Partitioning of NOx sources Using OMI Observations

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Since basic understanding of tropospheric NOx over India is inadequate due to the lack of observations with insufficient spatial-temporal resolution, it is imperative that more efforts are needed to understand the source category and dominant source of emissions over the Indian region. This study is particularly important because satellites can provide observations for the whole domain of India. Data from satellites provide valuable information to identify the source regions and to study the changes in NO_X emission and seasonal cycle in light of seasonal meteorology.

We use OMI space-based observations of tropospheric NO_2 columns to map the spatio-temporal variation of NOx over India. Using the characteristics of the seasonal variability of source categories (anthropogenic (fossil fuel and biofuel), biomass burning and soil), the dominant source of NOx emissions has been identified over India. It is observed that satellite observed anthropogenic NO_X distribution is remarkably similar to the fossil fuel combustion patterns of India as seen in the bottom-up inventories. We further present comprehensive review of the trends from the dominant anthropogenic source regions of the India using GOME and SCIAMACHY. We also examine NOx emission from peak biomass burning season, as well as rain-induced soil NO_X emission during the onset of Indian summer monsoon. NOx emission from biomass burning has been observed maximum in the month of March from central and southern part of India, whereas it is observed maximum during March-April from the northern part of India. We show that seasonal variations in OMI derived tropospheric NO2 column capture the emissions from soil during the early rainy season (June). It is observed that soil emission occurs in strong pulses lasting 1–3 weeks following the onset of rain during Asian summer monsoon and could be a major source of NO_X over the less populated regions of India.