Title: Derivation of point-source emission estimates from satellite retrievals

Problem to be solved: Is it possible to use satellite retrievals of NO2 and SO2 to estimate the emissions of NOx and SO2 from large point sources (LPS) with reasonable accuracy and, if so, under what conditions? Can agreement be found among top-down satellite observations, bottom-up inventories, and ground-based measurements over areas dominated by LPS emissions?

Project description: Last year we built a unit-based inventory for NOx emissions from Indian thermal power plants and investigated the interannual variations of multi-satellite observations of NO2 over the power-plant areas. We found good agreement between NO2 vertical columns and NOx emissions, and average NO2 satellite observations were continuously increasing during 1996-2010. At the end of the last contract period, we began to focus on SO2 and studied the relationship between OMI SO2 columns and SO2 emissions over large Indian power plants using the oversampling technique. The preliminary results show that the OMI instrument has the capability to detect the interannual trend of SO2 emissions, and its SO2 signals over Indian coal-fired power plants increased by at least 60% from 2005 to 2012. We found OMI SO2 columns are highly correlated with SO2 emissions for power plants with emissions higher than 50 Gg/year. We continue to explore the quantitative relationship between OMI observations and SO2 emissions, as well as ground-based measurements of SO2 concentrations at sites close to the Indian power plant areas. We are now applying the knowledge gained from NOx and SO2 studies in China and India to U.S. power plants.

Deliverables:

- A journal article was published reporting the results of comparisons between monthly NOx emissions and NO2 satellite retrievals over selected large power plants in India: Lu, Z., and D.G. Streets, Increase in NOx emissions from Indian thermal power plants during 1996-2010: unit-based inventories and multi-satellite observations, *Environmental Science & Technology*, 46, 7463-7470 (2012).
- A journal article on SO2 emissions in India is in process: Lu, Z., D.G. Streets, B. de Foy, and N.A. Krotkov, OMI observations of the interannual increase in SO2 emissions from Indian coal-fired power plants during 2005–2012.

Expected AQ management outcomes:

- The results will have benefits for AQ managers to cross-check power plant emissions (or their operation) from spaceborne observations. If additional emission regulations were to be implemented in the future, AQ managers would also be able to monitor the actual operation of emission control devices. Both domestic and international EPA activities will benefit.