

## 4.212 Indonesian fire history recorded in the upper tropospheric CO from the long-term CONTRAIL observation .

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Abstract:

CONTRAIL (Comprehensive Observation Network for TRace gases by AirLiner) is a Japanese airliner observation project that measures atmospheric carbon dioxide and other trace gases during intercontinental flights of Japan Airlines. We analyzed temporal variations of carbon monoxide (CO) in the upper troposphere at about 10-km altitudes from the CONTRAIL datasets of flask air sample measurements taken between Japan and Australia. Here we present a long record of CO in the upper troposphere between 30°N and 30°S over the western Pacific from 1993 to 2016. This study focuses on the CO variations in the Southern Hemisphere (SH) with unique seasonal cycles with CO peaking around October-November. Transport model experiments indicated CO emissions from Indonesian fires being transported into the upper troposphere of the southern tropics. The seasonal CO peak in the SH was largest around 20°S, and the peak significantly varied year by year. This interannual variation is found to be highly correlated with yearly changes in Indonesian fire emissions of CO estimated from the satellite-based inventory database. We also found that the interannual variation of CO seasonal peak is tightly related with the El Niño-Southern Oscillation (ENSO) events, indicating the enlarged Indonesian fires during the dry-condition El Niño years. In particular, anomalously large amount of CO was injected into the upper troposphere during the strong El Niño year 1997. We examined the relationship between the CO peak and Southern Oscillation Index, and found that the 1997 anomaly was exceptionally greater than those expected for all other years. This strongly suggests that fire emissions in 1997 were intensified not only by severe drought due to climate change but also by human amplification due to increased agricultural practices in Indonesia.