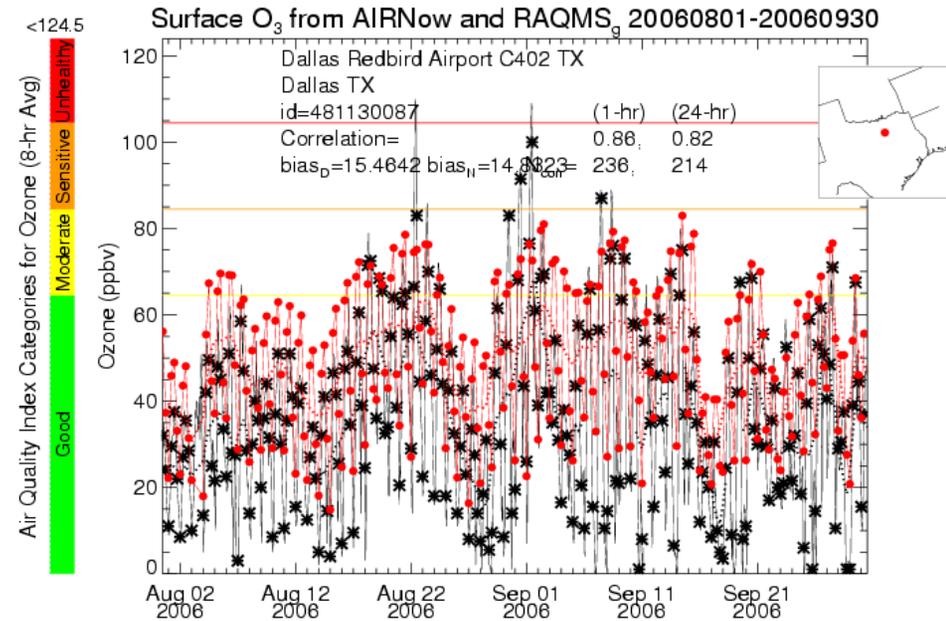
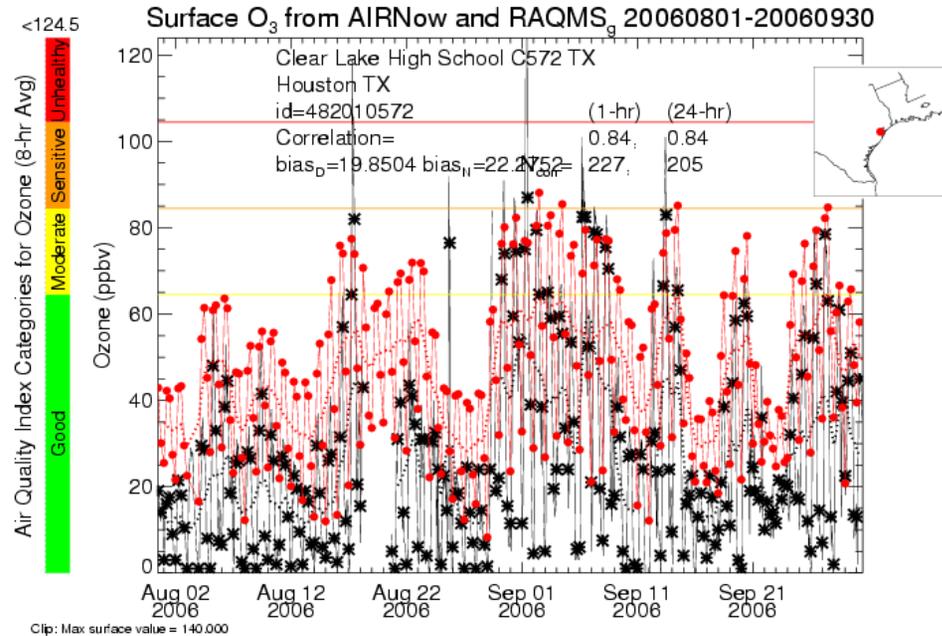


In East Texas, RAQMS analysis has approx 15 ppb high bias through free troposphere. No median bias near the surface although variance is underestimated.

RAQMS_{NRT}/NOAA P3 In-situ O₃ (Ryerson)
(8/31-10/13, 2006, All TEXAQS II available Flights)

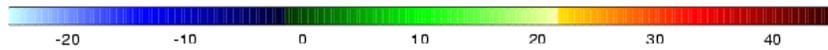
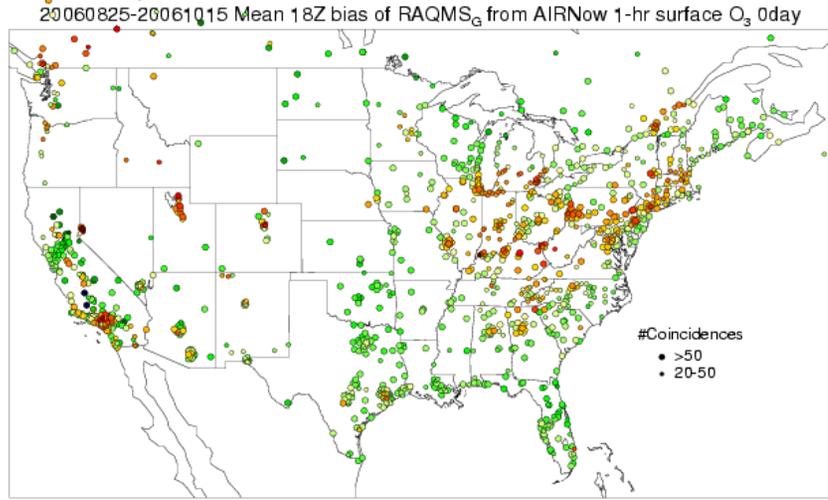


TexAQS, Aug-Sep 2006: Assessment of O₃ Analysis with Hourly Surface O₃ Measurements

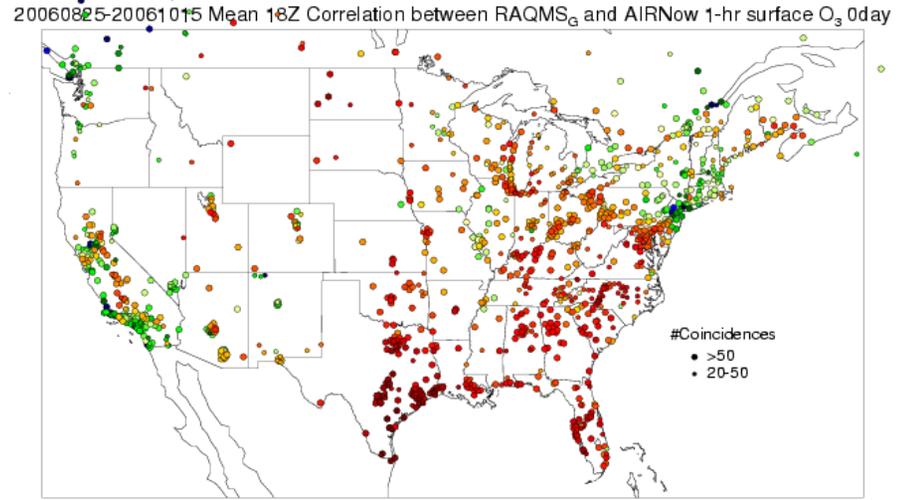


O₃ timeseries from monitoring locations in Houston and Dallas show that the RAQMS analysis captures the temporal behavior of surface O₃ at these sites (1-hour and 24-hour r values above 0.8) but has a persistent high bias.

TexAQS, Aug-Sep 2006: Assessment of O₃ Analysis with Hourly Surface O₃ Measurements



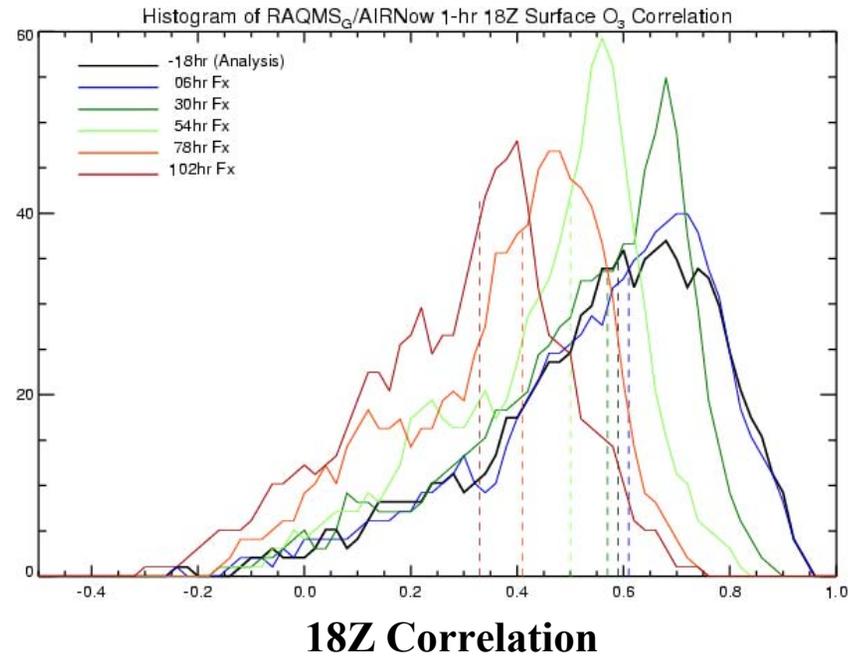
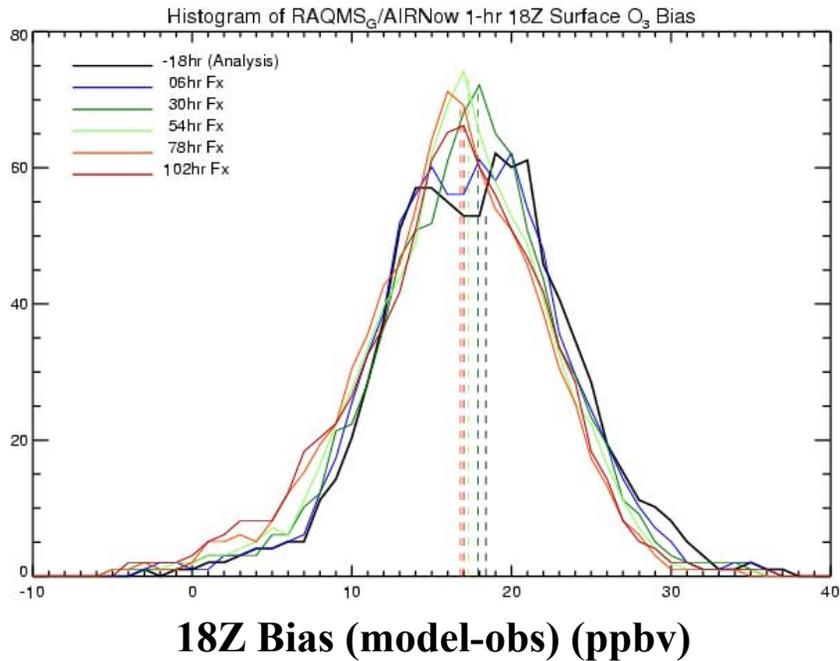
18Z Bias (model-obs) (ppbv)



18Z Correlation

National maps of time averaged site statistics show RAQMS 18Z surface O₃ analysis is high by 15 ppbv through most of the SE US and by 30 ppbv over the Ohio River valley and Northeast (left) but is highly correlated with measurements over most of the Eastern US (right).

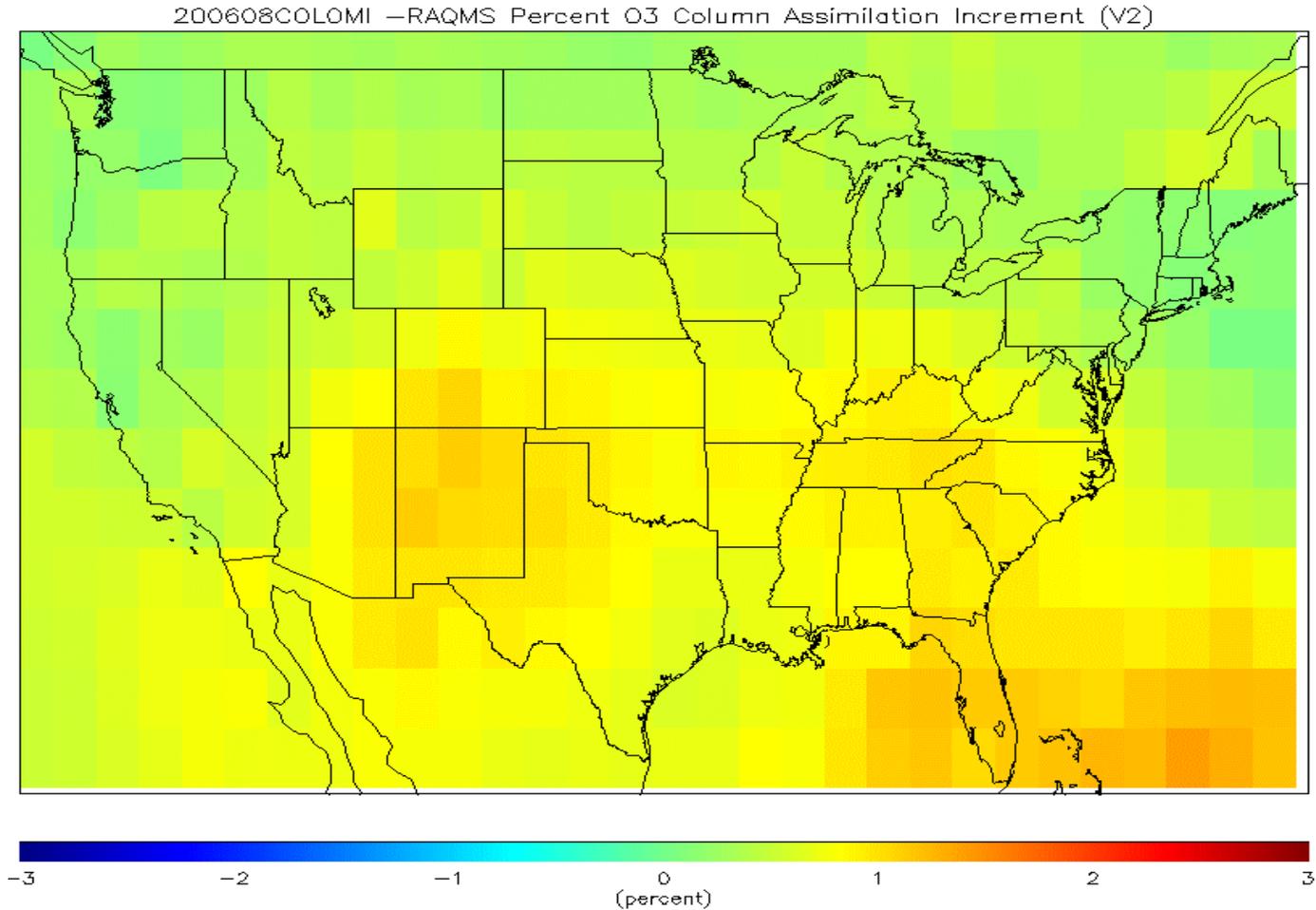
TexAQS, Aug-Sep 2006: Assessment of O₃ Forecasts with Hourly Surface O₃ Measurements



Histograms show the changes in bias and temporal correlation through the 5-day forecast period. There is little change in the distribution of biases or median bias during the forecast period (left). Temporal correlation coefficients (right) show significant skill through 30 hours (median correlation 0.6) and a systematic degradation at forecast periods of 54 hours and beyond.

Extra slides

RAQMS August, 2006 Mean OMI O3 O3 Analysis Increments (total column)



Assimilation of OMI total column O3 measurements results in small (1-1.5%) mean increases in total column O3 over CONUS.