Source Attribution of Background Ozone Concentration in the US Intermountain West

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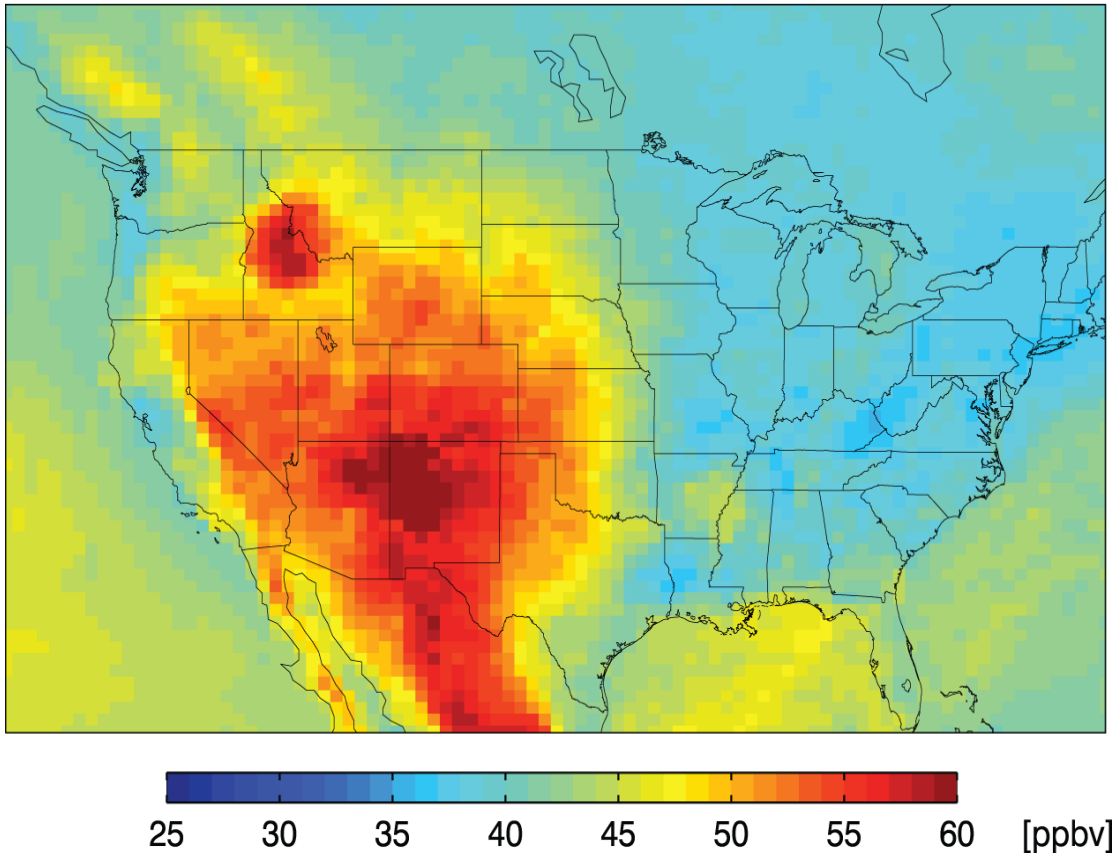
High background ozone concentrations in the Intermountain West

The GEOS-Chem nested model (v8-02-03) with 1/2° x 2/3° resolution over North America and adjacent oceans (140-40W, 10-70N), and 2°x2.5^o resolution over rest of world.

Annual 4th highest North American background ozone for 2006-2008

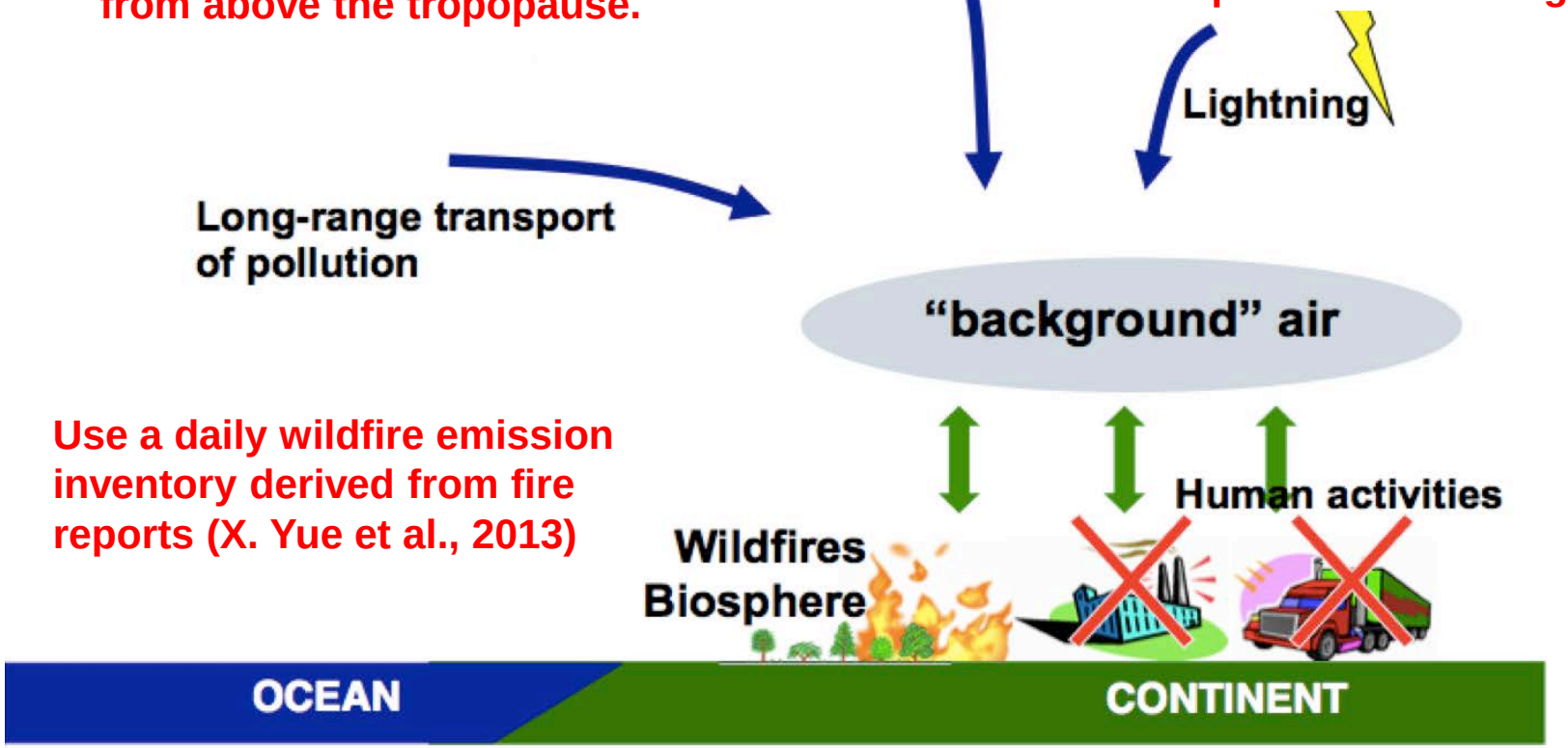


Zhang et al. (2011)

Sources contributing to background ozone

Examine two different approaches of defining stratospheric ozone: ozone produced vs. ozone transported from above the tropopause.

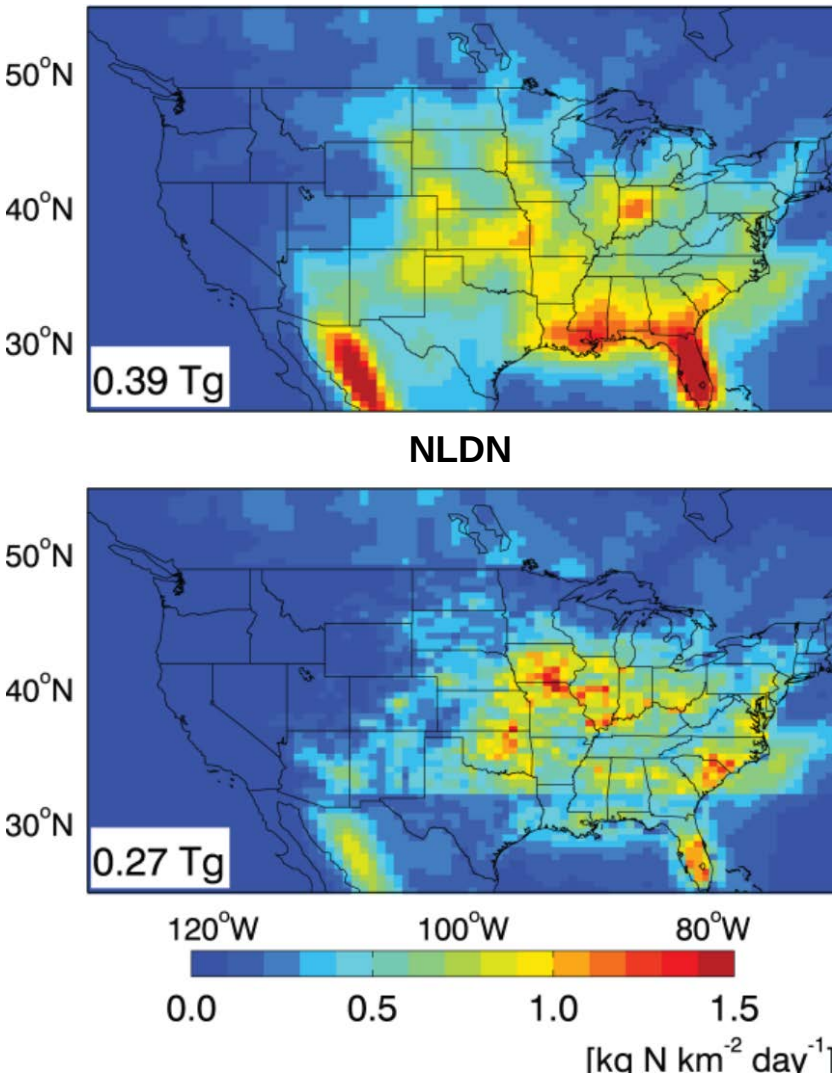
Use flash observations from the National Lightning Detection Network to improve model representation of lightning



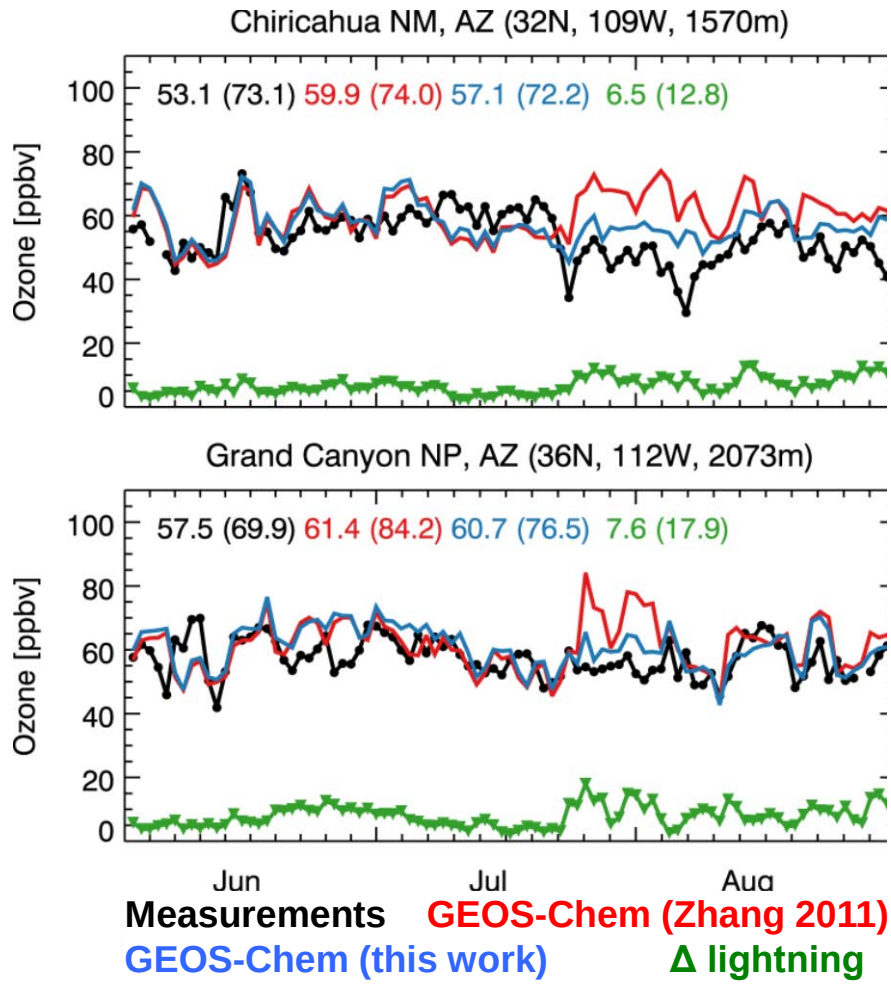
Use a daily wildfire emission inventory derived from fire reports (X. Yue et al., 2013)

Surface ozone influence from Lightning

Lightning NOx emission: OTD/LIS

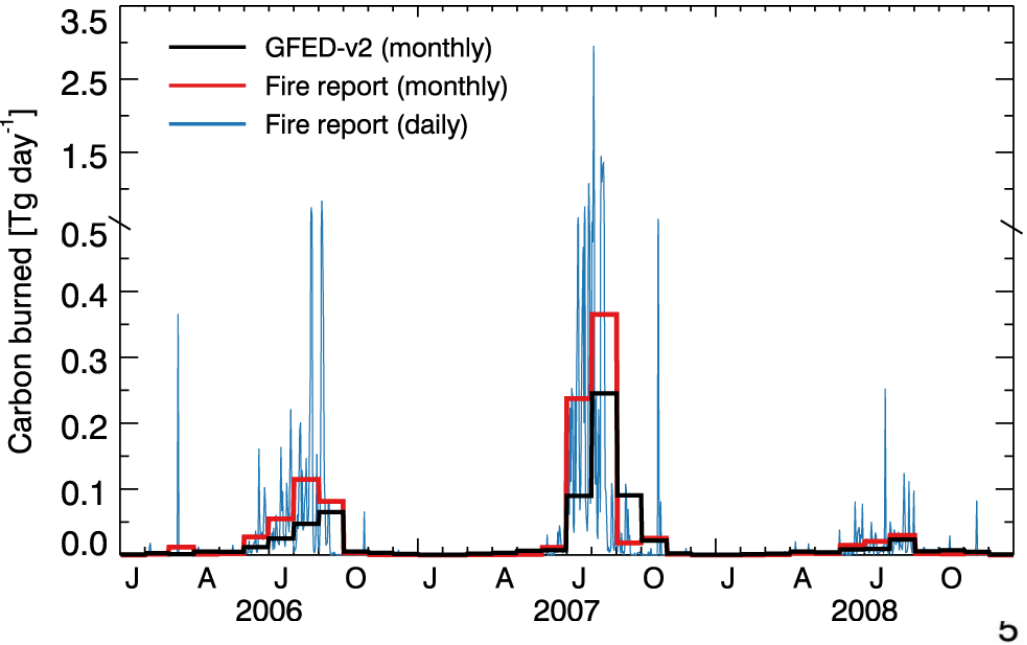


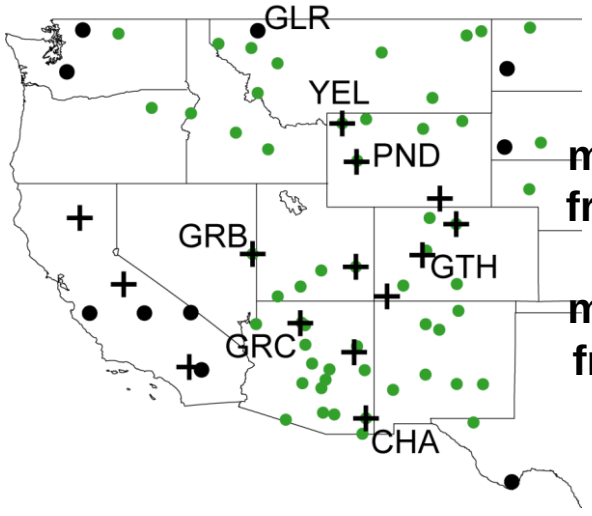
Also reduced the NOx yield by a factor of 2 between 23N-32N



- Using the NLDN data largely corrects ozone overestimates over the Southwest US in summer.
- 6-8 ppbv ozone on average from lightning with moderate variability.

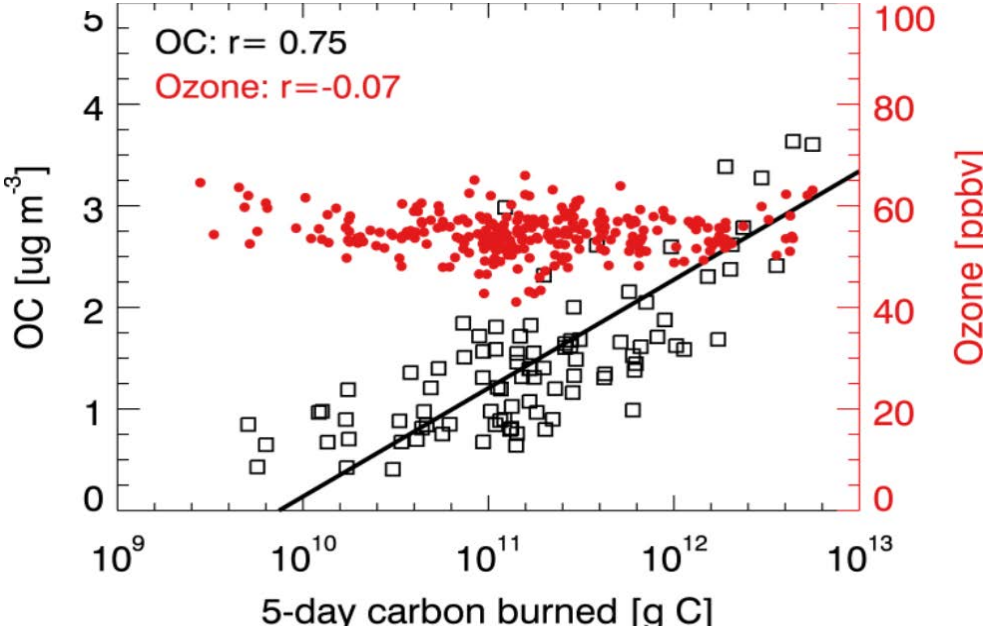
Wildfire emissions are a dominant source for organic carbon (OC) aerosol but not for ozone in the Intermountain West



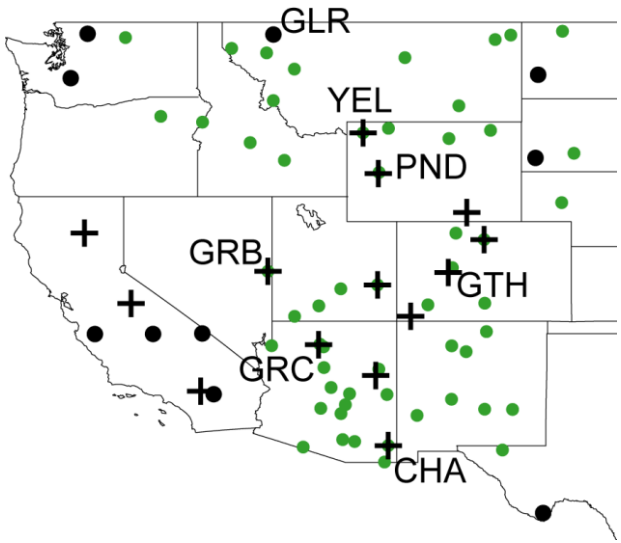


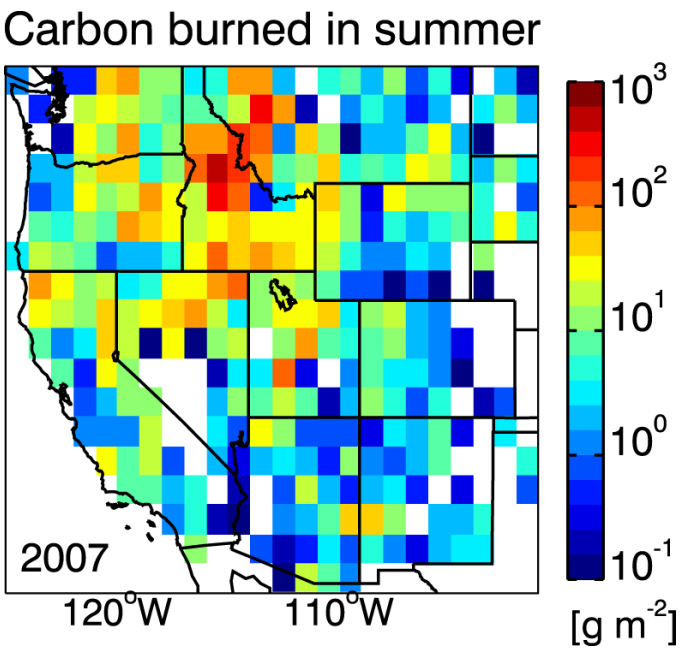
OC aerosol measurements from IMPROVE and ozone measurements from CASTNet

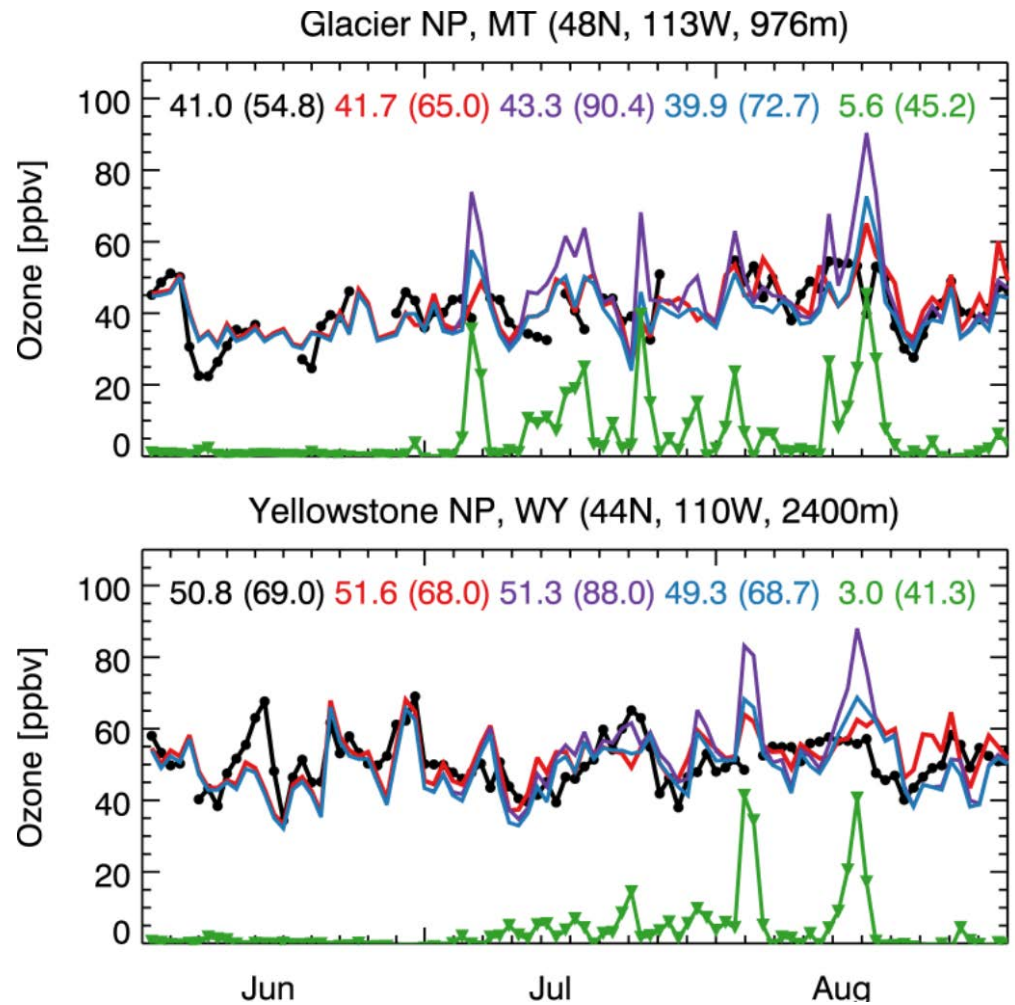
Intermountain West (120W-100W, 30N-50N)



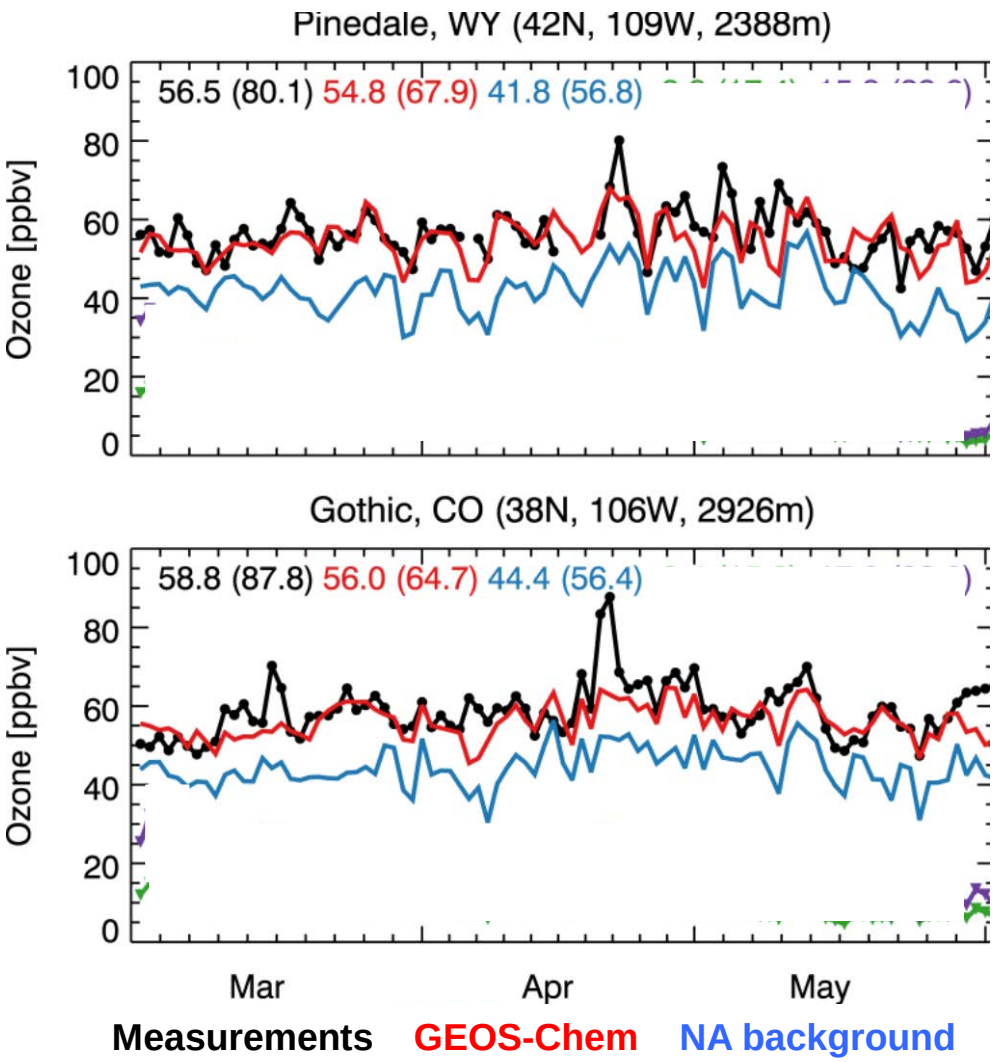
Model overestimates ozone production in fire plumes



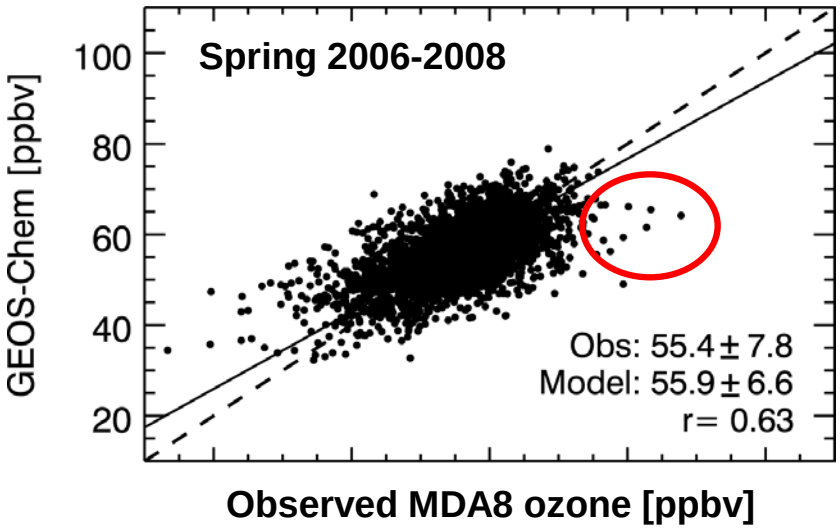




Model underestimates stratospheric intrusions in spring

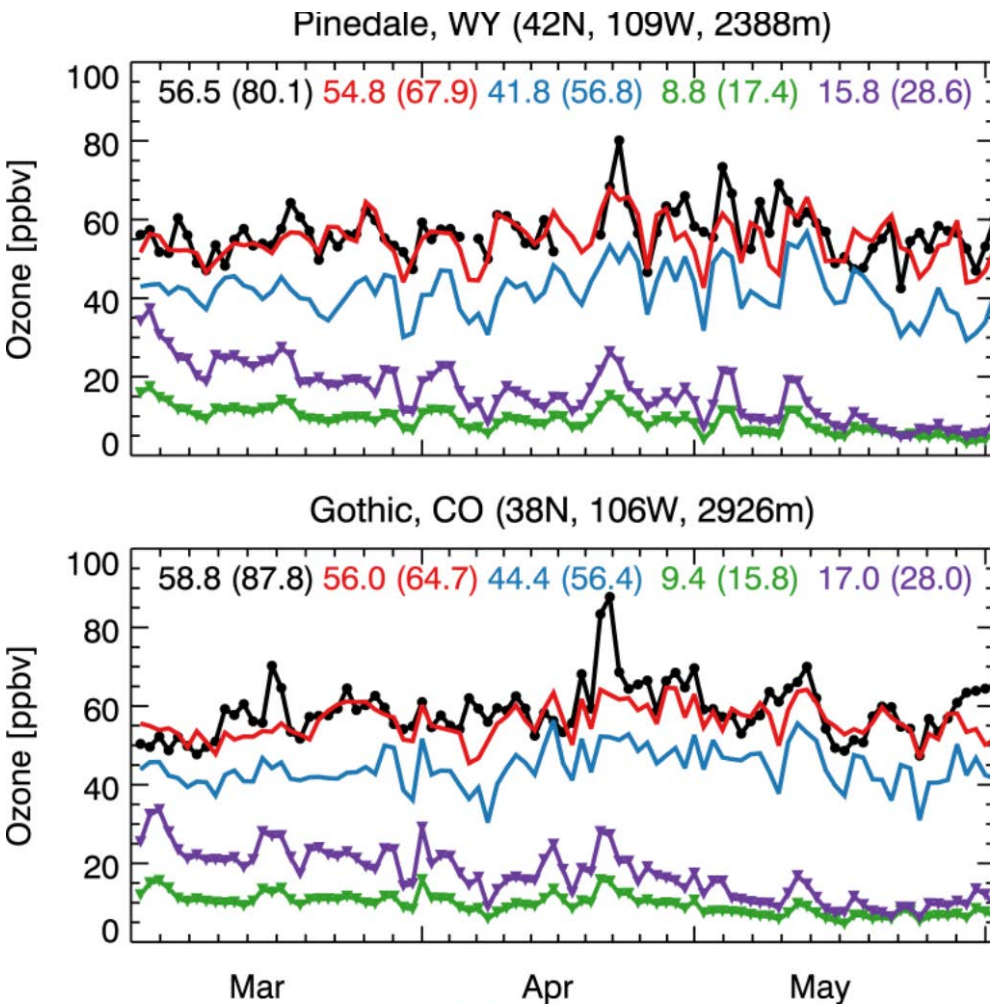


Elevated CASTNet sites in the Intermountain West

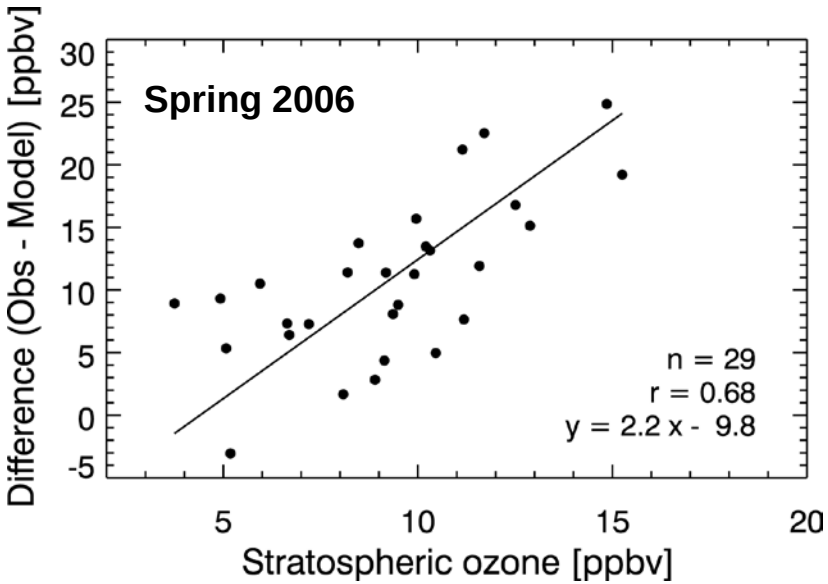


The model captures the timing of stratospheric intrusions but not their magnitude due to numerical diffusion.

Stratospheric ozone influence produced vs. transported from above the tropopause



Measurements **GEOS-Chem** **NA background**
Stratosphere (produced) **Stratosphere (transported)**
(GEOS-Chem tagged ozone simulations)



- Defining stratospheric ozone as transported from above the tropopause is a factor of 2 higher than that produced in the stratosphere.
- The correlation between model low bias and model stratospheric influence can be used to correct the model simulation of extreme events in spring.

Sources of surface ozone in the US Intermountain West