3.114 Temporal variations of the atmospheric CO2 mole fraction, isotopic ratios of CO2 and δ(O2/N2) observed at Ny-Ålesund, Svalbard.

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Abstract:

To elucidate contributions of the terrestrial biosphere and the ocean to the CO_2 cycle on the earth's surface, we have maintained systematic observations of CO_2 mole fraction, the isotopic ratios ($\delta^{13}C$ and $\delta^{18}O$) of CO_2 and oxygen to nitrogen ratio ($\delta(O_2/N_2)$) in the atmosphere at Ny-Ålesund, Svalbard since 1991, 1996 and 2001, respectively. The CO_2 mole fraction shows a clear seasonal cycle superimposed on a secular increase with an average rate of 2.0 ppm yr^{-1} for the period 1996–2013. On the other hand, $\delta^{13}C$ and $\delta(O_2/N_2)$ decrease secularly at an average rate of −0.020 ‰ yr^{-1} for 1996–2013, and −19.9 per meg yr^{-1} for 2001–2013, respectively. Based on the observed secular trends of the CO_2 mole fraction and $\delta(O_2/N_2)$, the average CO_2 uptake during 2001–2013 was estimated to be 1.6 ± 0.8 and 2.3 ± 0.5 GtC yr^{-1} for the terrestrial biosphere and the ocean, respectively. By using the observed CO_2 and $\delta^{13}C$, the corresponding CO_2 uptake of 1.3 ± 0.6 and 2.6 ± 0.5 GtC yr^{-1} were obtained for the same period. The estimates from the two methods are in good agreement with each other. The terrestrial biospheric CO_2 uptake derived by the latter method showed large inter-annual variability in association with El Niño events. On the other hand, the oceanic uptake increased secularly with less inter-annual variability during 1996–2013. In this presentation, temporal variations of the CO_2 mole fraction, $\delta^{13}C$, $\delta^{18}O$ and $\delta(O_2/N_2)$ observed at Ny-Ålesund up to 2017 will also be presented.