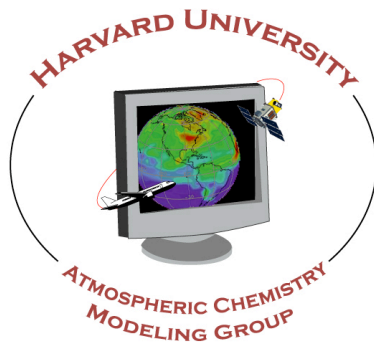


Joint Assimilation of Ozone and CO Geostationary Observations to Improve Constraints on Ozone Air Quality



Peter Zoogman

with Daniel J. Jacob, Kelly Chance, Lin Zhang, Annemarie
Eldering, Xiong Liu, Vijay Natraj, Susan S. Kulawik, Mary Barth,
David Edwards, Helen Worden

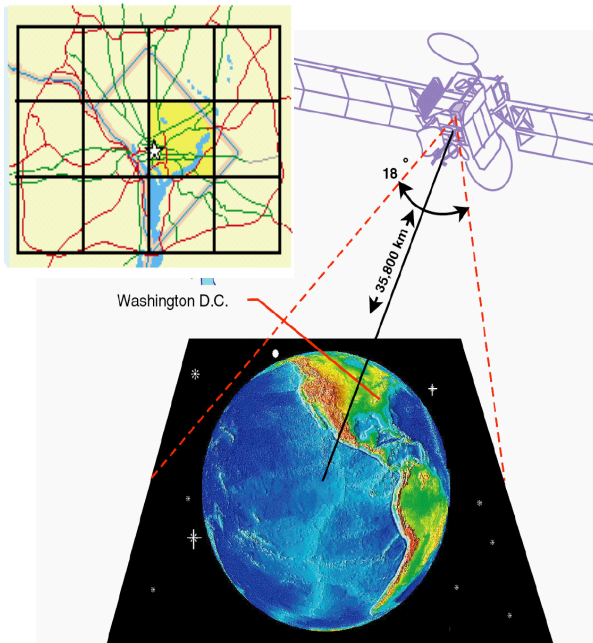
GEOS-Chem Users' Meeting

May 2, 2011



Observations from GEO-CAPE

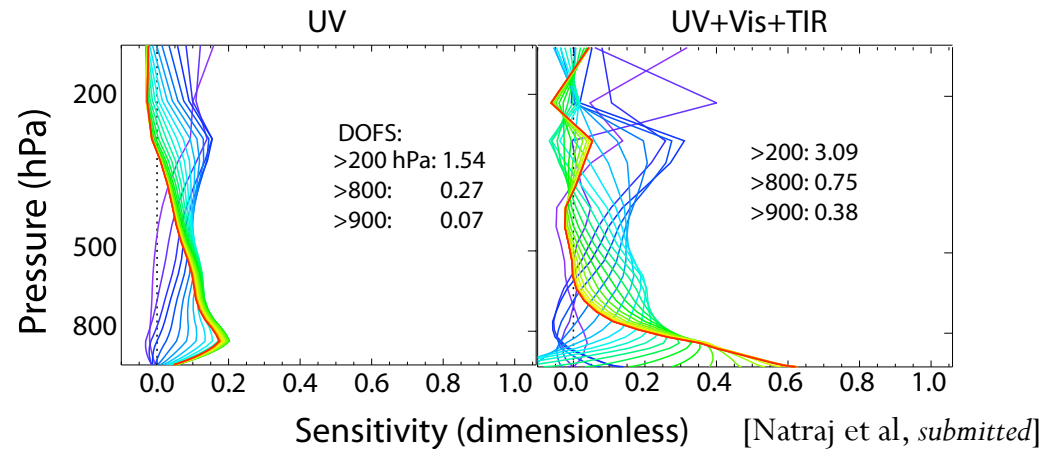
Geostationary Coastal & Air Pollution Events (2020??)



Features:

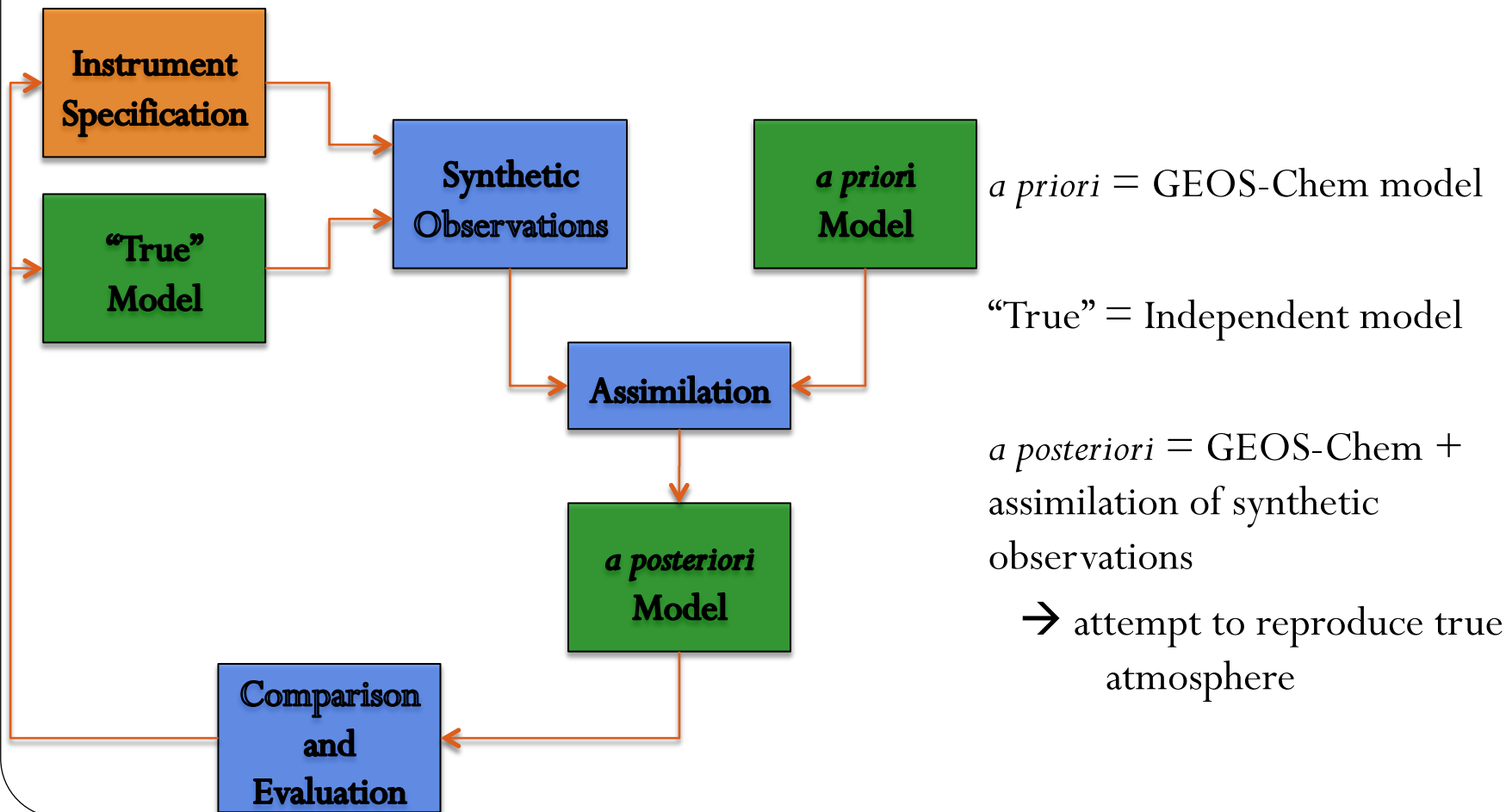
- High temporal resolution
- Multispectral observations for increased vertical information

Ozone sensitivities, GEO-CAPE



Observing System Simulation Experiment

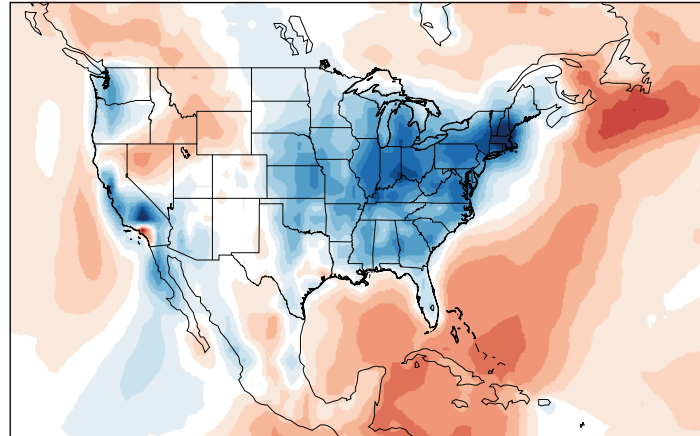
- To what degree can geostationary measurements in different spectral regions/combinations resolve ozone near the surface?
- What information can we gain about ozone from CO measurements from error correlations?



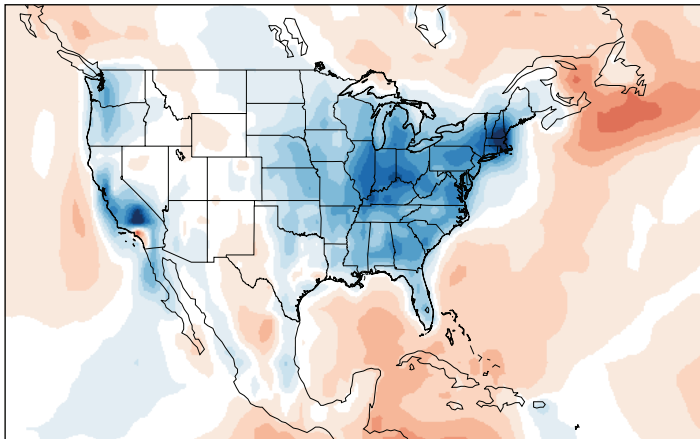
Air Quality Information from GEO-CAPE

Error in Surface MDA8 Ozone averaged for July 2001

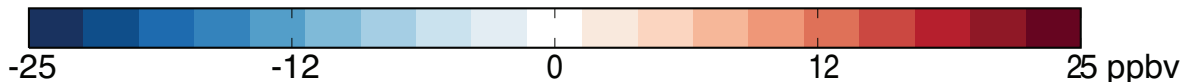
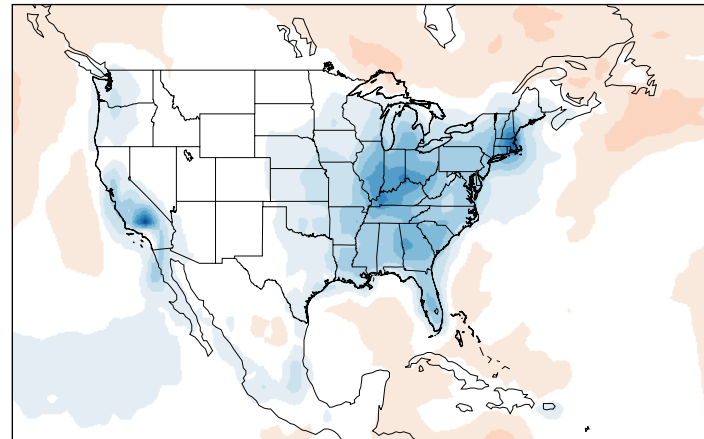
a priori RMSE: 8.0 ppbv



LEO UV+Vis+TIR RMSE: 6.5 ppbv



Geo UV+Vis+TIR RMSE: 3.7 ppbv

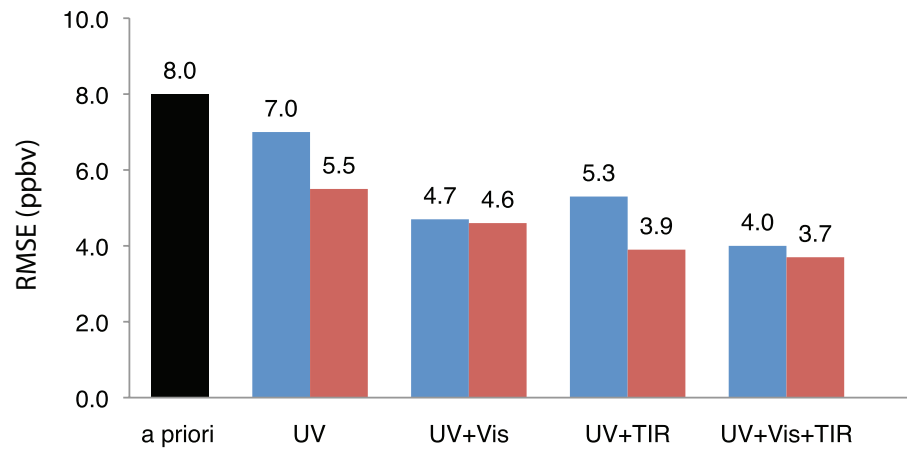


Need to combine observations in multiple spectral regions at high temporal resolution to constrain air quality

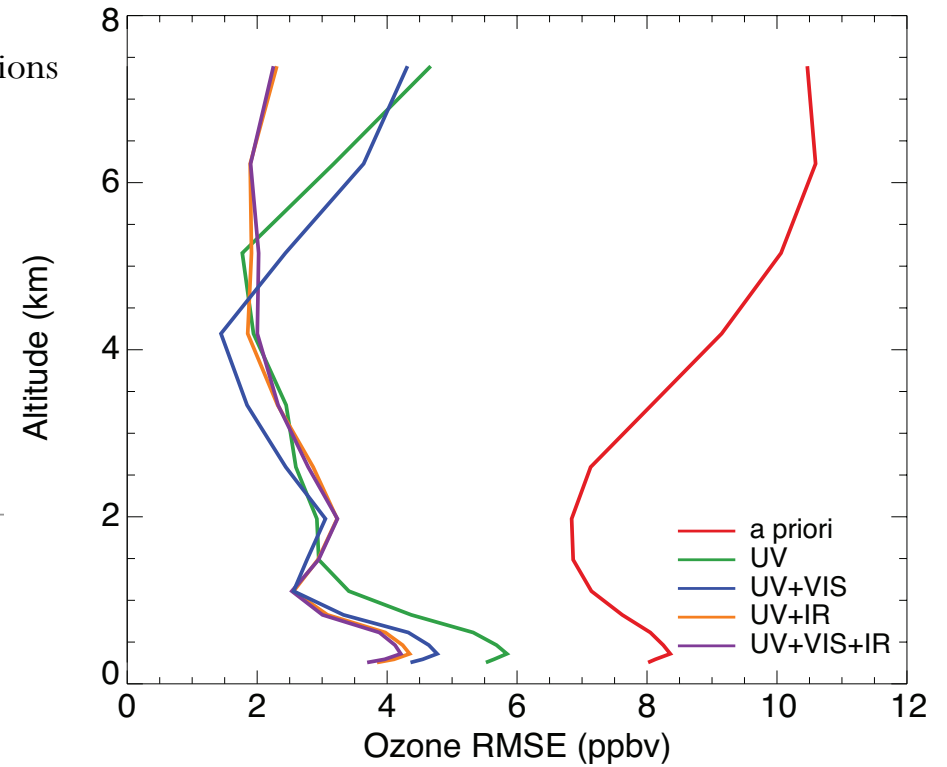
[Zoogman et al,
in review]

Comparison of Spectral Combinations

Error in ozone surface air concentration over the US after assimilation of observations in different spectral combinations



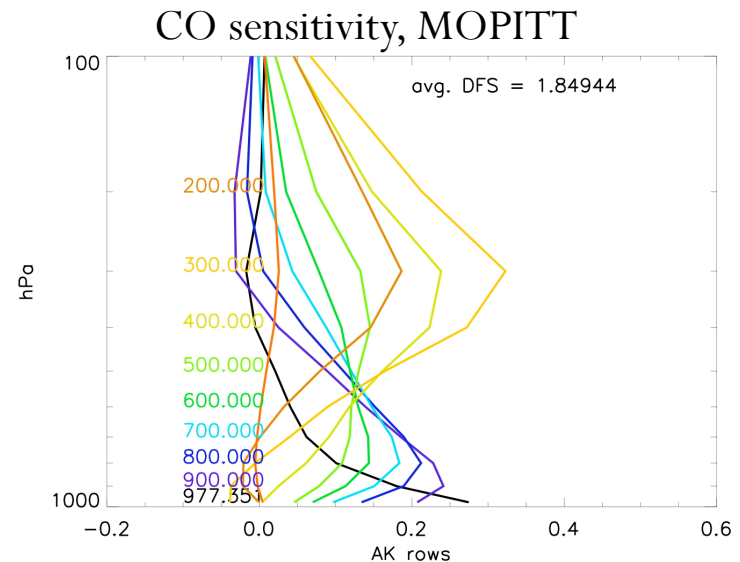
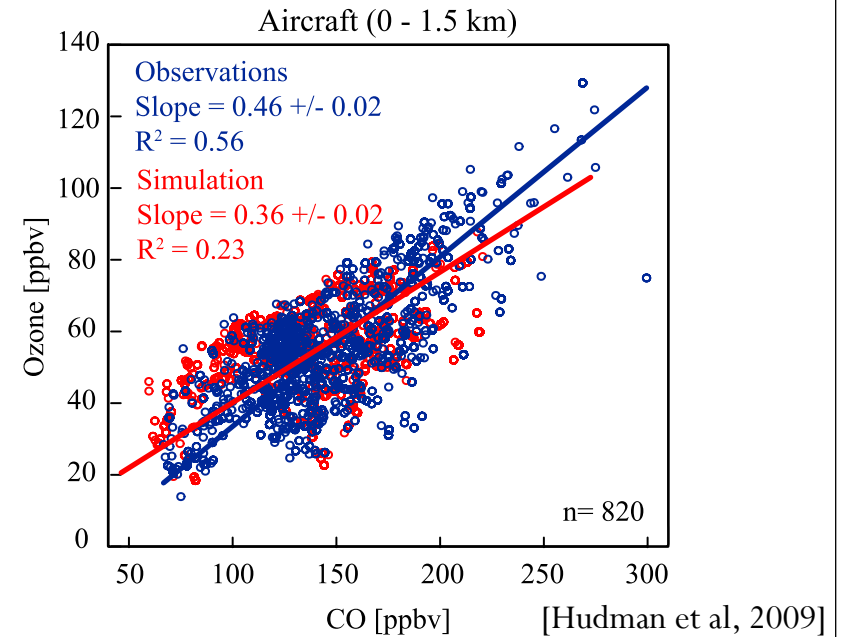
Vertical profile of *a posteriori* error in ozone concentrations



[Zoogman et al,
in review]

Usefulness of CO Observations

- O_3 :CO correlations are well known
- Data assimilation depends on constraining model error
 - CO observations can be used to constrain model transport error
- GEO-CAPE boundary layer sensitivity may be greater for CO than for ozone
 - Model errors correlated \Rightarrow CO observations could add information for ozone air quality



GEOS-Chem Error Correlation

- To quantify model error correlation we compared compared Nested NA GEOS-Chem to INTEX-NA below 2 km
 - July 1 – August 15, 2004
 - Below 2 km
- $R^2=0.5$, slope = .35

- Use WRF-Chem as high resolution “true” state

