

## 中赤外レーザー分光法を用いたCO<sub>2</sub>安定同位体の測定：都市のCO<sub>2</sub>循環の解析 Measurement of CO<sub>2</sub> stable isotope ratio by mid-infrared laser absorption spectrometry; analysis of CO<sub>2</sub> cycle in urban

弓場 彬江<sup>1\*</sup>; 高橋 けんし<sup>2</sup>; 中山 智喜<sup>1</sup>; 松見 豊<sup>1</sup>

YUBA, Akie<sup>1\*</sup>; TAKAHASHI, Kenshi<sup>2</sup>; NAKAYAMA, Tomoki<sup>1</sup>; MATSUMI, Yutaka<sup>1</sup>

<sup>1</sup>名古屋大学 太陽地球環境研究所, <sup>2</sup>京都大学 生存圏研究所

<sup>1</sup>Solar-terrestrial environment laboratory, Nagoya university, <sup>2</sup>Research Institute for Sustainable Humanosphere, Kyoto University

CO<sub>2</sub> concentration has been increasing from the range of 275 ppmv (parts per million by volume) to 285 ppmv in the previous industrial period to about 400 ppmv in 2013. IPCC reported that CO<sub>2</sub> has the most effective on the positive radiative force. The insight of CO<sub>2</sub> emission and absorption flux helps us to estimate the variation of radiative forcing and atmospheric environment. CO<sub>2</sub> concentration changed with the anthropogenic and biogenic emission and absorption. The stable isotope ratio of CO<sub>2</sub> ( $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$ ) is associated with the CO<sub>2</sub> source such as combustion and biogenic respiration. The contribution of each CO<sub>2</sub> source in the urban area was estimated by using the stable isotope ratio of CO<sub>2</sub>.

We conducted the continuous measurement for CO<sub>2</sub> concentration and stable isotope ratio of CO<sub>2</sub> using the mid-infrared absorption spectrometry which can obtain CO<sub>2</sub> concentration and its isotope ratio with high time resolution. The water vapor and stable isotope ratios of water vapor ( $\delta\text{D}$  and  $\delta^{18}\text{O}\text{-H}_2\text{O}$ ) were measured to show the relationship between H<sub>2</sub>O and CO<sub>2</sub> due to the isotopic exchange reaction. CO and NO<sub>x</sub> concentrations were obtained as a tracer of anthropogenic emission. The measurement was conducted for two weeks in summer and winter. The seasonal variation of CO<sub>2</sub> source was shown according to the comparison of CO<sub>2</sub> concentration and stable isotope ratio. Especially, we focused on the contribution of biogenic process to CO<sub>2</sub> concentration variation in the urban area.

CO<sub>2</sub> concentration and stable isotope ratio of CO<sub>2</sub> in the summer showed the diurnal variation. On the other hand, those in the winter had no diurnal variation. CO<sub>2</sub> concentration variation in the winter was correlated with CO concentration variation. These results suppose that CO<sub>2</sub> concentration variation in the winter was mainly dominated by the anthropogenic emission and that in the summer was related with biogenic process as well as anthropogenic emission. We will discuss the relationship between stable isotope ratio and meteorological condition or water vapor isotope ratio to identify the detail of CO<sub>2</sub> source.

キーワード: CO<sub>2</sub>, 都市域, CO<sub>2</sub> 循環, 中赤外レーザー分光法

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