Evaluation of U.S. NO_x emissions with satellite-based observations and model simulations

Nitrogen oxides (NO_x = NO + NO_2) of anthropogenic origin are produced primarily from fossil fuel combustion by motor vehicles, electrical power generation, and industrial processes. Accurate accounting of NO_x emissions is crucial for the prediction of the atmospheric formation of ozone and particulate matter. Each of these pollutants is subject to air quality standards in most of the industrialized world. Chemical-transport model calculations, which inform the design of pollution control strategies and test our scientific understanding of the troposphere, require detailed "bottom-up" emissions inventories. For most sources, bottom-up inventories are derived from complex calculations of source activity and emission factors. Independent evaluation is necessary to establish confidence in these inventories' predicted emission magnitudes and trends.

Space-based NO_2 observations have been widely used to monitor the sources of NO_x and improve bottom-up emission inventories at a global scale since the data from the GOME instrument became available in 1997. Finer scale measurements by the SCIAMACHY and OMI instruments on newer polar-orbiting satellites provide the capability of examining NO_x sources at regional to local scales. Over the past several years, our group has analyzed vertical columns of NO_2 retrieved by each of these satellite instruments and compared them to columns calculated by a regional air quality model. I will present some examples of the application of this approach to evaluate bottom-up NO_x inventories and infer trends in NO_x emissions from a variety of U.S. sources, including power generation and urban areas.

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