Abstract: R. Chatfield

Title: Maps Suggest Transport and Source Processes of PM2.5 at 1 km x 1 km for the Whole San Joaquin Valley, Winter 2011 (Generalizations from DISCOVER-AQ)

We present interpreted data analysis using MAIAC (Multiangle implementation of Atmospheric Correction) retrievals and appropriate RAPid Update Cycle (RAP) meteorology to map respirable aerosol (PM2.5) for the period January and February, 2011. The San Joaquin Valley is one of the unhealthiest regions in the USA for PM2.5 and related morbidity. The methodology evaluated can be used for the entire moderate-resolution imaging spectrometer (MODIS, VIIRS) data record. Other difficult areas of the West: Riverside, CA, Salt Lake City, UT, and Doña Ana County, NM share similar difficulties and solutions. The maps of boundary layer depth for 11–16 hr local time from RAP allows us to interpret aerosol optical thickness as a concentration of particles in a nearly well-mixed box capped by clean air. That mixing is demonstrated by DISCOVER-AQ data and afternoon samples from the airborne measurements, P3B (on-board) and B200 (HSRL2 lidar). This data and the PM2.5 gathered at the deployment sites allowed us to estimate and then evaluate consistency and daily variation of the AOT to PM2.5 relationship. Mixed-effects modeling allowed a refinement of that relation from day to day; RAP mixed layers explained the success of previous mixed-effects modeling. Compositional, size-distribution, and MODIS angle-of-regard effects seem to describe the need for residual daily correction beyond ML depth.

We report on an extension method to the entire San Joaquin Valley for all days with MODIS imagery using the permanent PM2.5 stations, evaluated for representativeness. Resulting map movies show distinct sources, particularly Interstate-5 (at ~ 1km x 1km resolution) and the broader Bakersfield area. Accompanying winds suggest transport effects and variable pathways of pollution cleanout. Such estimates should allow morbidity/mortality studies. They should be also useful for actual model assimilations, where composition and sources are uncertain. We conclude with a description of new work to extend these insights to similar regions, e.g. interior valleys of California, the Po Valley, the Mediterranean litoral, and the Ganges Plain.

This work show generalizable use of remote sensing, a major goal of DISCOVER-AQ, Deriving Information on Surface Conditions from COlumn and VERtically Resolved Observations Relevant to Air Quality.