

Impact of emission from anthropogenic source to CO concentration in the troposphere: evaluation by using a chemical AGCM

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To reproduce temporal and spatial variations of atmospheric carbon monoxide (CO), we made model simulations by using a three-dimensional atmospheric global chemical transport model (CHASER). The model results are compared to the data sets observed at/by monitoring stations, cruise ships, aircrafts, and satellites. For model calculation, several scenarios are arranged. 1) In 'Control' scenario, following emission inventories are used; Annually constant fluxes by EDGAR (Emission Database for Global Atmospheric Research) for anthropogenic CO emission without from China region, those by REAS (Regional Emission inventory in ASia) from China region, monthly fluxes by GFED (Global Fire Emission Database) for CO emission from biomass burning. 2) In 'Anth+50%' and 3) 'BB+50%' scenarios, CO emissions from anthropogenic and biomass burning was made to increase by 50% from scenario 1, respectively. 4) In 'Seasonal Anth' scenario, we applied seasonal variation to the anthropogenic emissions.

In comparison between model results and observations, The results of scenario 2 improved annual averaged CO concentration in northern hemisphere, but did not reproduce the seasonal cycles at several observational sites well. Although scenario 3 showed a clear effect around the emission sources, the change of influence was small in the distant region. By using scenario 4), model results are improved in upper altitude mainly due to large contribution in winter and spring from India and South China. In these regions, large amounts of biofuels are used for heating and emitted CO is rapidly transported from surface to upper troposphere. This result suggests that the change of surface CO emission from Asian region have large and rapid impact to CO variations not only in the downwind area of lower troposphere, but also in the upper troposphere.