

Variations of atmospheric carbon dioxide and its radioisotope in the arctic region

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To elucidate fossil fuel CO₂ input into the atmosphere, we analyzed temporal variations of CO₂, O₂ and CO concentration and ¹⁴CO₂ at Ny Alesund, Svalbard (79°N, 13°E) since 2012. Short-term variations of the atmospheric CO₂ concentration on the scale of hours to days were extracted from the Ny Alesund data at first and the durations of higher CO₂ with higher CO and lower O₂ were defined as CO₂ event in this study. Then, using a Lagrangian particle dispersion model and fossil fuel CO₂ emission database, we estimated the amount of CO₂ increase during the CO₂ events and compared it with the observation. As a result, the modeled values well reproduced the observations for the CO₂ events with air mass inflow from European regions, but the modeled values were lower than the observed values for CO₂ events from northern Russia. Using the flask observations of atmospheric ¹⁴CO₂ in the case of the CO₂ event from northern Russia, we estimated that the fossil fuel CO₂ was responsible to the CO₂ event. In order to evaluate the amount and distribution of the CO₂ emission by fossil fuel combustion, continuous observations of CO₂, O₂ and CO and systematic ¹⁴CO₂ observation are valuable.

Keywords: carbon dioxide, global warming, atmospheric observations