

## **Surface CO<sub>2</sub> flux in weekly temporal resolution over the globe inferred from the CONTRAIL dataset**

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The atmospheric concentrations of CO<sub>2</sub> measured on board the passenger aircraft Comprehensive Observational Network for Trace gases by Air Liner (CONTRAIL) combined with a global atmospheric transport model (Simulator of Trace Atmospheric constituent on a Global scale; STAG) were used to estimate the emissions and absorptions of atmospheric CO<sub>2</sub> at the surface of the globe. A Bayesian synthesis inverse method was used to measure weekly emissions at 64 areas during the years 2005–2009 (261 weeks) using 206912 tropospheric (PV < 2, 5 km <) samples outside a 2° × 2° area around the Narita Airport. The results indicated a significant increase in emissions during the winter in North America and tropical Africa. The largest weekly emission (2.9 PgC/yr) was measured in the northeastern United States from June 28 to July 4, 2008. The largest weekly absorption (2.9 PgC/yr) was measured in Southeast Asia on March 17–23, 2007. The corresponding measurements for the largest emission are those over Europe (July 5–14, 2008). Those for the largest absorption were those over Japan and the west coast of the United States (March 24–31, 2007). The root-mean-square error between the model and the observations was 1.7 ppm when using the sources and sinks of Carbon Tracker/NOAA, while it was reduced to 1.3 ppm using the revised flux. The seasonal cycle in the model and the data mismatch remained at a size of 6 ppm (peak to peak) north of 60°N in the simulations with revised flux, which indicates an unknown transport error in the model.