Observation of isotopic compositions of CO$_2$ and H$_2$O 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$_2$O 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$_2$O isotopologues ($^{16}$O$^{12}$C$^{16}$O, $^{16}$O$^{13}$C$^{16}$O and $^{18}$O$^{12}$C$^{16}$O for CO$_2$, D$_2$O and H$_2^{18}$O for H$_2$O) using infrared absorption laser spectrometers (Aerodyne Inc. for CO$_2$ and Los Gatos Research Inc. for H$_2$O). 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$_2$O isotopes, laser spectroscopy, ecosystem, atmospheric CO$_2$, urban atmosphere