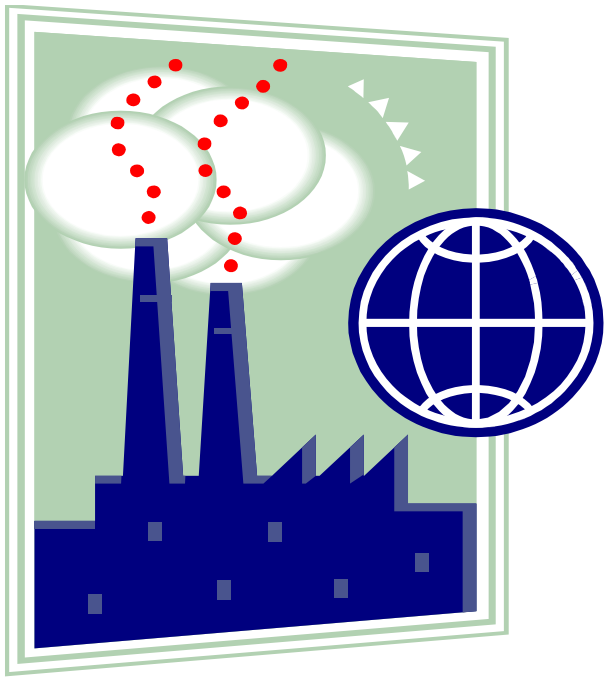
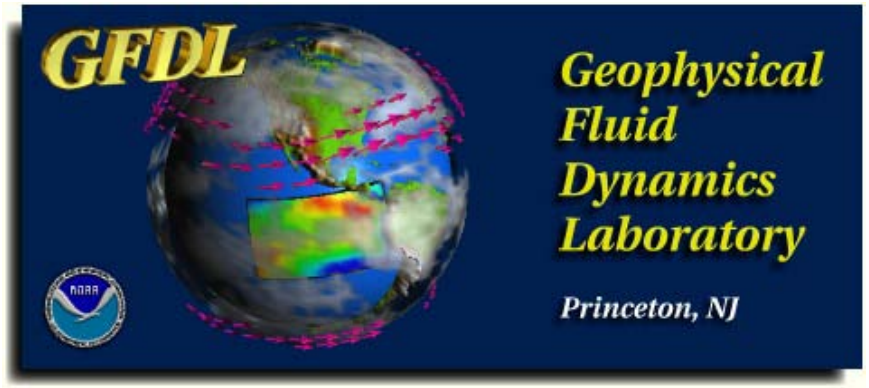


Modeling Intercontinental Transport, Hemispheric Pollution, And Climate Linkages At GFDL

Arlene M. Fiore
Larry W. Horowitz

NOAA/EPA
Scientist-to-Scientist Meeting

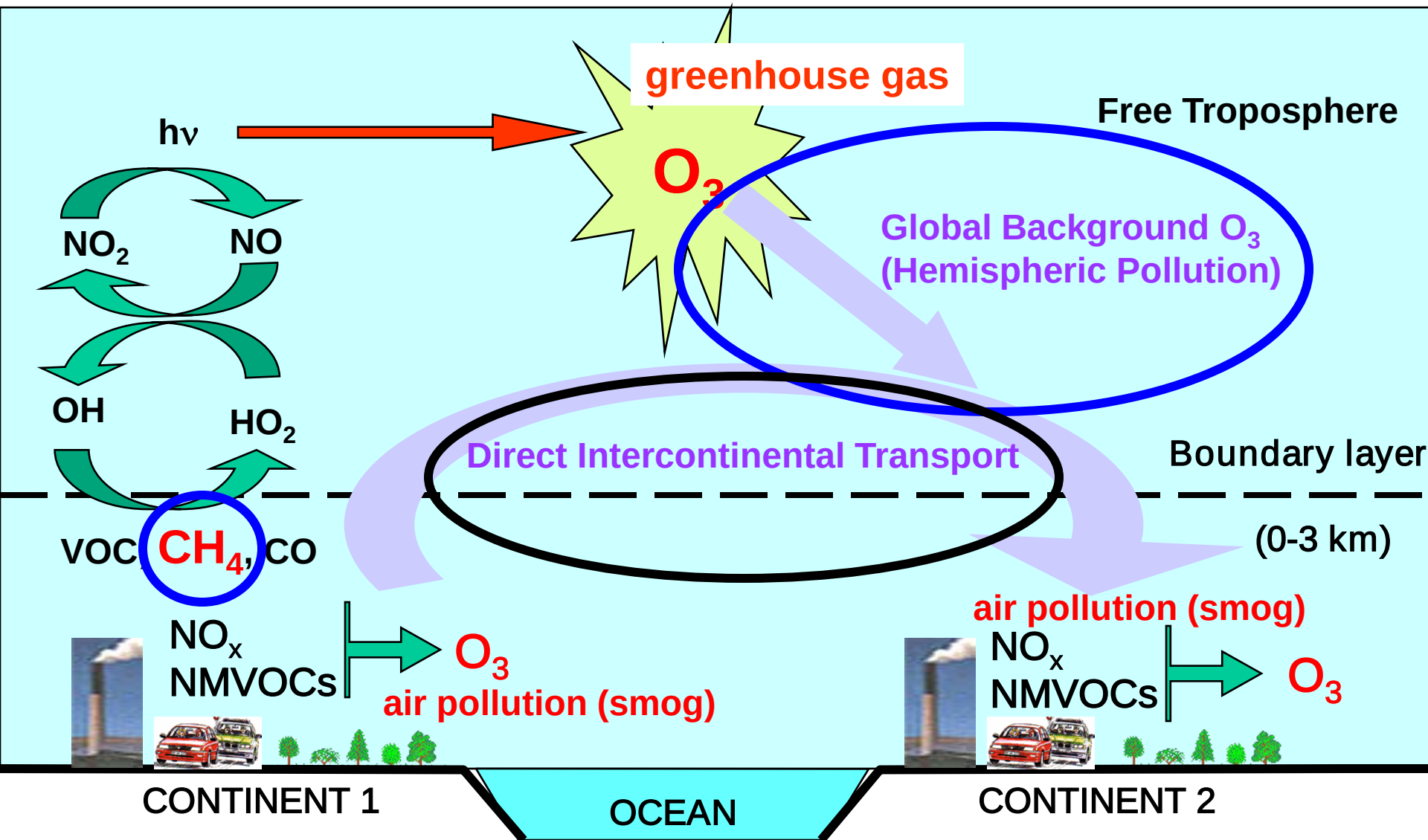
Boulder, CO
October 28, 2004



Air quality-Climate Linkage:

CH_4, O_3 are important greenhouse gases

CH_4 contributes to background O_3 in surface air



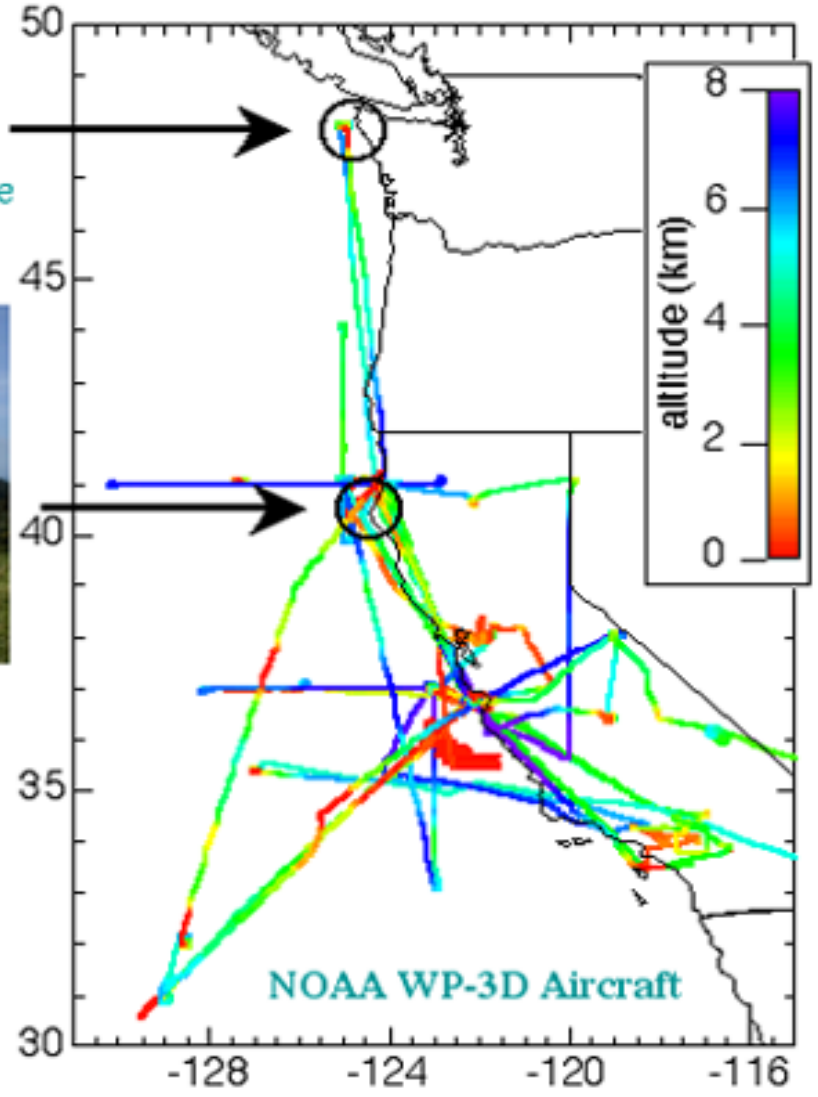
Trans-Pacific Transport (ITCT 2K2)

Location of ITCT 2002 Measurements

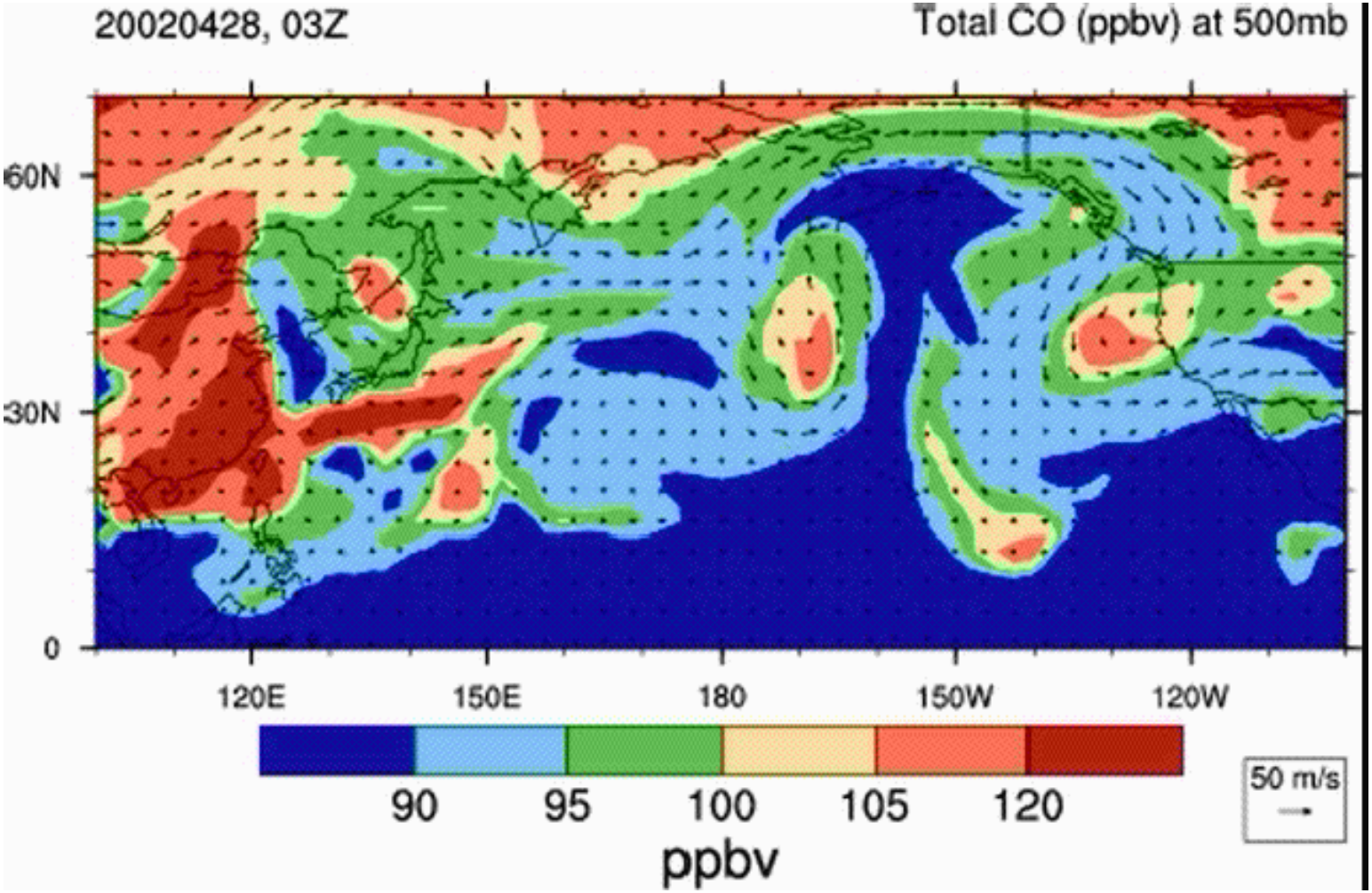
PHOBEA-2
Aircraft Profiles,
Cheeka Peak, WA Ground Site

Trinidad Head, CA
Ground Site

Coordinated with **PEACE-B**
(Japanese Aircraft Study)

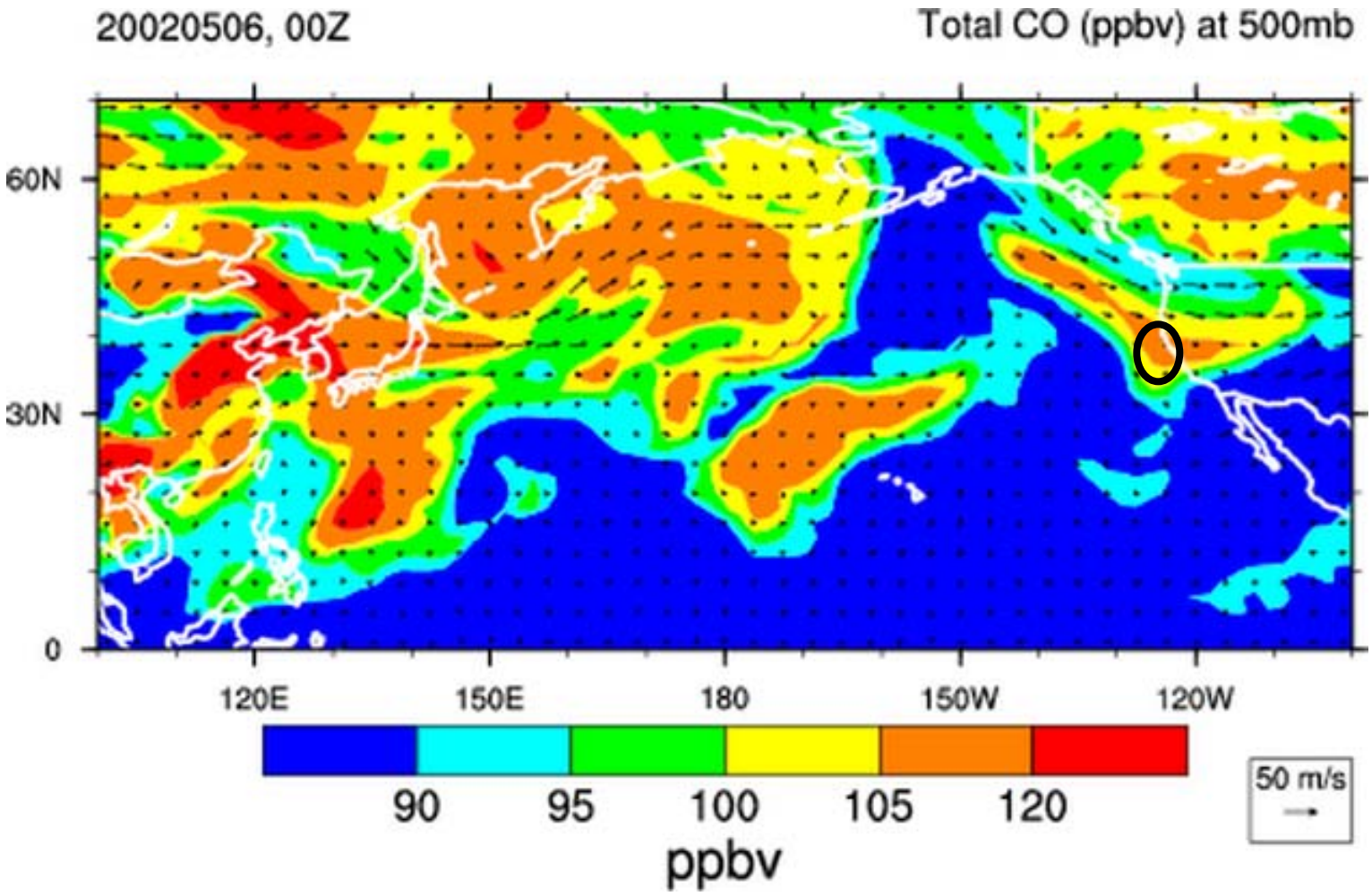


Trans-Pacific Transport (ITCT 2K2)



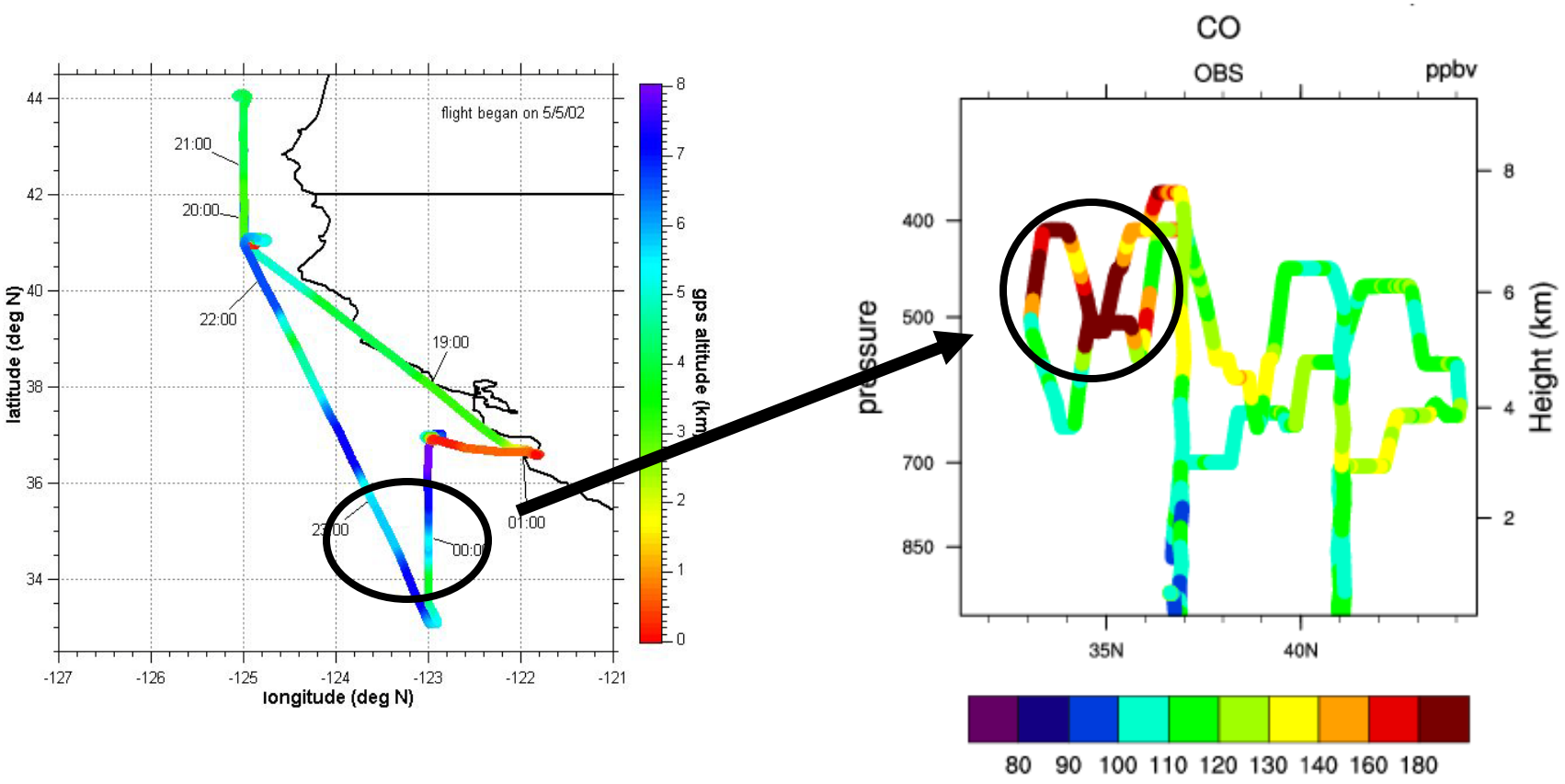
Trans-Pacific Transport (ITCT 2K2)

CO (ppbv), 500hPa, April 28 – May 5, 2002

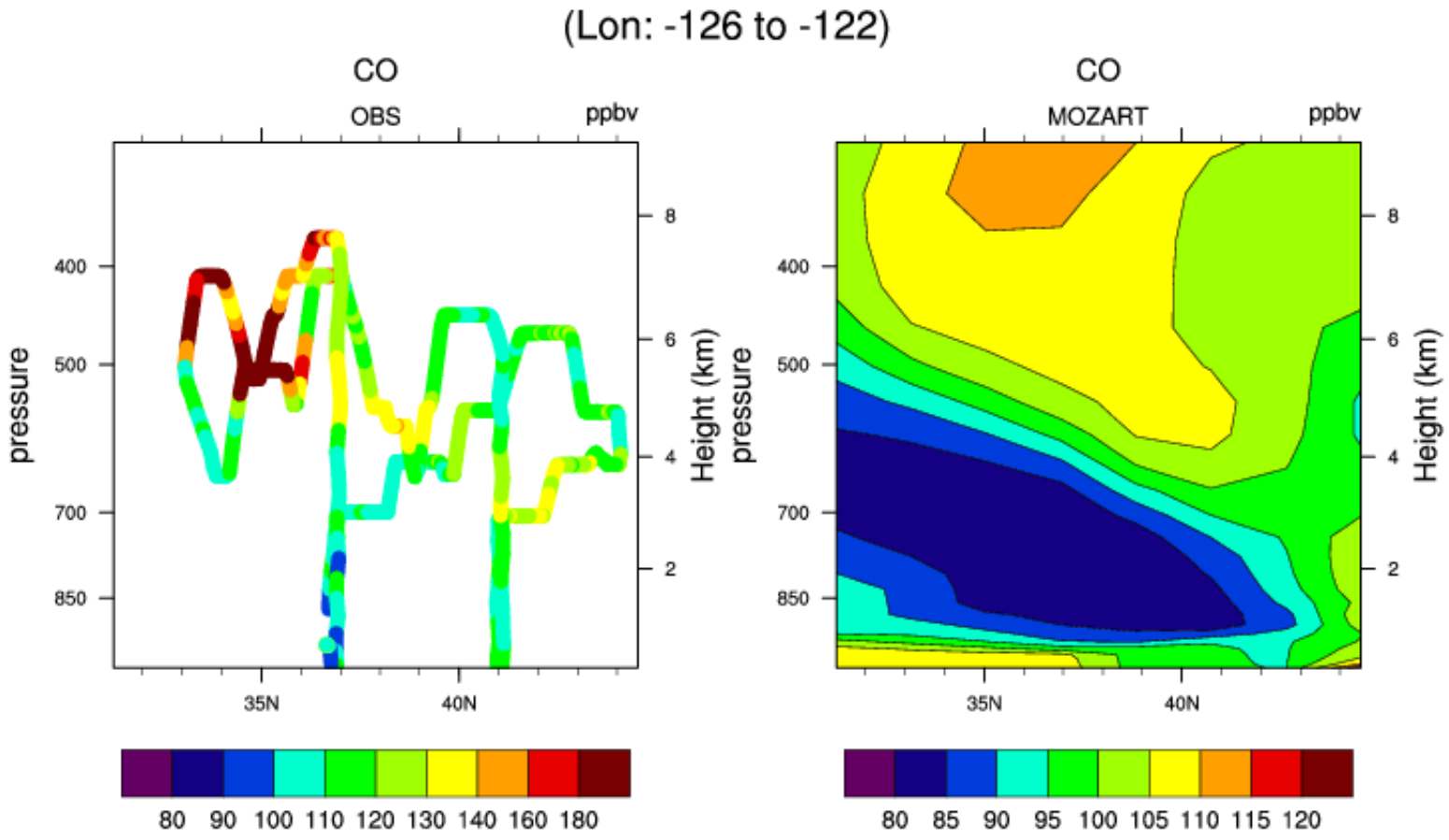


Trans-Pacific Transport (ITCT 2K2)

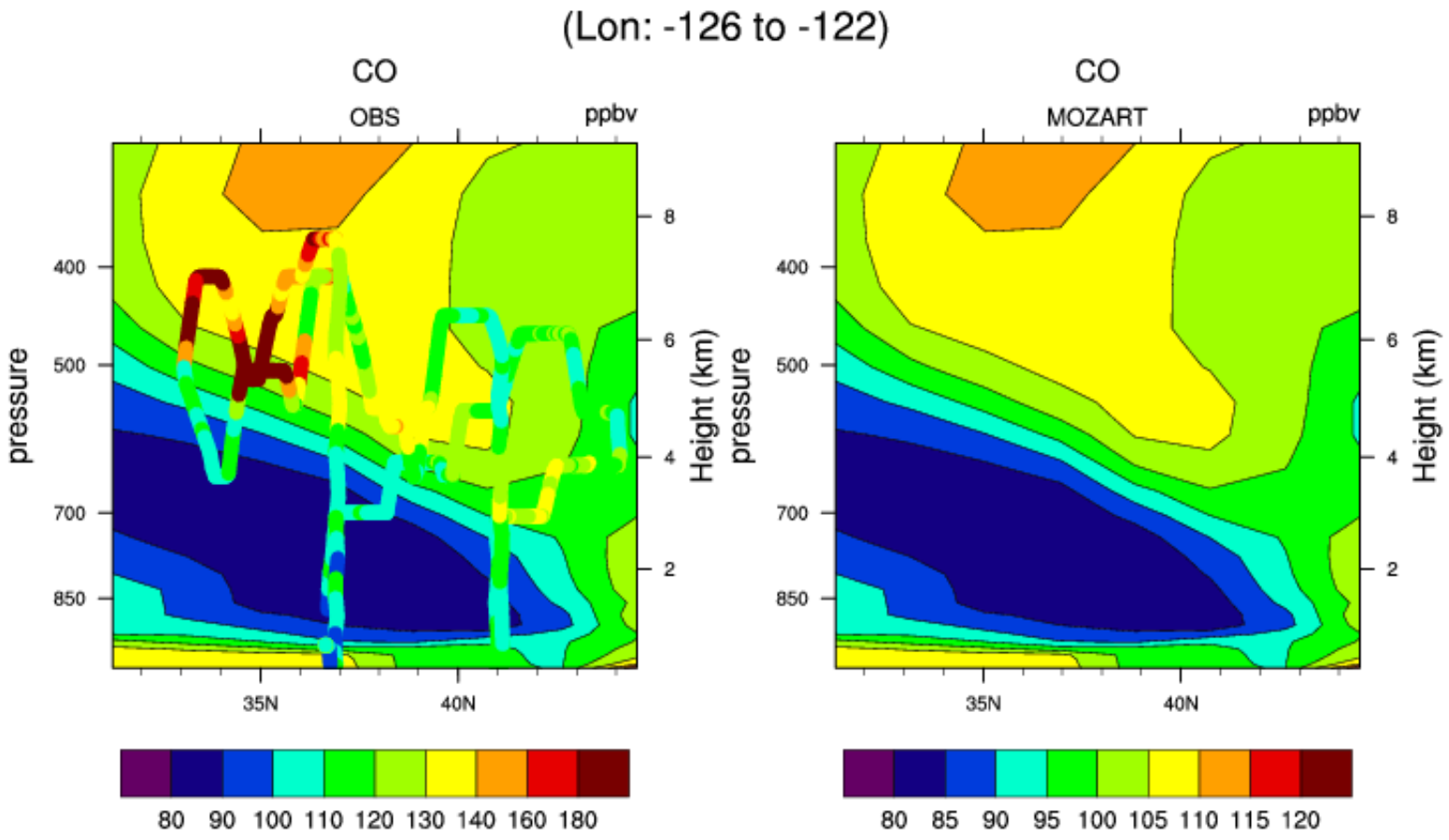
May 05 Flight



May 05 Flight, CO (ppbv)



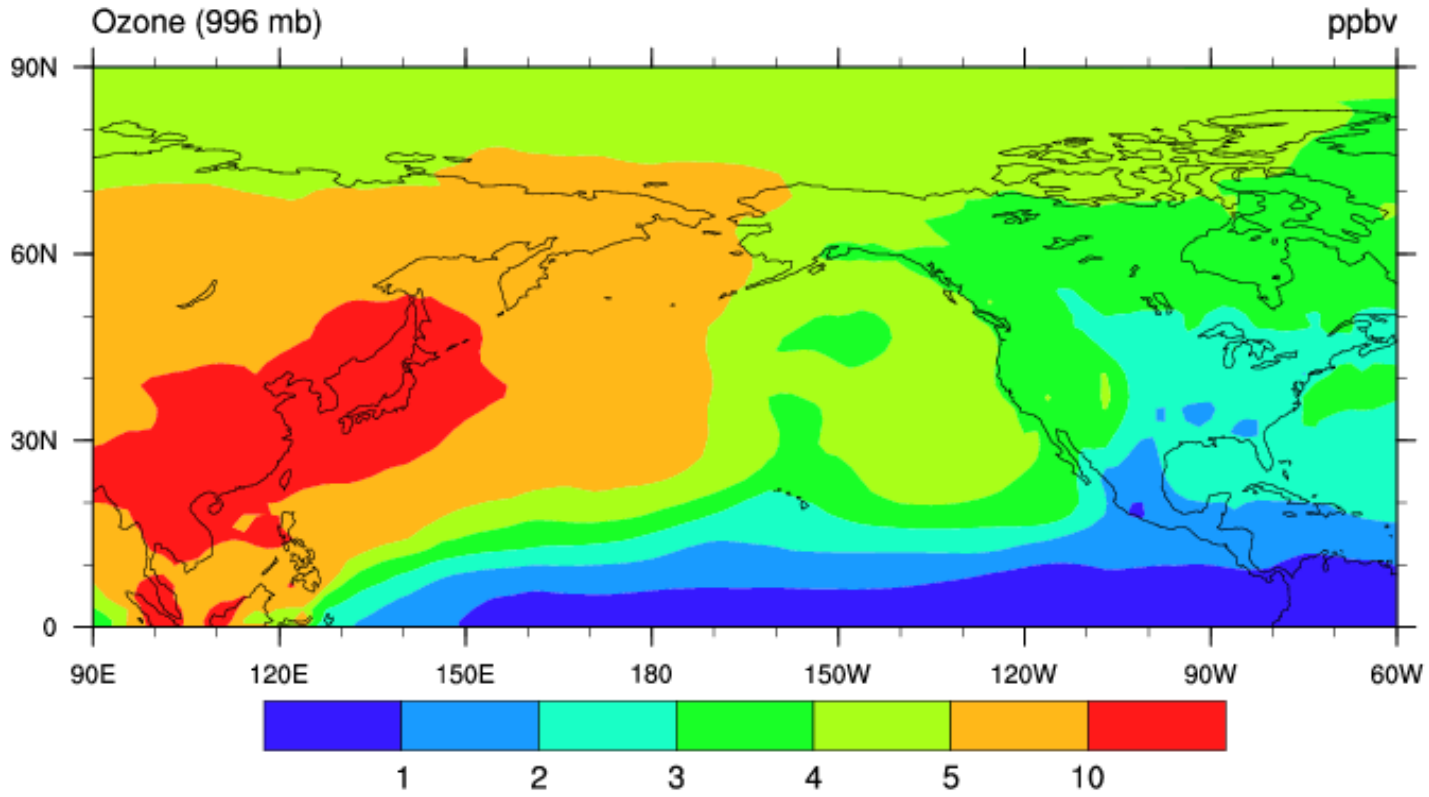
May 05 Flight, CO (ppbv)



→ Direct intercontinental transport of CO leads to observed enhancements in total concentrations

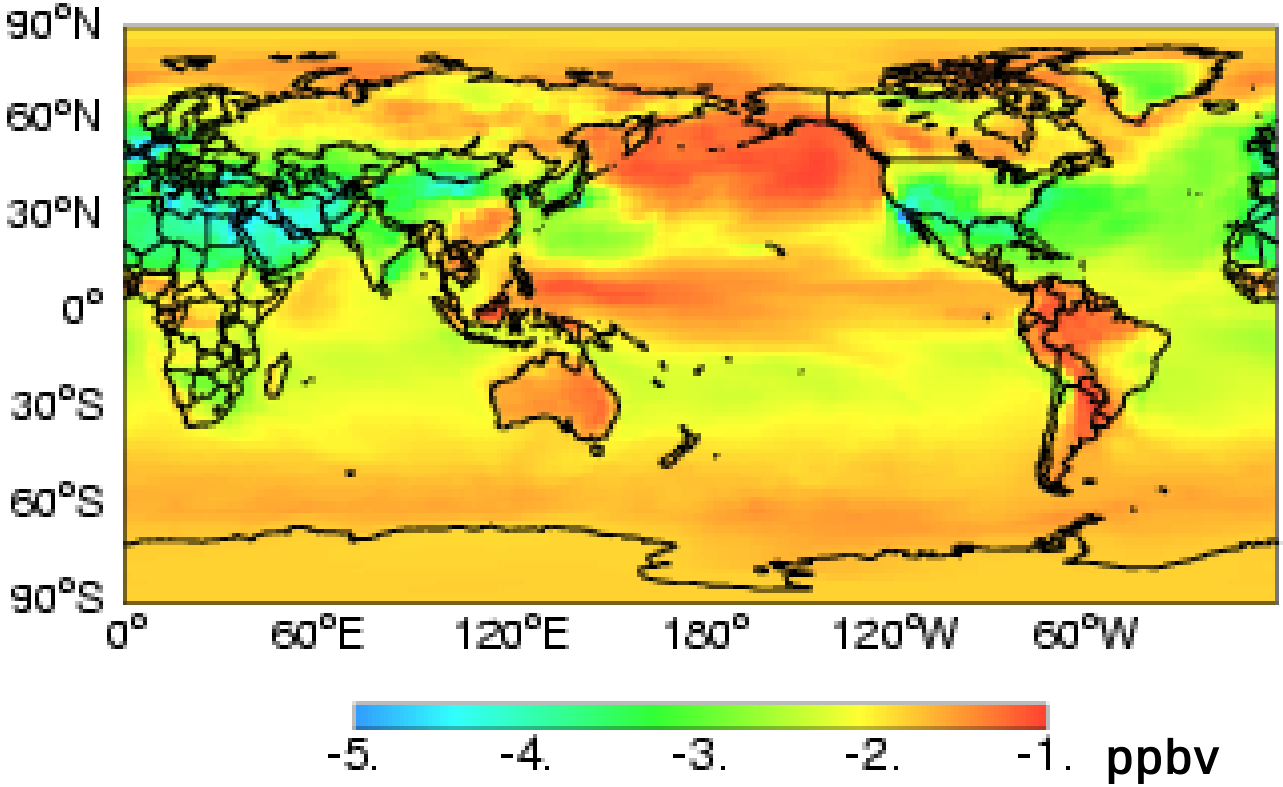
Episodic O_3 enhancements not usually detected → hemispheric background influence

Asian O_3 (ppbv) at surface in MOZART-2 April-May 2002 Mean



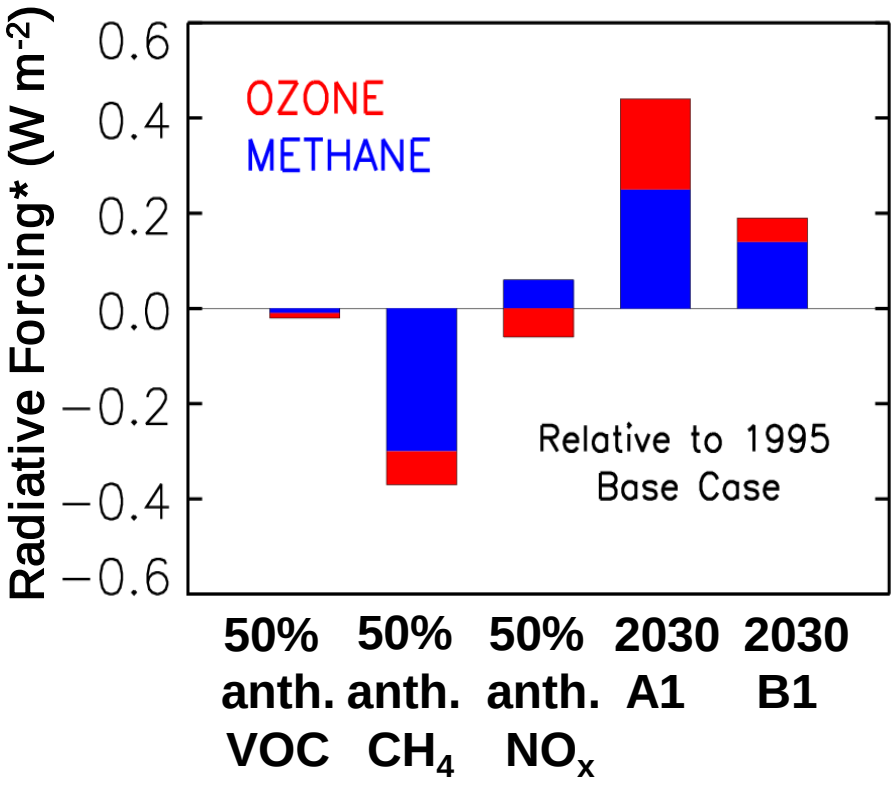
Methane emissions enhance global O_3 background

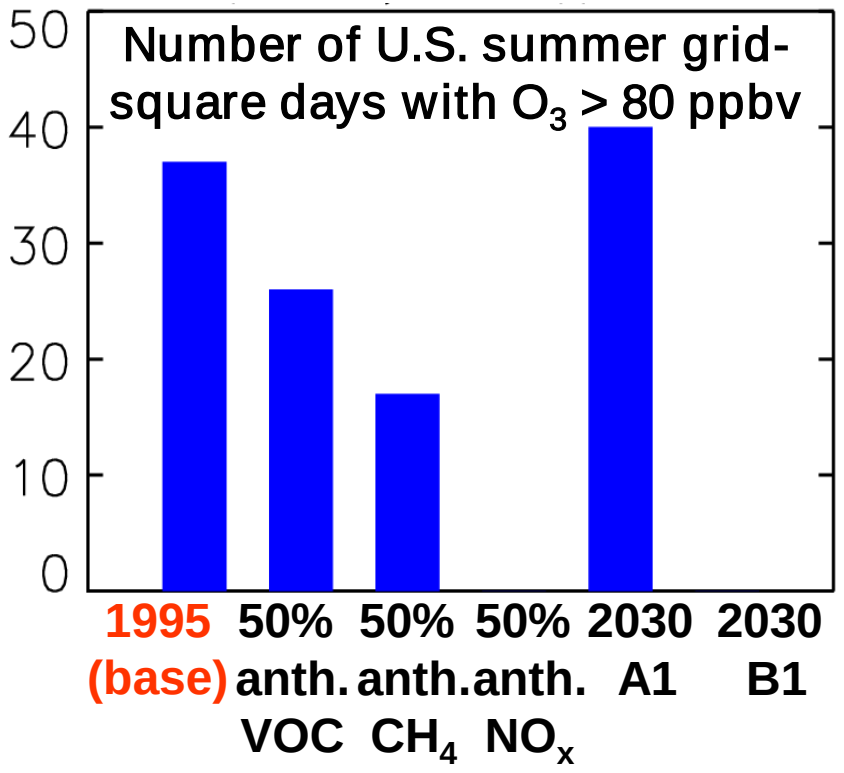
Decrease in MOZART-2 July 1995 Mean Surface O_3 concentrations from 50 % reductions in global anthropogenic CH_4 emissions



→ **Results consistent with earlier GEOS-CHEM results**

Air Quality-Climate Linkage: Impacts of future changes in global anthropogenic emissions (GEOS-CHEM; 4 x5)





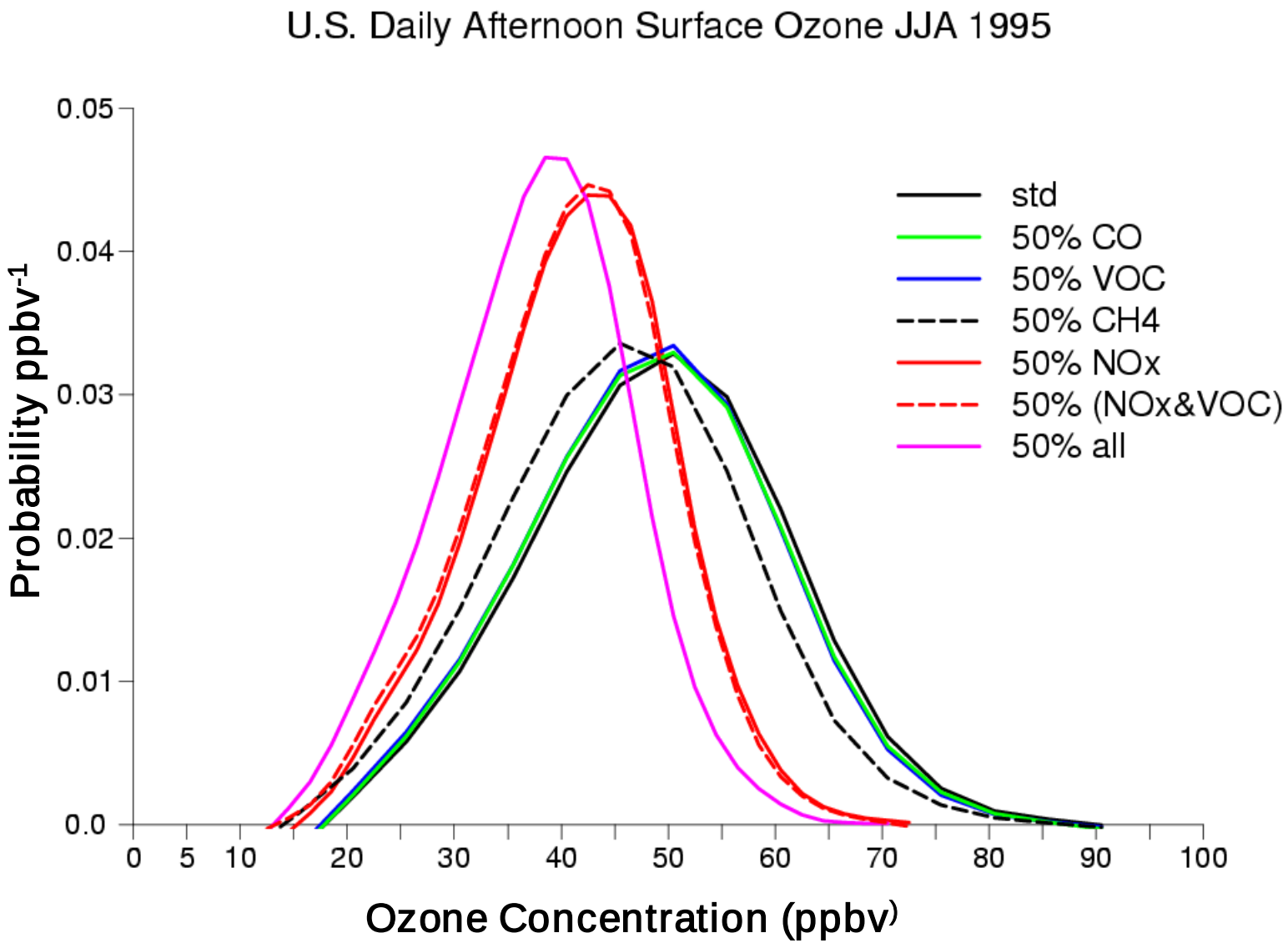
IPCC scenario	Anthrop. NO_x emissions (2030 vs. present) Global	U.S.	Methane emissions (2030 vs. present)
A1	+80%	-20%	+30%
B1	-5%	-50%	+12%

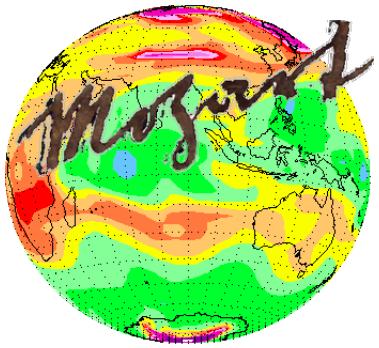
CH_4 links air quality & climate via background O_3

Fiore et al., GRL, 2002

Methane emission reductions shift entire summertime afternoon surface O_3 frequency distribution over U.S.

(GEOS-CHEM results)





Near-term MOZART-2 simulations for addressing hemispheric pollution (NCEP T62 ~1.9° resolution)

- **Sensitivity simulations with various combinations of global / national / sector reductions in CH_4 emissions**
  - **Global & regional climate forcings**
  - **Characterize ozone response - methane emissions relationship**

- **Contribute to IPCC AR4 atmospheric chemistry section**
  - **2030: IIASA scenarios (2000 base, BAU, MFR) & SRES A2**
  - **2100: IPCC scenarios**
  - **AEROCOM (present-day)**
  - **Historical 1860-1990 (decadal)**