Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

AAS021-04 Room:102 Time:May 23 09:15-09:30

Evaluation of CO2 emission from the Tokyo metropolitan area based on balloon born measurements: Simultaneous observation

Mai Ouchi[1], Hiroshi Sasago[1], Yutaka Matsumi[1*], Tomoki Nakayama[1], Masatomo Fujiwara[2], Kensaku Shimizu[3], Kouji Shibata[3], Masato Shiotani[4], Masafumi Ohashi[5], Gen Inoue[6], Ryoichi Imasu[7], Tatsuya Yokota[8]

[1]Nagoya University, [2]Hokkaido University, [3]Meisei Electric, [4]Kyoto University, [5]Kagoshima University, [6]RIHN, [7]The University of Tokyo, [8]NIES

Emissions of CO2 have increased drastically over the past century as a result of the mass consumption of fossil fuels due to the expansion of industrial activities resulting in dramatic increases in atmospheric concentrations of CO2. CO2 emissions from urban area are an important term of global carbon budget, but its estimation is mainly based on inventories of fossil fuel consumption and road traffic. To ascertain the CO2 flux values from urban area, detailed CO2 measurements including vertical distribution are required.

In this study, simultaneous measurements of CO2 vertical profiles using originally developed balloon borne instruments (CO2-sonde) at three sites on January 7, 2011 to evaluate CO2 emission from the Tokyo metropolitan area. The three sites, Isezaki (Gunma Pref.), Ichihara (Chiba Pref.), and Shirako (Chiba Pref.), where the balloon borne instruments were launched, are located upwind, inside, and downwind of the metropolitan area, respectively. The CO2 sensors are based on a non-dispersed infrared absorption spectroscopy technique at the wavelength around 4.3 micrometers. The data of the optical infrared absorption are transmitted through a GPS rawin-sonde (Meisei RS-06G) with temperature, humidity and GPS data every second.

As a result, at lower altitude (<1 km), CO2 mixing ratio obtained at Ichihara are higher than those obtained at other sites by 2-7 ppmv, while the three vertical profiles are indistinguishable at free troposphere. These observational data will be used to evaluate CO2 emission from the Tokyo metropolitan area using CO2 transport models and also to validate CO2 total column measurements by the greenhouse gas observing satellite (GOSAT) and a ground base fiber-etalon spectrometer.

Keywords: Carbon dioxide emission, Balloon-borne measurement, Tokyo metropolitan area, Satellite validation