

# Air Quality Forecast Models during TEXAQS-2K6: Forecasts, Ensembles and Evaluations

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- AQ forecast models available for summer of 2006
- Model related forecast/science questions to address
- Observations and platforms
- Remaining Issues

## Forecast/Science Issues for AQ models

- Statistical comparisons
  - Identifying Model Biases
  - Overall model performance comparisons
  - Guidance to AQ forecast centers
- Process Studies
  - Emissions inventories - comparison to observations
  - Transport pathways
  - Photochemical mechanism evaluations

## AQ Forecast Models available in 2006

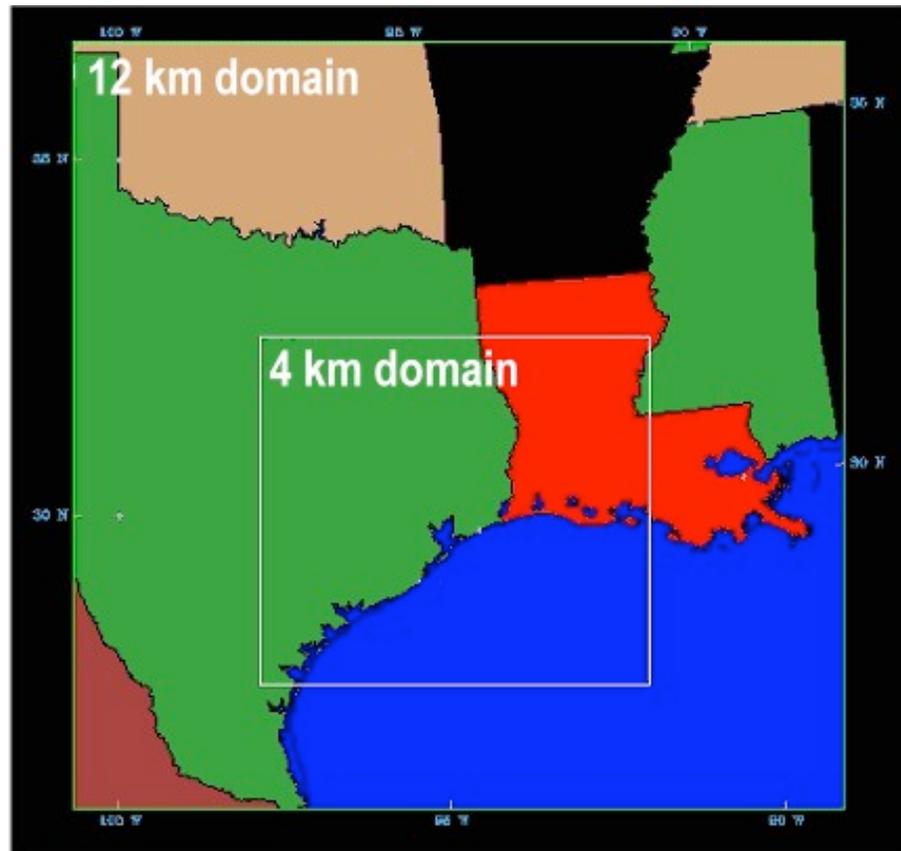
### Available in Real-Time

- University of Houston, 4km and 12km, MM5/CB-IV, PM2.5
- NOAA NWS/NCEP, 12km, WRF/CMAQ - O<sub>3</sub> and met. only
- NOAA ESRL/GSD, 12km, WRF-CHEM
- Canadian CMC, 21km, CHRONOS
- Canadian CMC, 40km, AURAMS
- University of Iowa, 4km and 12km, WRF/STEM

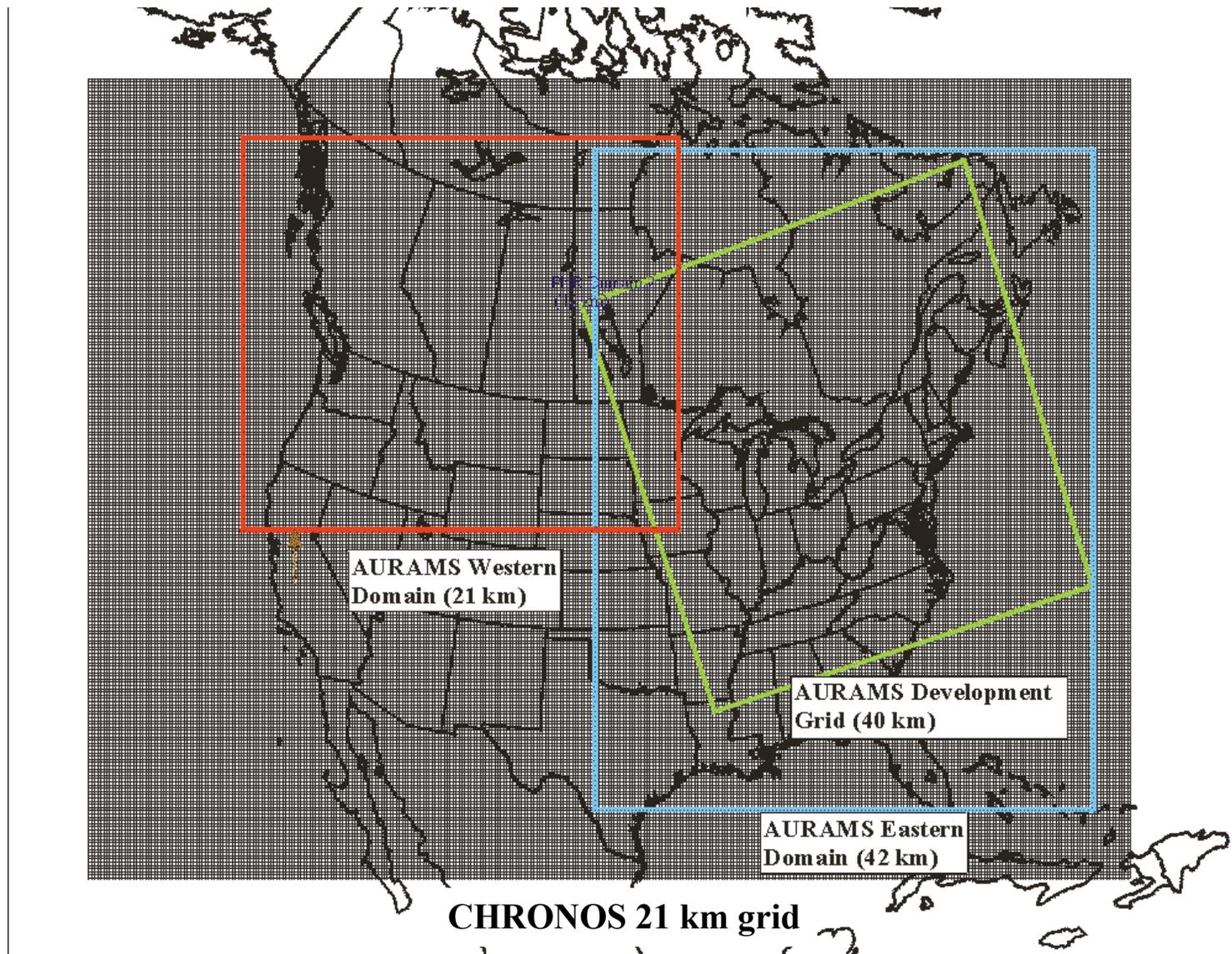
### Available after the Experiment

- NOAA NWS/NCEP, Upper-Air Composition, PM2.5
- Baron AMS, 4km and 12km, MM5/MAQSIP-RT

## University of Houston model domains for 2006



# Eastern and Western AURAMS Domains



## Model Evaluation Protocol

- Make Model Forecasts Available (ftp, scp)  
File formats, saved domain, species, predetermined  
Central location (ESRL/CSD)  
Meteorological forecasts along with chem/aerosol
- Real-time display of model/obs comparisons (ESRL/PSD)  
AIRNOW O<sub>3</sub> and PM<sub>2.5</sub> network in 2006  
CAMS network?  
Ron Brown  
Ensemble O<sub>3</sub> forecasts
- Post Mission Analysis  
Statistics/Evaluation on preliminary data  
Twin Otter O<sub>3</sub> lidar, NOAA P-3 data  
Wait for QA/QC data for final analysis  
Combining met./chem. evaluations

## Model variables available for Comparison with NOAA Aircraft and Ron Brown data for 2004

### gas phase chemistry

	AURAMS	CHRONOS	STEM	WRF-2
O <sub>3</sub>	✓	✓	✓	✓
CO			✓	✓
NO	✓	✓	✓	✓
NO <sub>x</sub>	✓	✓	✓	✓
NO <sub>y</sub>	✓	✓	✓	✓
PAN	✓	✓	✓	✓
Isoprene	✓	✓	✓	✓
SO <sub>2</sub>	✓	✓	✓	✓
NO <sub>3</sub>	✓	✓		✓
N <sub>2</sub> O <sub>5</sub>	✓	✓		✓
CH <sub>3</sub> CHO	✓			✓
Toluene		✓		✓
Ethylene	✓	✓		✓
NH <sub>3</sub>				✓

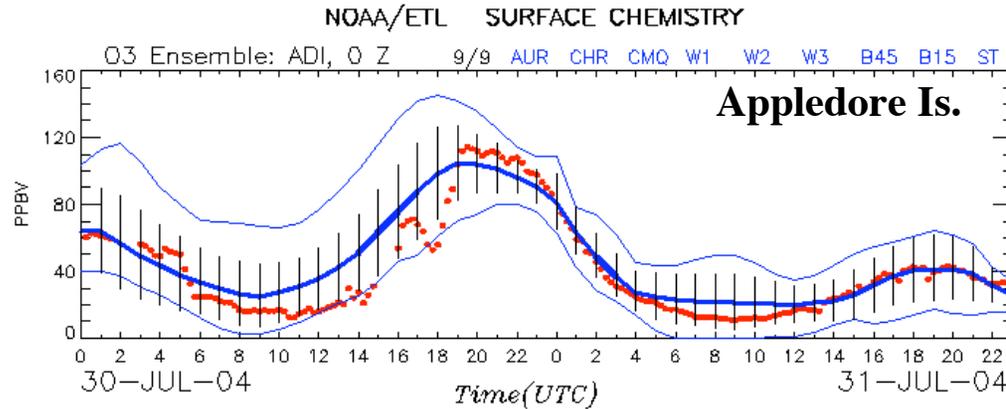
### aerosols, radiation, meteorology

	AURAMS	CHRONOS	STEM	WRF-2
PM2.5	✓	✓	✓	✓
Asol SO <sub>4</sub>	✓	✓	✓	✓
Asol NH <sub>4</sub>	✓			✓
Asol OC	✓	✓	✓	✓
Asol EC	✓		✓	✓
Asol NO <sub>3</sub>	✓			✓
JNO <sub>2</sub>				✓
T	✓	✓	✓	✓
P	✓		✓	✓
H <sub>2</sub> O	✓	✓	✓	✓
winds	✓	✓	✓	✓
SST	✓			✓
Radiation				✓

[http://www.al.noaa.gov/icartt\\_modelevel](http://www.al.noaa.gov/icartt_modelevel)

# Real-time Ensemble Air Quality Forecasts during NEAQS-2004

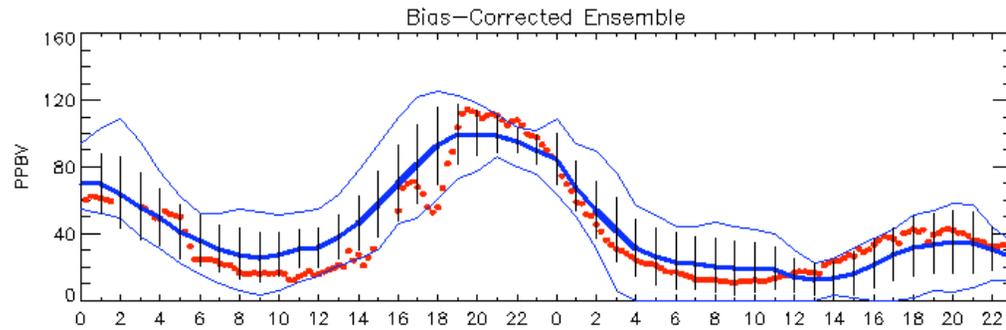
<http://www.etl.noaa.gov/programs/2004/neaqs/verification/>



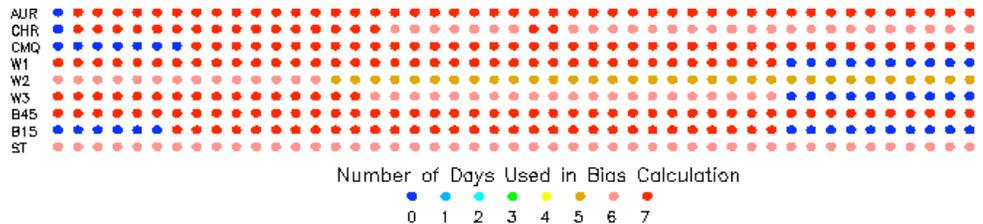
**Ensemble Average O<sub>3</sub>,  
Model max, min, 1 sigma St. Dev.**



**9 Air Quality Models**

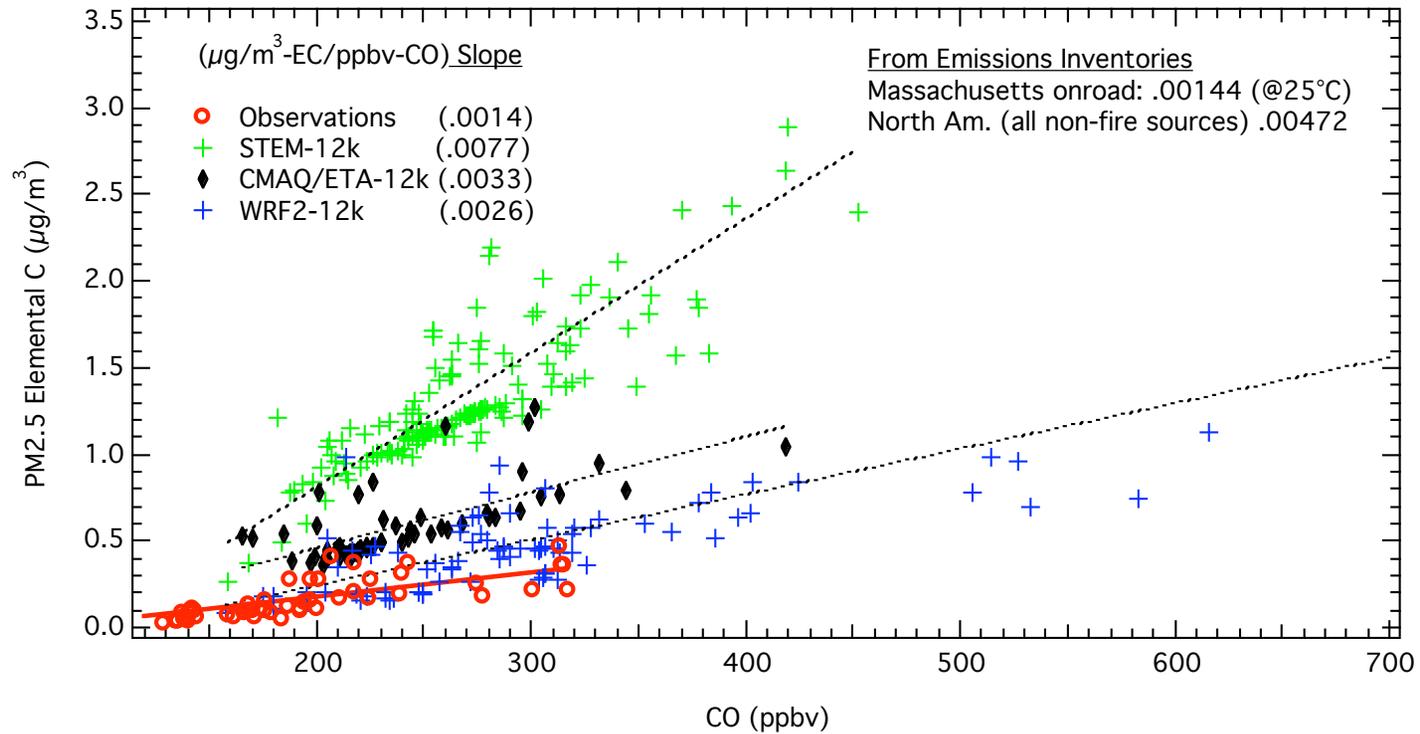


**Bias Corrected Ensemble  
average O<sub>3</sub>, (7-day bias statistics)**



Jim Wilczak  
Irina Djalalova  
Jessica Koury

## Example of Emissions Verification from Ron Brown Data (Correlations of Elemental Carbon with CO)



Model results from 7/21//04  
(downwind of Boston)

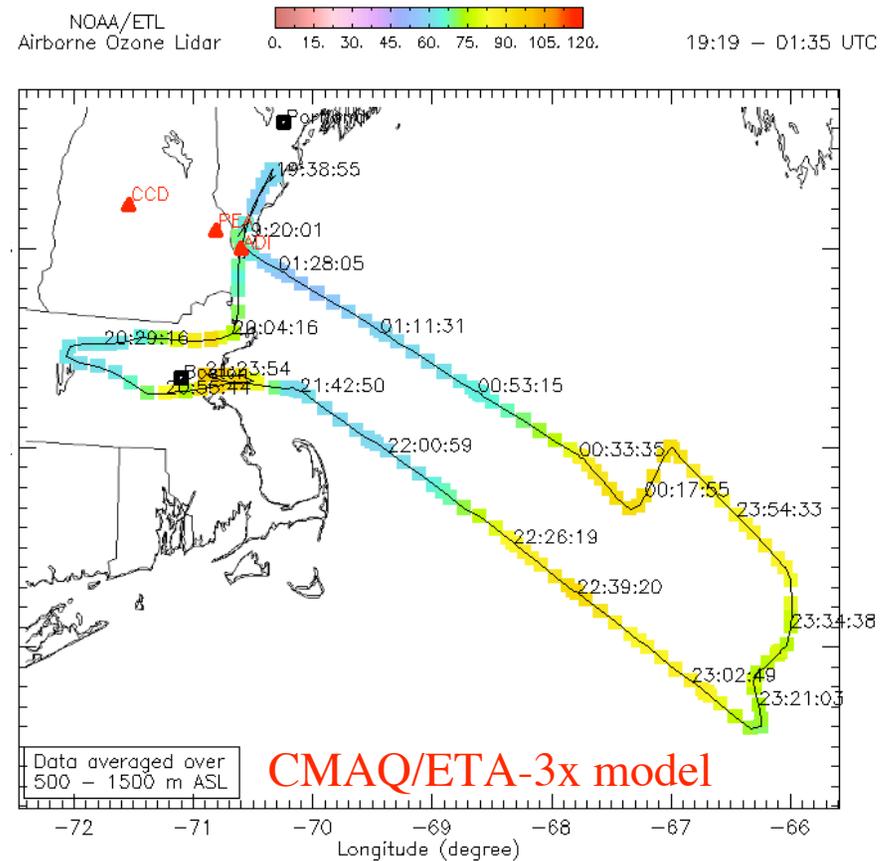
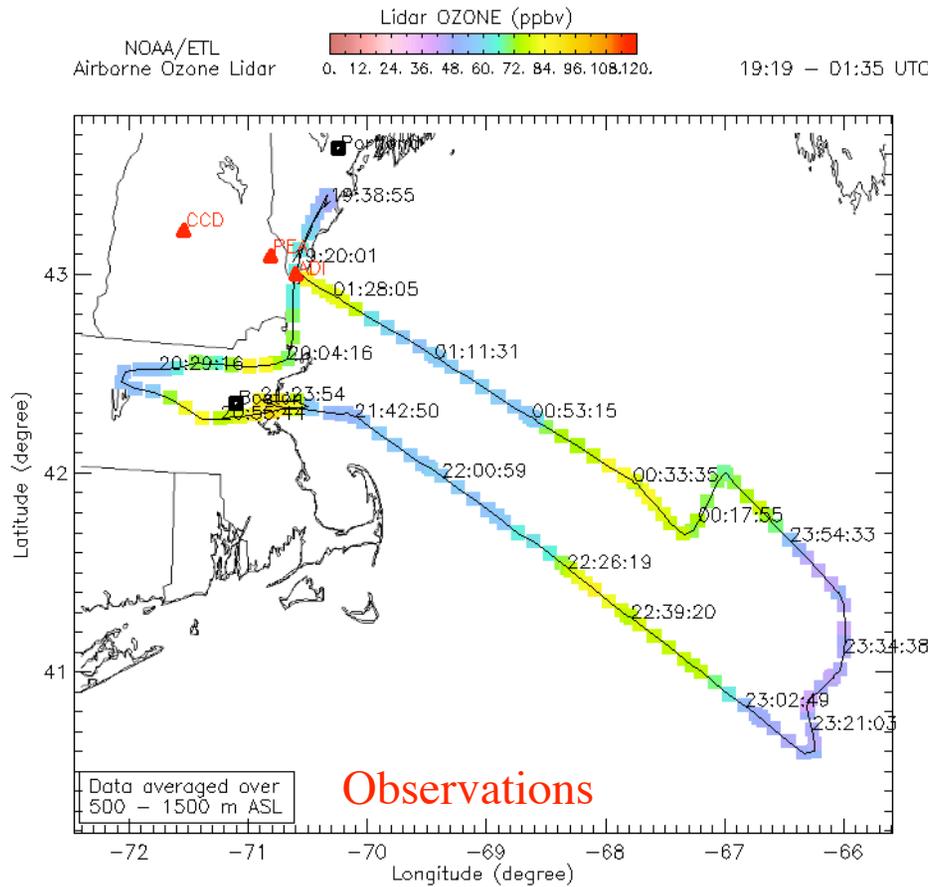
Observations from filter  
impactors - all data

# NOAA DC-3 Airborne Ozone Lidar

([www.etl.noaa.gov/programs/2004/neaqs/verification](http://www.etl.noaa.gov/programs/2004/neaqs/verification))

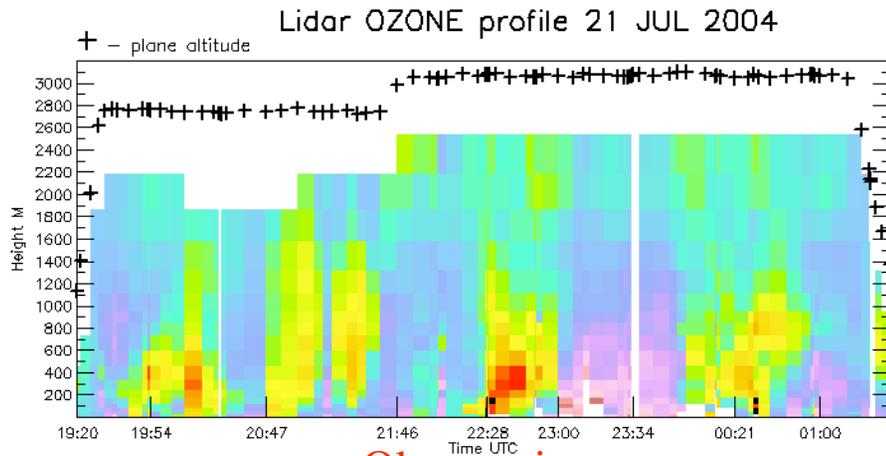
## Irina Djalalova

Plane position 21 JUL 2004

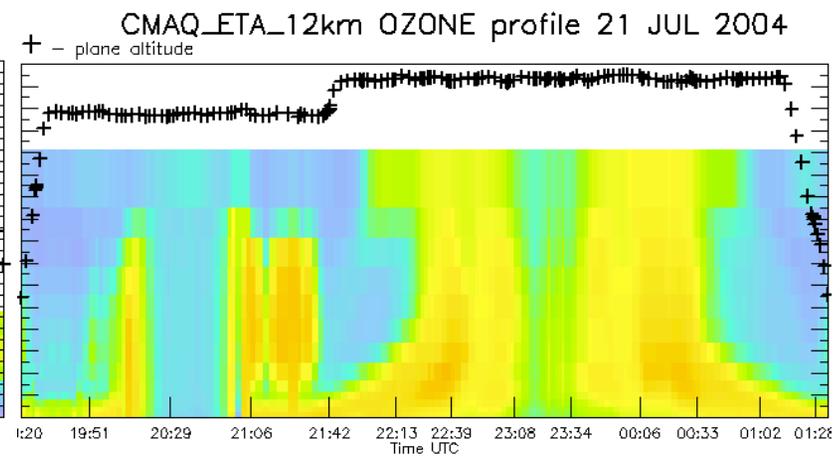


# NOAA DC-3 Ozone curtains; observations and models

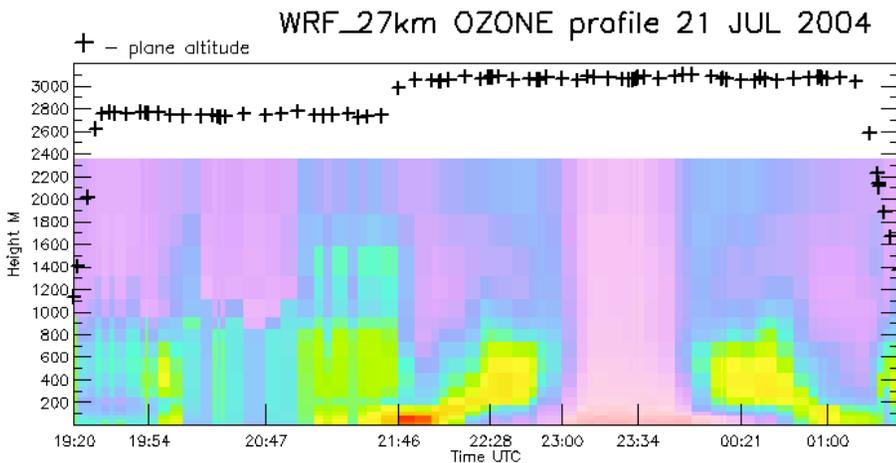
## July 21, 2004



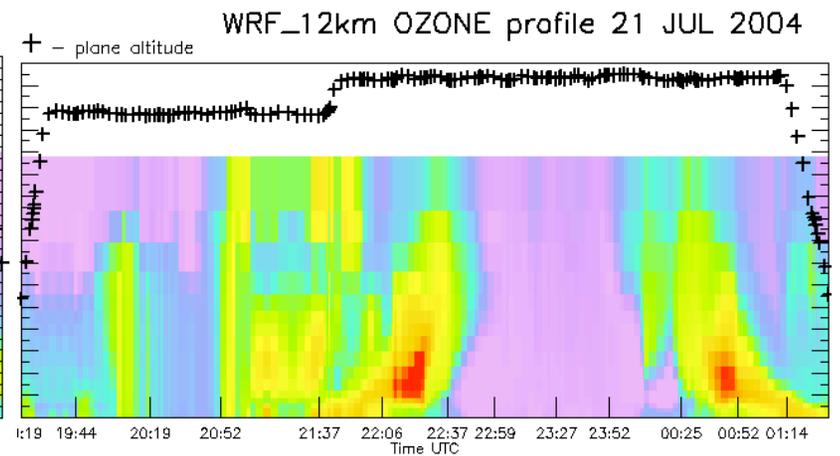
Observations



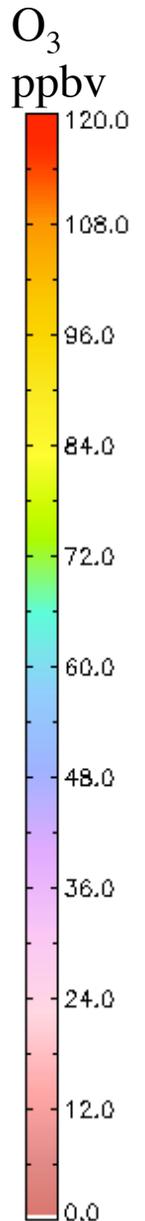
CMAQ/ETA-3x Model



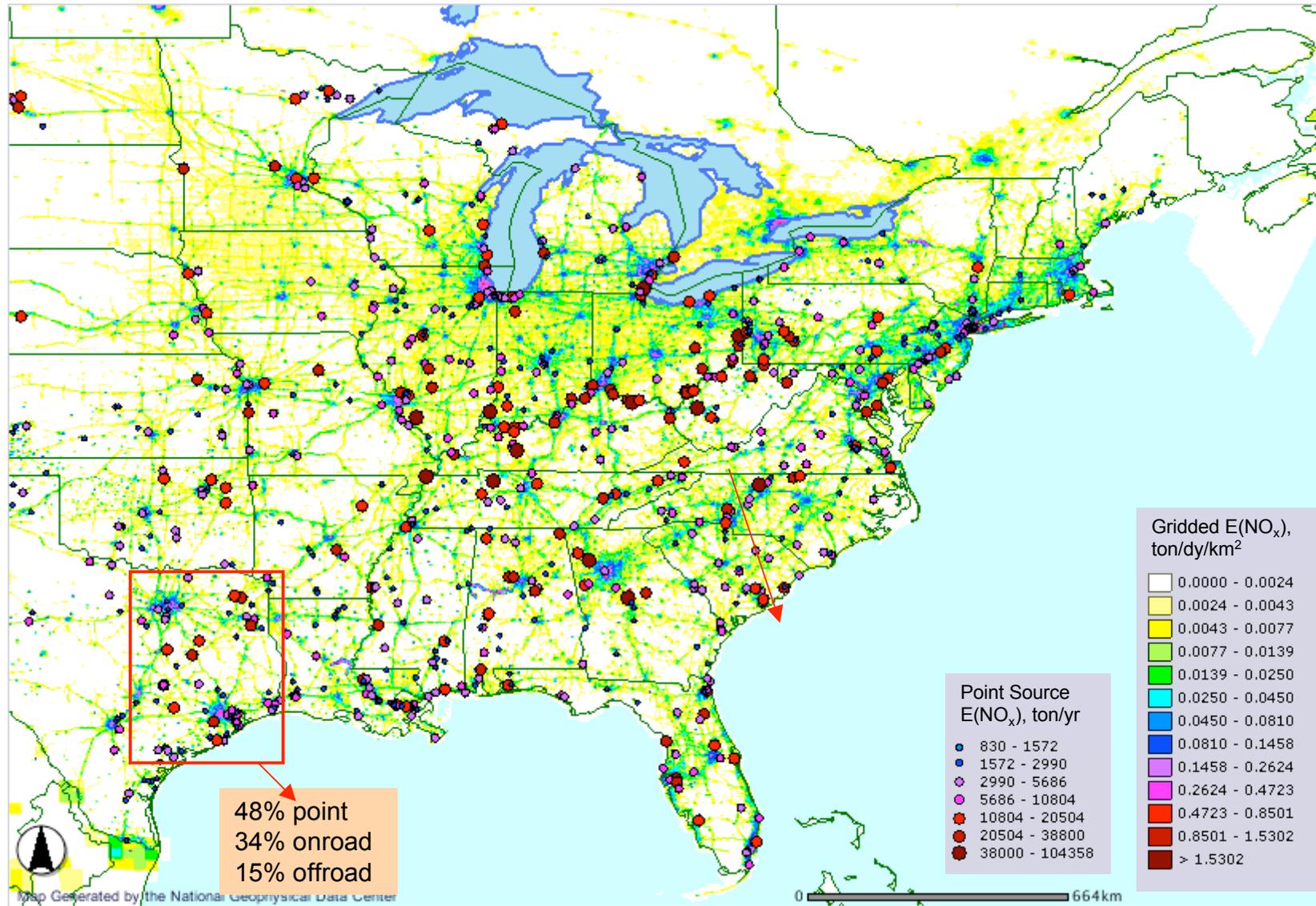
Mellor-Yamada(2.5) PBL scheme



YSU PBL scheme



NGDC-Boulder display products  
Emissions, AIRNOW O<sub>3</sub>, AQ model forecasts



<http://map.ngdc.noaa.gov/website/al/emissions>

## Additional Issues

### Real-time displays (multi-model displays)

ESRL/CSD and ESRL/ACD

NGDC at Boulder

Coordination with other groups?

### Ensemble Forecasting

Real-time O<sub>3</sub> done by ESRL/PSD

Select Sites

Entire Overlapping domain at surface

Ensembles of Meteorology?

PM2.5 ensemble?

### Additional sites and networks - priorities