



The recent changes and topics in CONTRAIL project

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CONTRAIL (Comprehensive Observation Network for TRace gases by AirLiner) project has been conducted since 2005 with Continuous CO₂ Measuring Equipment (CME) and Automatic air Sampling Equipment (ASE) onboard commercial airliners for observations of atmospheric greenhouse gases. Japan Airlines (JAL) offers eight Boeing 777-200ER airplanes modified for CONTRAIL; CME and ASE can be installed on all and five of them, respectively. ASE measurements have provided the long records of greenhouse gases in the upper troposphere along the flight route between Japan and Australia. In addition, we started a new sampling program between Japan and Europe in 2012 to obtain data at higher latitudes and the UT/LS region. When the 777-200ER airplane was not operated for the observation route, we used Manual air Sampling Equipment (MSE) for taking air onboard as substitute for ASE. Since flight routes with 777-200ER have been restricted only to Asian countries and Hawaii in the last few years, additional two Boeing 777-300ERs were modified to install CME and expand area coverage of CO₂ observations to Europe, Australia and the east coast of US in 2015-2016. We also present our recent data analysis for intensive CME observations over Delhi, India, which indicates a significant impact of Indian wintertime agriculture on the regional carbon budget.