



Inter-annual variations of CO₂ observed by commercial airliner in the CONTRAIL project

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Since 2005, we have conducted an observation program for greenhouse gases using the passenger aircraft of the Japan Airlines named Comprehensive Observation Network for TRace gases by AirLiner (CONTRAIL). Over the past 10 years, successful operation of Continuous CO₂ Measuring Equipment (CME) has delivered more than 6 million in-situ CO₂ data from about 12000 flights between Japan and Europe, Australia, North America, or Asia. The large number of CME data enable us to well characterize spatial distributions and seasonal changes of CO₂ in wide regions of the globe especially the Asia-Pacific regions. While the mean growth rates for the past 10 years were about 2 ppm/year, large growth rates of about 3 ppm/year were found in the wide latitudinal bands from 30S to 70N from the second half of 2012 to the first half of 2013. The multiyear data sets have the potential to help understand the global/regional CO₂ budget. One good example is the significant inter-annual difference in CO₂ vertical profiles observed over Singapore between October 2014 and October 2015, which is attributable to the massive biomass burnings in Indonesia in 2015.