Title: Stratospheric influence on surface ozone over the Western United States

Problem to be solved: As the ozone NAAQS threshold is lowered, attainment is more difficult with local controls, and quantitatively accurate estimates for background levels, including variability in the various background components, are needed. It is important to identify and screen out exceptional events (high-ozone events caused by natural processes or international pollution transport) so that they do not affect a county’s compliance status with the ozone NAAQS.

Project description: We have been analyzing Asian pollution and stratospheric influences on surface ozone over the Western U.S. during May and June 2010, using the global GFDL AM3 model at ~0.5° horizontal resolution, nudged to NCEP winds and leveraging intensive in-situ observations from the CalNex NOAA field campaign. We find that stratospheric ozone influence drives a substantial portion of the observed day-to-day variability in western U.S. surface ozone in late spring and early summer. With a ~2° GFDL AM3 1980-2010 simulation nudged to NCEP winds, we will extend this analysis to place 2010 in the context of recent decades. Over the past year we have also published an initial attempt to develop a space-based indicator of day-to-day variability in the Asian pollution influence on western U.S. surface ozone, using AIRS CO over the eastern North Pacific. We will scope out a similar approach using the AIRS total ozone column product as an indicator for western U.S. surface day-to-day ozone variability driven by stratospheric ozone intrusions.

Deliverables:
- Integrated analysis of in situ measurements and satellite products with the GFDL AM3 model for specific Asian pollution and stratospheric intrusion events over the western United States, delivered to EPA, state, and regional air quality managers as requested.
- Publication documenting a series of stratospheric intrusions influencing surface ozone over the Western United States in the late spring of 2010.
- Publication documenting the contribution of stratospheric influence to inter-annual variations in surface ozone over the Western United States.

Expected AQ management outcomes:
- Better estimates of the balance between local-to-regional versus international emission controls needed to attain ever-tightening standards
- Enhanced knowledge needed to develop criteria to define exceptional events
- Demonstrate potential for space-based products to indicate background enhancements to surface ozone over the Western United States with a few days lead time.