Real time, continuous measurements of CO\textsubscript{2} and H\textsubscript{2}O isotopes in the forest using laser absorption spectrometers

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Measurements of CO\textsubscript{2} and H\textsubscript{2}O isotope compositions are very powerful methods for investigating the carbon and water cycles. We had been deployed in the red-pine forest at the foot of Mt. Fuji for 10 days from the end of July, 2010 and had successfully measured CO\textsubscript{2} and H\textsubscript{2}O isotopologues (\textsuperscript{16}O\textsubscript{12}C\textsubscript{16}O, \textsuperscript{16}O\textsubscript{13}C\textsubscript{16}O and \textsuperscript{18}O\textsubscript{12}C\textsubscript{16}O for CO\textsubscript{2}, D\textsubscript{2}O and H\textsubscript{2}\textsuperscript{18}O for H\textsubscript{2}O) using infrared absorption laser spectrometers (Aerodyne Inc. for CO\textsubscript{2} and Los Gatos Research Inc. for H\textsubscript{2}O). The CO\textsubscript{2} isotope laser spectrometer can measure the isotope ratios (delta\textsuperscript{13}C, delta\textsuperscript{18}O) of ambient air CO\textsubscript{2} in 10-second integration time with a precision of 0.1 permil in real-time. The height of the observation tower is 30 m. Air was sampled every 260 seconds from six vertical height locations from above the forest canopy to 2 m above the ground. The total interval time was 30 minutes including measurements of standard gases for the calibration. The 30-minutes interval measurements of the CO\textsubscript{2} and H\textsubscript{2}O isotope ratios were repeated continuously during the 10 days. The figure shows observed data for carbon isotopic composition of CO\textsubscript{2}, delta\textsuperscript{13}C, determined by the laser absorption spectrometer in one cycle (30 minutes) from 00:00 August 4, 2010. We will discuss the details of the observation result at the meeting.

Keywords: CO\textsubscript{2} isotopes, H\textsubscript{2}O isotopes, forest, laser spectroscopy, ecosystem, atmospheric CO\textsubscript{2}