CONTRAIL-CMEで観測された対流圏CO2の平均的時空間変動
Climatology of spatiotemporal variations of tropospheric CO2 observed by CONTRAIL-CME

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CONTRAIL is the ongoing project that measures atmospheric trace gases during intercontinental flights of Japan Airlines. Atmospheric CO2 concentration is analyzed using Continuous CO2 Measuring Equipment (CME) onboard the aircraft. From ~20 thousands of measurement flights since 2005, extensive number of CO2 data (~2 millions) along level-flight and ascent/descent tracks have been obtained, enabling us to well characterize spatiotemporal distributions of atmospheric CO2 covering large part of the globe especially the Asia-Pacific regions. In this study, we define ΔCO2 as a deviation from the long-term trend observed at a northern hemispheric baseline station Mauna Loa, Hawaii, to illustrate climatological CO2 distributions including seasonal and shorter-term variations. For instance, over airports in Japan, ΔCO2 reaches seasonal maximum at the end of April with higher values near the surface. In this season, high ΔCO2 spreads east of the Asian continent in the upper troposphere over the northern Pacific. In contrast, seasonal minimum of ΔCO2 occurs in September with more depletion in the upper troposphere. The summertime low ΔCO2 in the upper troposphere appears to be more pronounced over the Asian continent than over the Pacific. Likewise, we present seasonal variations of vertical profiles of tropospheric ΔCO2 over various airports and of spatial distributions in the upper troposphere in large-scale perspective, and discuss them from viewpoints of seasonally varying continental sources/sinks and atmospheric transport.
Keywords: CONTRAIL, CO2, troposphere, seasonal variation, vertical profile