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Observation of isotopic compositions of CO_2 and H_2O in an urban region

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It is important to estimate the terrestrial CO_2 cycle, including such factors as emissions, storages and fluxes. Knowledge of the terrestrial CO_2 cycle will help increase understanding of climate change phenomena, and aid in predicting future atmospheric CO_2 concentrations and global temperatures. Using CO_2 isotope compositions is a very powerful method for investigating the sources of atmospheric CO_2. We investigated phenomena of oxygen isotope exchanges between CO_2 and water vapour. The oxygen isotope exchanges should be happened either on the ground or on the plant leaves, and it will influence the isotopic compositions of CO_2 and H_2O in the atmosphere. We had been deployed in Nagoya from September 1 to September 30, 2010. Ambient air was sampled from the top of the Solar Terrestrial Environment Laboratory building at Nagoya University, which was surrounded by vegetation, but was located in a highly populated urban area of Nagoya. We had successfully measured CO_2 and H_2O isotopologues ($^{16}O^{12}C^{16}O$, $^{16}O^{13}C^{16}O$ and $^{18}O^{12}C^{16}O$ for CO_2, D_2O and $H_2{}^{18}O$ for H_2O) using infrared absorption laser spectrometers (Aerodyne Inc. for CO_2 and Los Gatos Research Inc. for H_2O). The CO_2 isotope laser spectrometer can measure the isotope ratios (Delta ^{13}C, Delta ^{18}O) of ambient air CO_2 in 10-second integration time with a precision of 0.1 permil in real-time. We will discuss the details of the observation result with meteorological data at the meeting.

Keywords: CO_2 isotopes, H_2O isotopes, laser spectroscopy, ecosystem, atmospheric CO_2, urban atmosphere