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## Atmospheric observations of CO<sub>2</sub>, <sup>14</sup>CO<sub>2</sub> and O<sub>2</sub> concentrations to capture fossil fuel CO<sub>2</sub> emissions from the Greater Tokyo Area

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The Greater Tokyo Area is the most populated (38 million) metropolitan area in the world. To capture fossil fuel carbon dioxide (CO<sub>2</sub>) emissions from the Greater Tokyo Area, we performed ground-based atmospheric observations for measuring concentrations of CO<sub>2</sub>, radiocarbon in CO<sub>2</sub> (<sup>14</sup>CO<sub>2</sub>), oxygen (O<sub>2</sub>) and carbon monoxide (CO) at Tokyo Skytree (TST, with high altitude (250m) inlet) and Yoyogi (YYG, turbulent CO<sub>2</sub> flux measurement site located in residential area) in Tokyo and at National Institute for Environmental Studies (NIES, suburb/rural area) in Ibaraki, Japan. The <sup>14</sup>CO<sub>2</sub> measurement was used for separating the fossil fuel CO<sub>2</sub> emissions from the biotic emissions. Results from <sup>14</sup>CO<sub>2</sub> measurements showed that a ratio of fossil fuel-derived CO<sub>2</sub> to the variation of CO<sub>2</sub> concentrations was 71% in average for winter both at TST and YYG but varied from 44% to 92%, indicating significant contribution of biotic CO<sub>2</sub> in Tokyo. The O<sub>2</sub>:CO<sub>2</sub> exchange ratio (oxidation ratio, OR) was used for the partitioning of CO<sub>2</sub> into emissions from gas fuels and gasoline. We observed larger OR in winter than in summer (due to both wintertime increases of fossil fuel combustion and summertime terrestrial biospheric activities) at TST and YYG and larger OR in the morning and late evening in winter due to increase of gas fuel combustion at YYG. We showed that the O<sub>2</sub> concentrations might be also used as a proxy for continuous monitoring of fossil fuel CO<sub>2</sub> content by assuming typical ratio of gas fuels and gasoline combustions. The presenter will introduce the related projects including development of building/road-scale dynamic CO<sub>2</sub> mapping and grid-based CO<sub>2</sub> emission inventory with high special resolution in Tokyo.