

## Observation of isotopic compositions in carbon dioxide to estimate the anthropogenic and biogenic contributions

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The carbon and oxygen isotope compositions of ambient CO<sub>2</sub> in Nagoya, Japan were observed and the variation of contribution of the CO<sub>2</sub> sources of natural gas combustion, gasoline combustion and biogenic respiration to the local CO<sub>2</sub> concentration were estimated. We used an observation method of absorption spectroscopy technique with a Mid-IR quantum cascade laser (QCL). The observation method would provide us the advantages of more high temporal resolution of the data (1 minute) and less labour for the operation of an instrument compared to the traditional analysis method using isotope ratio mass spectroscopy (IRMS). Variation of local CO<sub>2</sub> concentrations from natural gas combustion, gasoline combustion and biogenic respiration in the nighttime were investigated. The magnitude of contribution of the local CO<sub>2</sub> sources were varied frequently in the nighttime and the data implied that the variation of the contributions of CO<sub>2</sub> sources had a relationship with wind directions and wind velocities. Seasonal variations of the contribution of CO<sub>2</sub> sources to the local concentration were also investigated. The contribution of natural gas combustion increased but biogenic respiration decreased in winter compared to those in spring, which could be explained by more consumption of the natural gas for a heating system and less biogenic activities in winter. The contribution of CO<sub>2</sub> sources at the stable and unstable conditions in the atmosphere along with ceilometers observations and turbulence intensity measurements were also discussed.

Keywords: CO<sub>2</sub>, carbon dioxide, isotope, global warming, laser spectroscopy, observation