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Analysis of satellite-observed CO_2 and CH_4 of GOSAT for estimation of GHG emissions from power plants and large cities from space

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National GHG inventories, which are reported on annual basis by country, are a tool to monitor the compliance of GHG emission reduction. National emissions are calculated according to the local activity statistics by sector and thus total emissions and emission changes from the past are obtained. National inventories are presently the only tool available to give a measure of national emissions, although these might not accurately reflect the true quantity of national emissions due to data quality, calculation methods, and time lag.
We present an attempt to directly monitor GHG emissions, especially from intense sources such as large power plants and populated cities using GOSAT observations. Our preliminary analysis suggested that emissions from such intense sources cause changes in X_{CO2}, which are detectable by GOSAT, in low wind condition. Since August 2009 we have requested GOSAT targeted mode measurements over large power plants and cities. The large power plants were selected from CARMA (Carbon Monitoring and Action) database by emission intensity, and cities were selected by population ranking. Until to December 2009, 137 X_{CO2} measurements over 98 observation points were successfully obtained. We evaluated difference between the data at requested points and background concentration, which we defined as monthly mean concentration over 800 km vicinity. An analysis using observational data suggested that X_{CO2} over requested points might be higher than zonal mean and background concentrations on average, and the range of the difference (1.07 ppm for 3 months) appears to be close to prior estimates. The level of uncertainty at this point (71 % of the mean value) is still at the level of the value itself, however a simple estimate suggests that it can be reduced to about 10% assuming a larger number of measurements, improvements on the retrieval and 5-year operation of GOSAT.