

Inverse analysis of CO₂ emissions from a mega-sized city using satellite and in situ observation data

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The greenhouse gas observing satellite (GOSAT) has functioned normally for more than four years since its launch on 23 January 2009. Although its main purpose is the measurement of greenhouse gases globally to reduce the estimation error of source/sink strength in a sub-continental size region, it can measure gas concentrations at multiple targets on a regional scale during one orbital over-flight. We have initiated and conducted special observations to monitor CO₂ concentrations at sufficiently numerous observation sites and thereby cover all regions of a mega-sized city. The main sensor of the satellite, the "thermal and near infrared sensor for carbon observation Fourier transform spectrometer (TANSO-FTS)", has been operated in a "specific operation mode" to measure CO₂ concentrations at 4 x 4 (totally 16) mesh points over the Kanto Plain, the center of which is Tokyo. This specific observation covers about 100 km x 100 km of the plain. These satellite data are used as inputs as well as ground-based and aircraft observation (CONTRAIL) data for the inverse analysis of emission/sink strength of CO₂. The AIST meso-scale transport model (AIST-MM), whose highest spatial resolution is 1 km is used for the inverse analysis. Boundary conditions in a large area outside the regional target are provided by the NICAM based transport model (NICAM-TM). The system detected a signal of reduction of CO₂ emission from some industrial districts just after the Tohoku-Pacific Ocean Earthquake.

Keywords: carbon dioxide, inverse analysis, GOSAT, mega-sized city