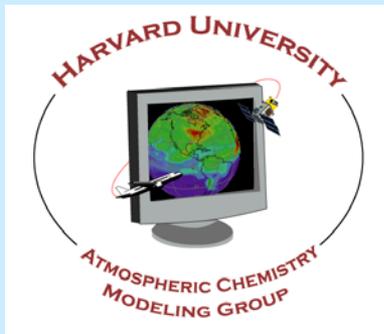


Estimating background ozone in surface air over the United States with global 3-D models of tropospheric chemistry

Description, Evaluation, and Results

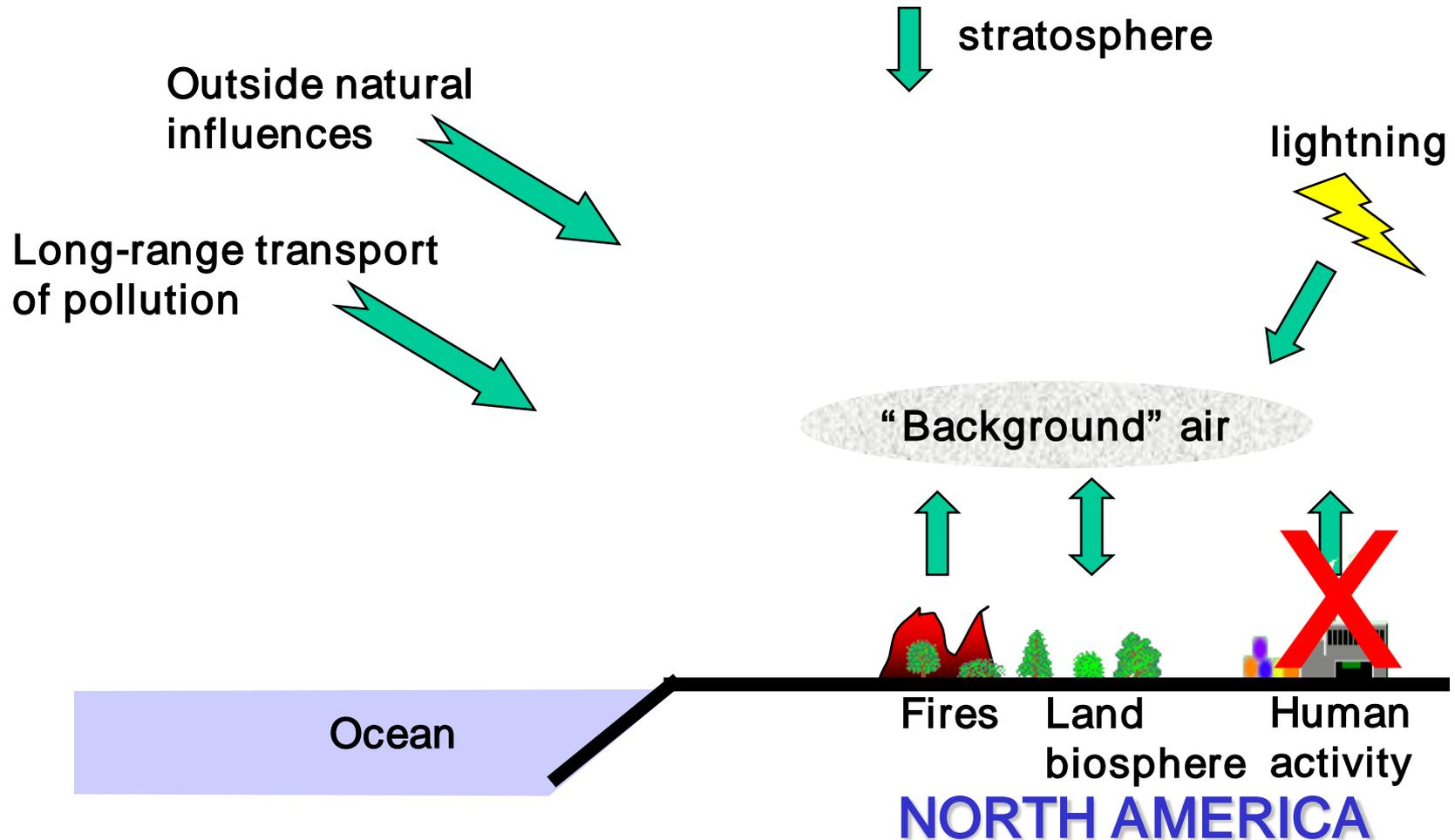


Arlene M. Fiore
Daniel J. Jacob



“POLICY RELEVANT BACKGROUND” (PRB) OZONE:

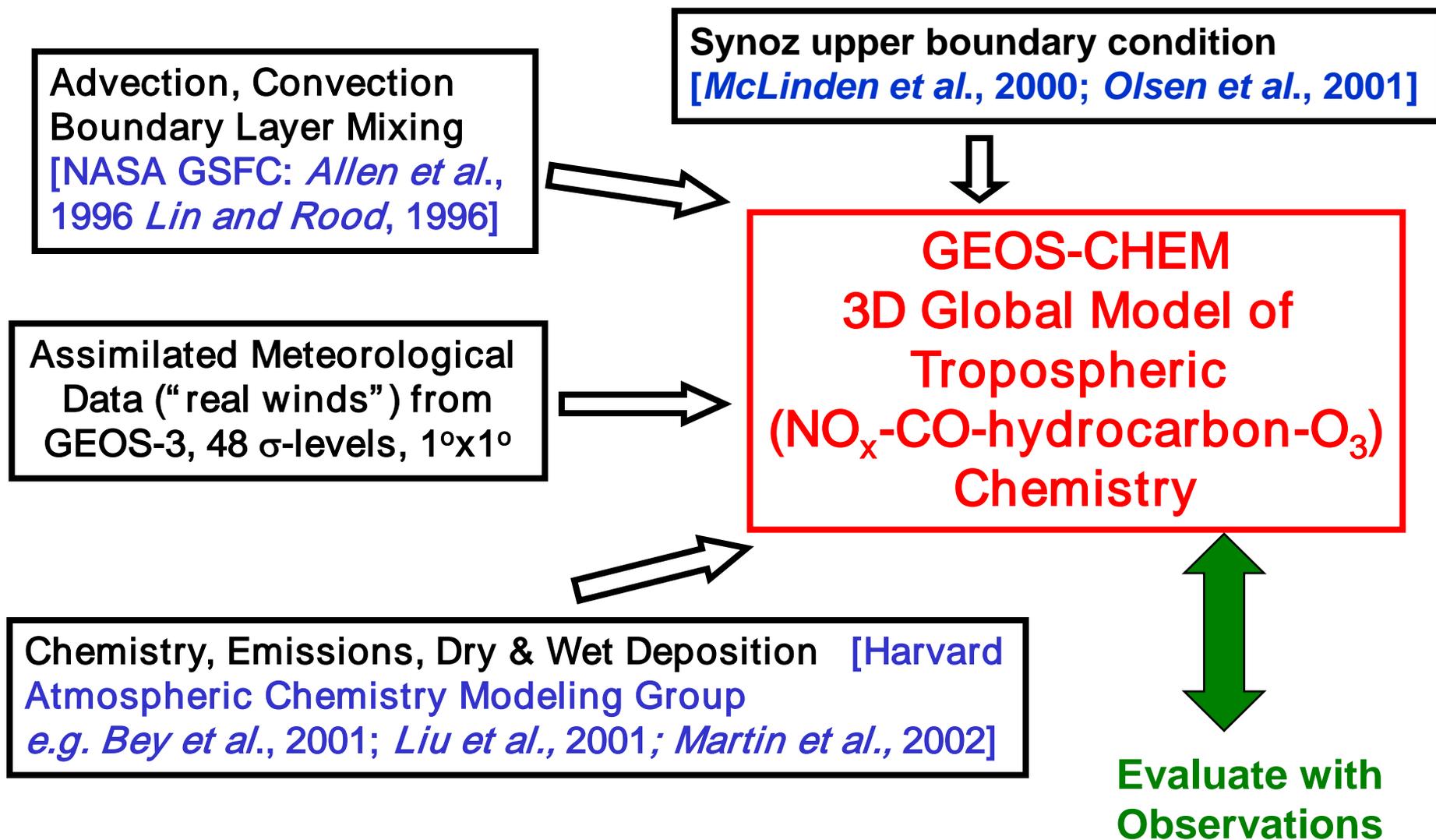
Ozone concentrations that would exist in the absence of anthropogenic emissions from the U.S., Canada and Mexico



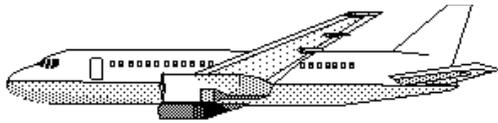
**PRB ozone is not directly observable
→ Must be estimated with models**

GEOS-CHEM Global 3-Dimensional Model of Atmospheric Chemistry and Transport

<http://www-as.harvard.edu/chemistry/trop/geos> >50 peer-reviewed papers



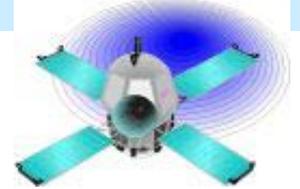
Models are evaluated with observations from ground stations, towers, aircraft, balloons, satellites for ozone and several related species



DC-8



P-3

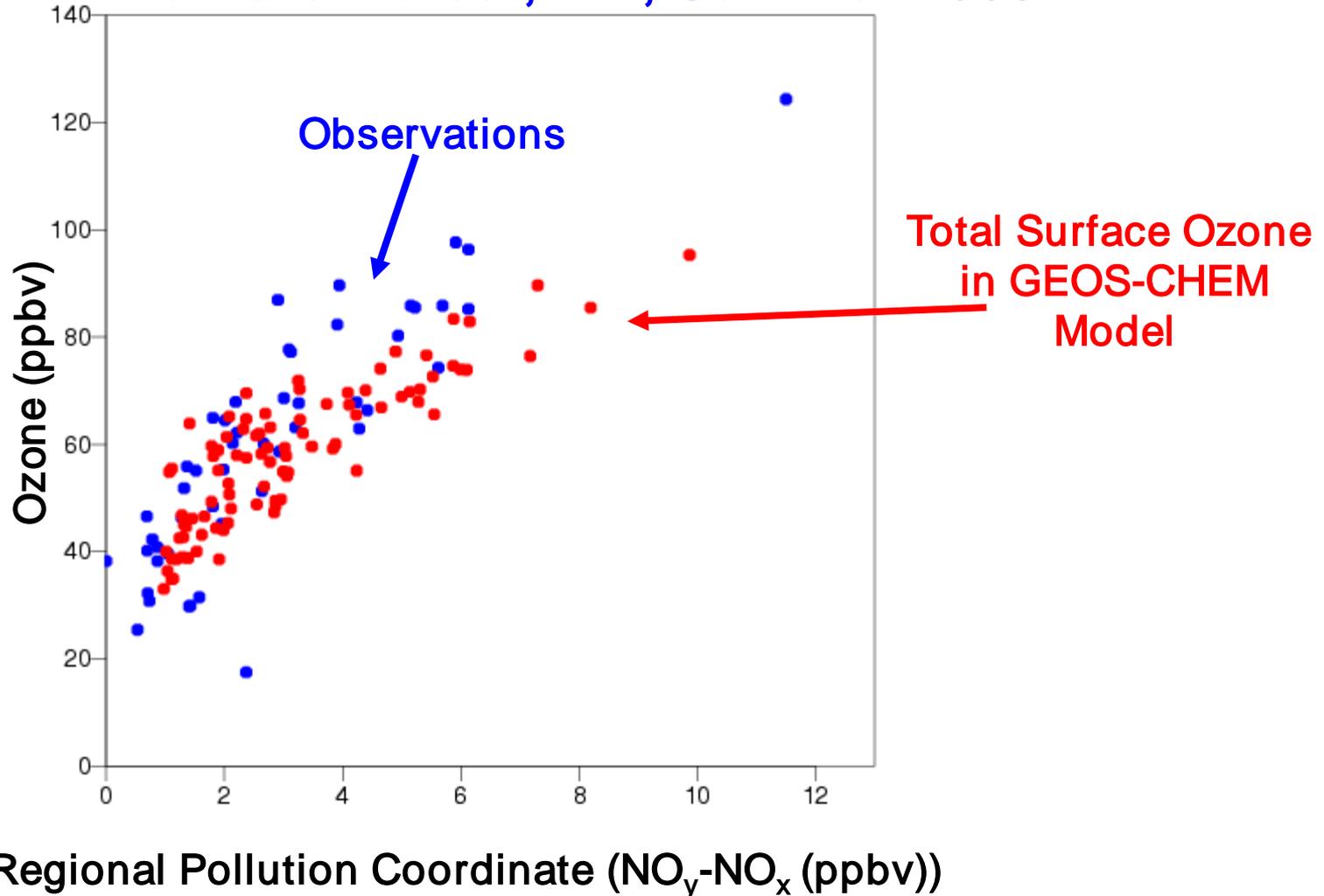


Tropospheric chemistry models including GEOS-CHEM are playing an important role in:

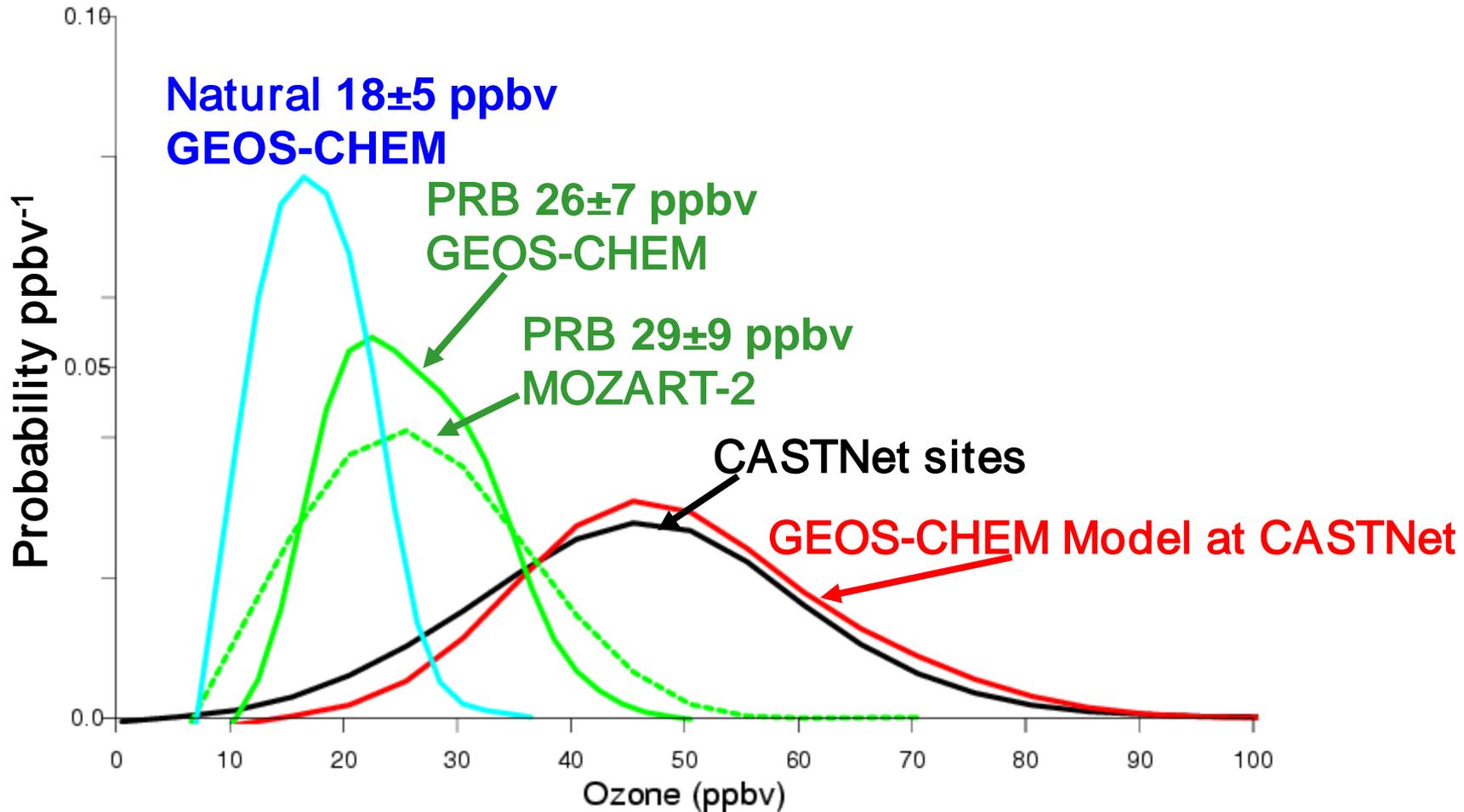
- Interpreting results from several national and international field campaigns
- Atmospheric Chemistry sections of the IPCC assessments

Evaluation of Ozone Production Chemistry and Background

Daily mean afternoon O_3 vs. (NO_y-NO_x)
At Harvard Forest, MA, Summer 1995



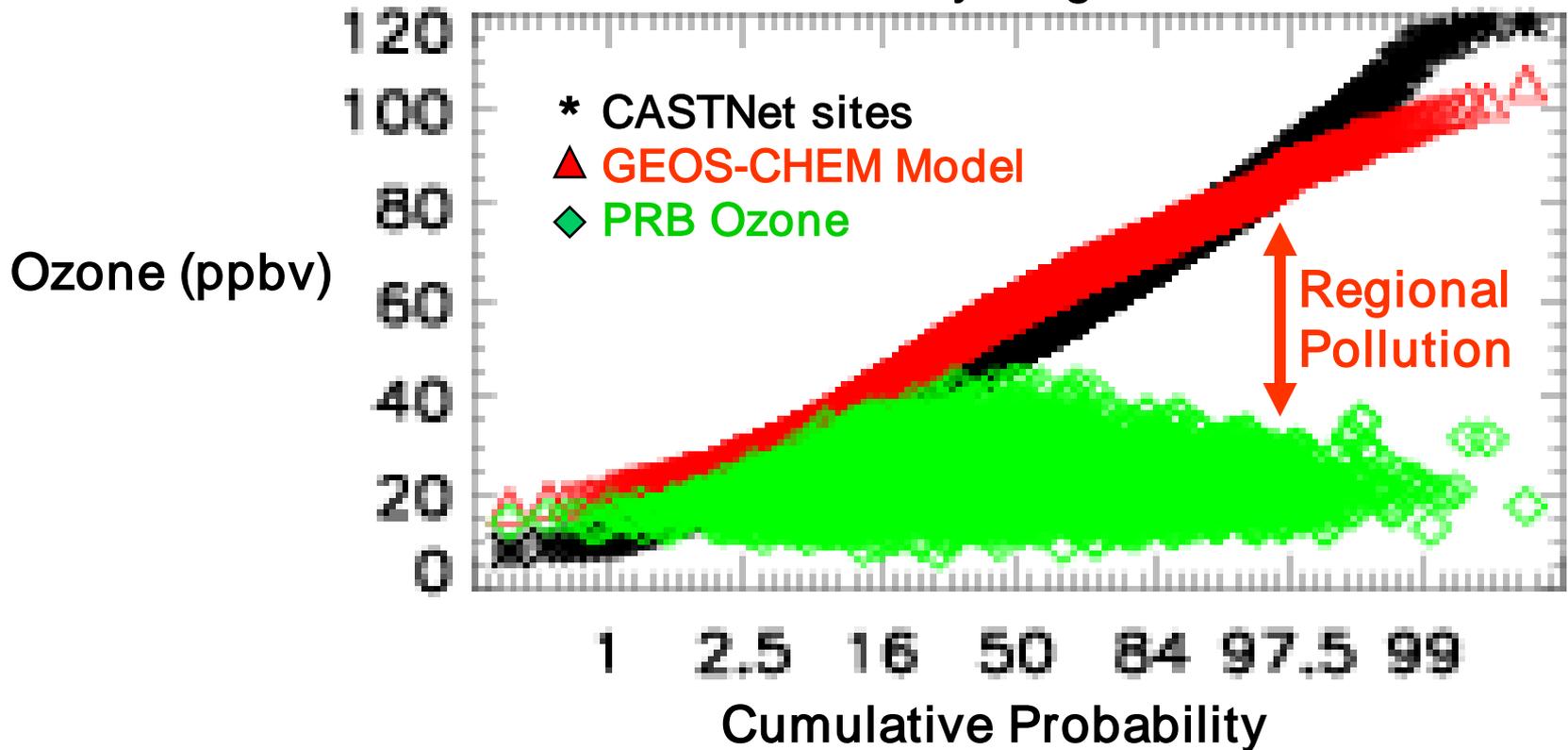
Compiling daily afternoon (1-5 p.m. mean) surface ozone from all CASTNet sites for March-October 2001:
PRB ozone is typically 20-35 ppbv



→ Hemispheric Pollution enhances PRB by 8±4 ppbv

PRB ozone is lower under polluted conditions: typically below 25 ppbv

Daily mean afternoon O_3 at 58 low-elevation U.S. CASTNet sites
June-July-August



Conclusions

- Global 3D models represent our best knowledge of the processes controlling tropospheric ozone
 - Successfully simulate observations with little bias
 - Most appropriate tool for quantifying PRB ozone
- Two different models (GEOS-CHEM and MOZART) show consistent **PRB ozone** of **25 ± 5 ppbv** at low-elevation U.S. sites in summer
- PRB ozone definition should account for its **variation with season, altitude, and** its anticorrelation with **high domestic ozone**
 - During smog episodes, PRB ozone is depleted (to chemical and depositional loss) while locally-generated ozone rapidly accumulates