



Atmospheric CO₂ budget analysis over East Asia with satellite sensing and GEOS-Chem

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There is growing interest in CO₂ budget analysis since space-born measurements of global CO₂ distribution have been conducted (e.g. GOSAT project). Here we simulated global CO₂ distribution to estimate individual source/sink contributions over East Asia. The chemical transport model (GEOS-Chem) was used in order to simulate global CO₂ distribution with updated global sources/sinks with $0.5^\circ \times 0.666^\circ$ horizontal resolution. In addition, 3-D emissions from aviation and chemical oxidation of CO are implemented. The model simulated CO₂ amounts were compared with the GOSAT column averaged CO₂ column (SWIR L2 & L3 data) from April 2009 to December 2010. The seasonal cycles of CO₂ concentration were compared. The regional patterns of CO₂ distribution are explained by the model and seasonal variation of CO₂ over East Asia. The GEOS-Chem CO₂ concentrations are comparable to the in-situ measurements (e.g., GLOBALVIEW) data with reasonable agreement but discrepancies in seasonal variability need more accurate sources and sinks information over this region. We further estimated the sources/sinks contributions to the CO₂ budget over East Asia through 9 tagged CO₂ tracers (fossil fuels, ocean exchanges, biomass burning, biofuel burning, balanced biosphere, net terrestrial exchange, ship emissions, aviation emissions, and oxidation from carbon precursors) over the last 5 years (2005 ~ 2009). Global CO₂ concentration shows 2.1 ppbv/year in which the human fossil fuel and cement emissions are main driving force (5.0 ppbv/year) for the trend. Net terrestrial and oceanic exchange of CO₂ are main sinks (-2.1 ppbv/year and -0.7 ppbv/year, respectively). Our model results show the regional atmospheric CO₂ budget in recent years and suggest the regional mitigation target.