Signal of CO_2 emitted from 2020 Western U. S. wildfire captured by commercial airliner observations

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In 2020, the Western United States experienced a series of serious wildfires, ignited in August across California, Oregon, and Washington, followed by expansion of the burning in early September. In the early September, the color of the sky turned orange due to huge aerosols emitted from the wildfires in those regions. The preliminary estimate of the annual wildfire emission of CO_2 in California by the California Air Resources Board is more than twice of the largest emission in the past 20 years.

The Comprehensive Observation Network for TRace gases by AIrLiners (CONTRAIL) with Continuous Measuring Equipment (CME) onboard aircraft of Japan Airlines can continuously obtain atmospheric CO_2 mole fraction on the flight path. In 2020, considerable number of measurement flights to Los Angeles (~40 profiles) were carried out in September compared to previous years. Vertical profiles of CO_2 mole fraction obtained by CONTRAIL-CME over Los Angeles showed high magnitude of variability throughout the troposphere, in comparison to those in September of the preceding years. This resulted in exceptionally large median and mean values of the CO_2 mole fraction calculated from all profiles in September of 2020.

We also tried model simulations using the latest biomass burning emission inventory of GFED and GFAS. Preliminary simulations by an on-line atmospheric tracer transport model (GSAM-TM) reproduces some of CO_2 enhancement observed in relatively wide altitude range of more than a few kilometers in the vertical profile. More detailed analysis results will be prepared in our presentation.

Keywords: wildfire, co2, aircraft observation

