

Evaluation of NO_x emissions in the western U.S.
using WRF-Chem model simulations and satellite observations

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In the western U.S., there are many isolated sources of NO_x emissions such as power plants, cities, and highways. Thus, errors in bottom-up NO_x emissions from various sectors could be evaluated separately with atmospheric chemistry models and satellites in this part of the U.S. We carried out simulations with the Weather Research and Forecasting-Chemistry model (WRF-Chem) for the western US domain during the summer of 2005. The sensitivities of simulated NO₂ columns to chemical mechanism and scalar-advection scheme are examined. These factors explain 10-20 % variability of model NO₂ columns, exhibiting larger variability over more polluted regions. Model NO₂ columns are compared with SCIAMACHY and OMI satellite observations. For SCIAMACHY satellite data, the effects of *a priori* NO₂ profile and aerosol loadings on the retrieved NO₂ columns are investigated. These factors explain 10-30% variability of satellite NO₂ columns, indicating significant impact of aerosols on the retrieval over the big western cities such as Los Angeles, Fresno, Sacramento, and San Francisco. To check the accuracy of satellite retrieval, the two satellite data are compared with the model NO₂ columns over Four Corners and San Juan power plants. Because emissions from these power plants are well monitored, uncertainties in model emissions from these power plants are much less than those from cities and highways. Thus, model NO₂ columns over this region can be regarded as a surrogate for in-situ measurements. Overall, both SCIAMACHY and OMI NO₂ columns over these power plants agree well with model NO₂ columns with discrepancies between the two being within the variability of model or satellite. In contrast to this power plant region, model NO₂ columns over big cities along the west coast are approximately twice as large as satellite NO₂ columns from SCIAMACHY and OMI, implying overestimations of the bottom-up emissions over these cities. Possible causes of these discrepancies will be suggested.