

United States ozone trend analysis

Owen R. Cooper



Policy decisions based on sound science have led to dramatic reductions in air pollution in major urban areas like Los Angeles.

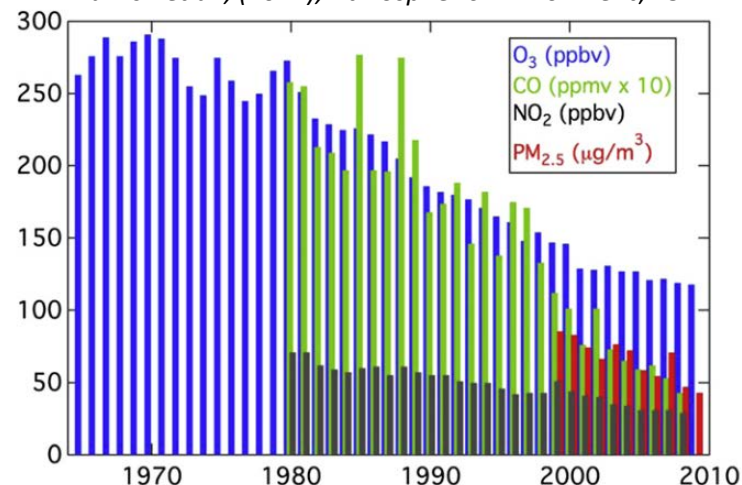
... but reducing local emissions doesn't always result in lower ozone pollution.

NOAA ESRL CSD

- is leading assessments of the nationwide variability in ozone trends
- is exploring the contribution of regional and background ozone pollution to US air quality

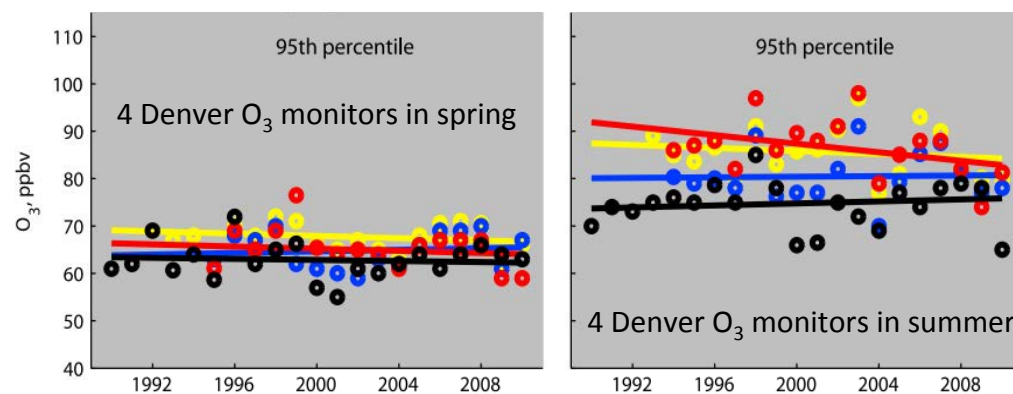
Los Angeles air pollution: 1965 – 2010

Parrish et al., (2011), Atmospheric Environment, 45



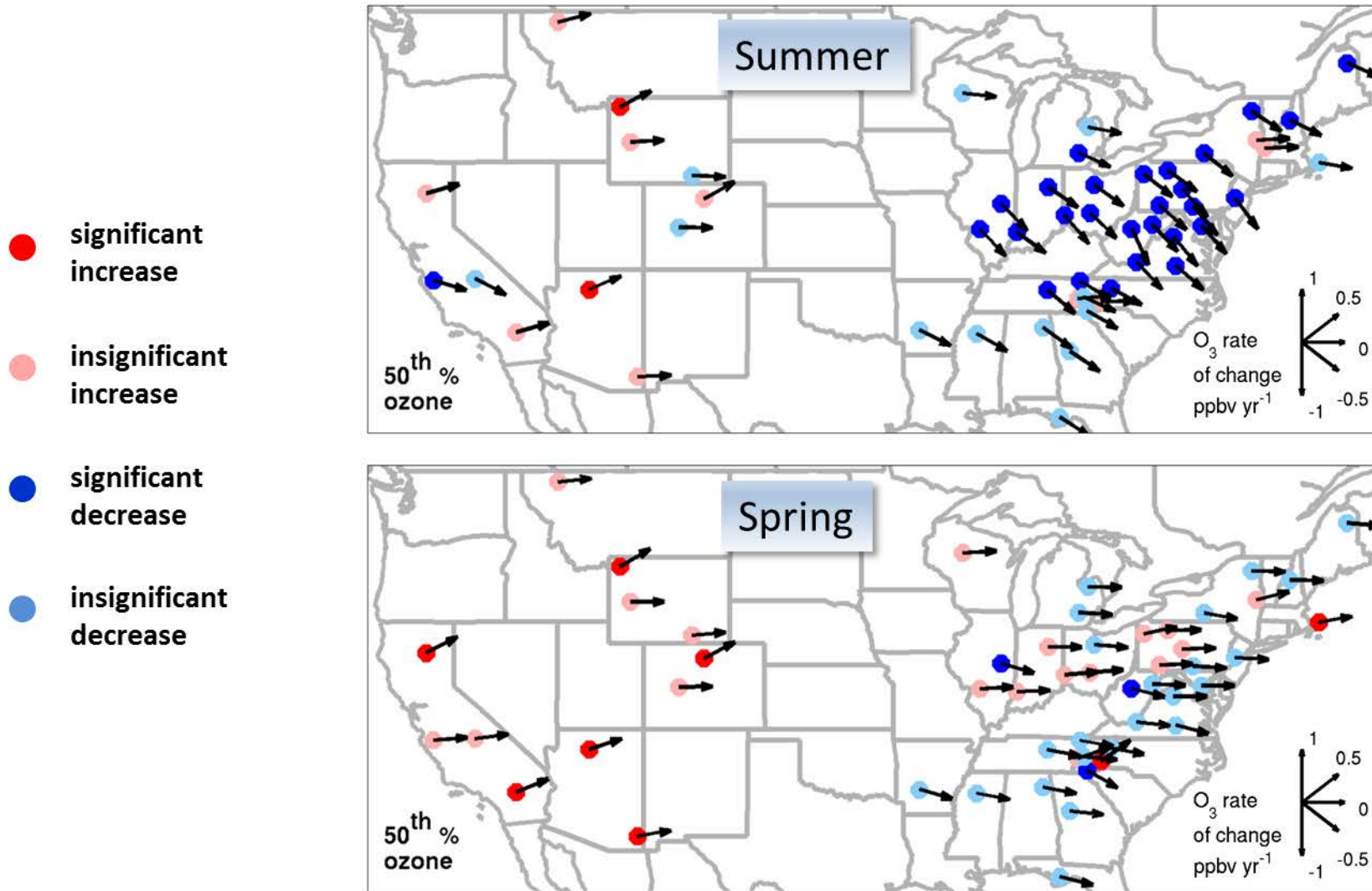
O₃ pollution episodes in Denver have not decreased, despite 20 years of emissions reductions.

Cooper et al., (2012), J. Geophys. Res., 117.



Rural ozone trends: 1990 - 2010

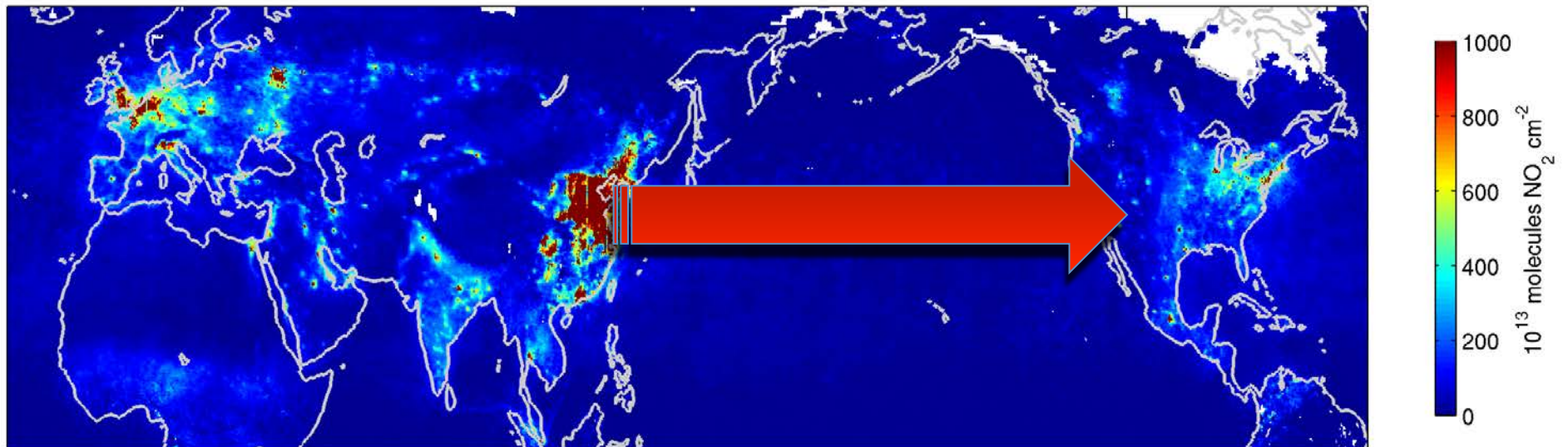
Emissions reductions have not helped the western USA



Cooper, O. R., R.-S. Gao, D. Tarasick, T. Leblanc, and C. Sweeney (2012), Long-term ozone trends at rural ozone monitoring sites across the United States, 1990–2010, *J. Geophys. Res.*, 117, D22307.

Anthropogenic emissions upwind of the USA are changing rapidly

April-May 2009-2011 average SCIAMACHY tropospheric NO₂



Tropospheric NO₂ column data from the GOME and SCIAMACHY sensors were freely downloaded from: www.temis.nl

For methodology see:

Boersma, K. F., et al. (2004), Error analysis for tropospheric NO₂ retrieval from space, J. Geophys. Res., 109, D04311,

Richter, A., et al. (2005), Increase in tropospheric nitrogen dioxide over China observed from space, Nature, 437

LETTERS

Increasing springtime ozone mixing ratios in the free troposphere over western North America

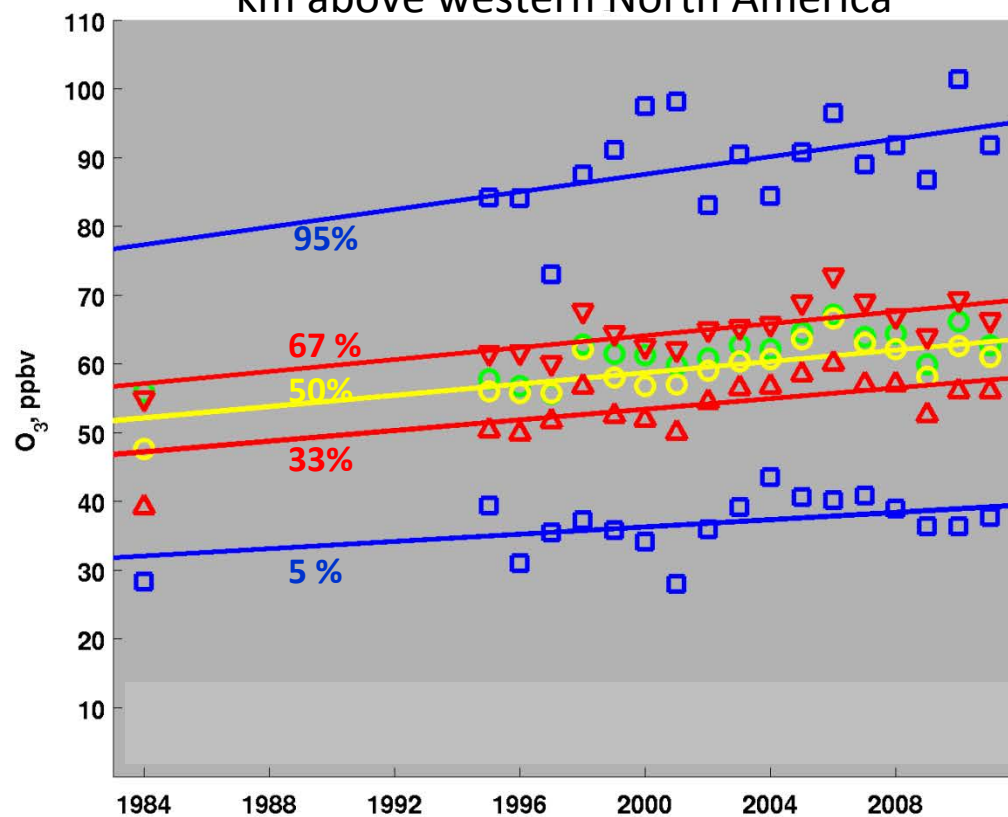
O. R. Cooper^{1,2}, D. D. Parrish², A. Stohl³, M. Trainer², P. Nédélec⁴, V. Thouret⁴, J. P. Cammas⁴, S. J. Oltmans², B. J. Johnson², D. Tarasick⁵, T. Leblanc⁶, I. S. McDermid⁶, D. Jaffe⁷, R. Gao², J. Stith⁸, T. Ryerson², K. Aikin^{1,2}, T. Campos⁹, A. Weinheimer⁹ & M. A. Avery¹⁰

Ozone increased significantly in the free troposphere above western North America during springtime, 1984-2008.

The increase was strongest when the sampled air masses were transported directly from south and east Asia.

An update to the study shows that ozone increased by 29% from 1984-2011.

A composite of ozone observations, 3-8 km above western North America



Partnerships for solving the ozone problem in the western USA

EPA:

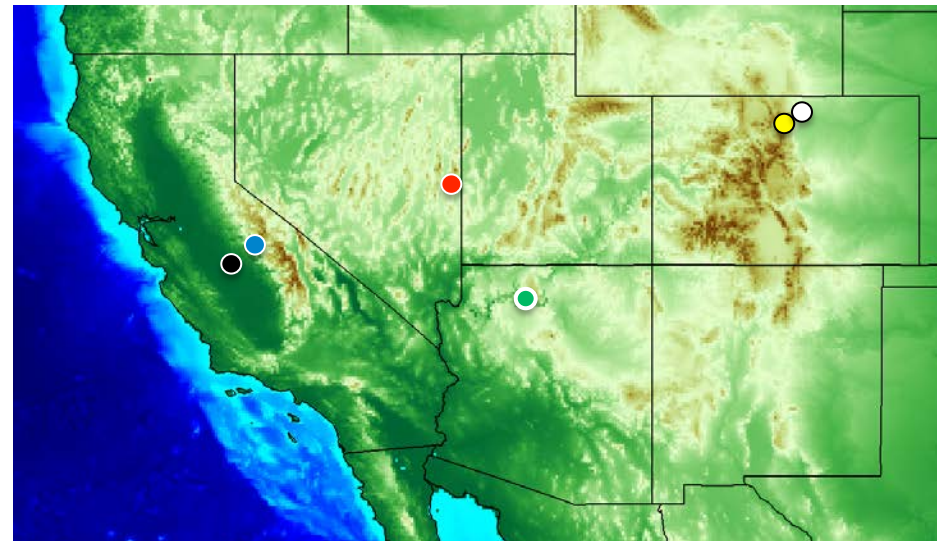
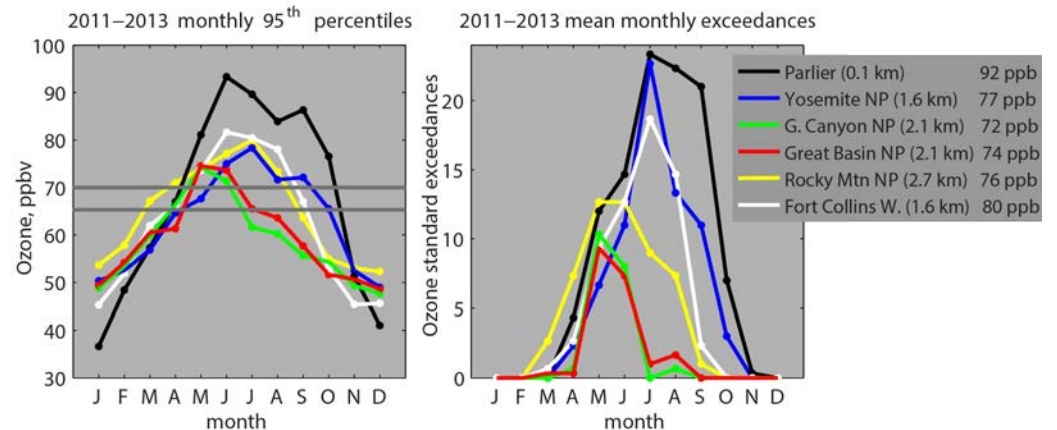
- Proposed a revised ozone standard in the range of 65-70 ppbv
- Based on human health impacts
- By law, cannot consider attainability

NOAA CSD research:

- Many rural high elevation sites in the western USA will exceed the new standard.
- There is little these regions can do to reduce their ozone
- Continental background ozone plays a major role

Partnerships:

CSD is partnering with EPA and NASA to develop monitoring and modeling for accurately quantifying the impact of background ozone on the western USA.



Fostering Global Cooperation on Ozone Research



IGAC's newest Activity:

Tropospheric Ozone Assessment Report (TOAR)

Global metrics for climate change, human health and crop/ecosystem research



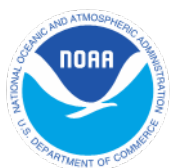
143 scientists from 29 nations on 6 continents

Mission:

Provide the research community with an up-to-date global assessment of tropospheric ozone's distribution and trends from the surface to the tropopause.

Facilitate access to the ozone metrics necessary for quantifying ozone's impact on human health and crop/ecosystem productivity.

Stakeholders:



Task Force on Hemispheric Transport of Air Pollution