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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

梅澤 拓 [1*] ; 町田 敏暢 [1] ; 澤 庸介 [2] ; 松枝 秀和 [2] ; 丹羽 洋介 [2]
UMEZAWA, Taku[1*] ; MACHIDA, Toshinobu[1] ; SAWA, Yousuke[2] ; MATSUEDA, Hidekazu[2] ; NIWA, Yosuke[2]

[1] 国立環境研究所, [2] 気象研究所地球化学研究部
[1]National Institute for Environmental Studies, [2]Meteorological Research Insitute

CONTRAIL is the ongoing project that measures atmospheric trace gases during intercontinental flights of Japan Airlines. Atmospheric CO_2 concentration is analyzed using Continuous CO_2 Measuring Equipment (CME) onboard the aircraft. From ˜20 thousands of measurement flights since 2005, extensive number of CO_2 data (˜2 millions) along level-flight and ascent/descent tracks have been obtained, enabling us to well characterize spatiotemporal distributions of atmospheric CO_2 covering large part of the globe especially the Asia-Pacific regions. In this study, we define $\triangle CO_2$ as a deviation from the long-term trend observed at a northern hemispheric baseline station Mauna Loa, Hawaii, to illustrate climatological CO_2 distributions including seasonal and shorter-term variations. For instance, over airports in Japan, $\triangle CO_2$ reaches seasonal maximum at the end of April with higher values near the surface. In this season, high $\triangle CO_2$ spreads east of the Asian continent in the upper troposphere over the northern Pacific. In contrast, seasonal minimum of $\triangle CO_2$ occurs in September with more depletion in the upper troposphere. The summertime low $\triangle CO_2$ 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 $\triangle CO_2$ 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