Development of CO2 measurement system in a remote area under hash observation environment -a case of Mt, Fuji-

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National Institute for Environmental Studies (NIES) Center for Global Environmental Research (CGER) has developed a CO_2 measurement system which is able to operate independently under remote and harsh observation conditions. An experimental operation was conducted on the top of Mt, Fuji in summer, 2008.

There are approximately 100 atmospheric observation bases all over the world for Green House Gasses (GHGs). Because most of them are located in the Northern Hemisphere, gap areas exist in South America, Africa, Siberia, and Oceanic areas especially around equator. It is demanded that burying those gap areas in order to explain the world scale carbon cycle and to improve inverse model results. In general, widely used measurement system needs big stable power supply, constant check and maintenances, and properly kept surrounding conditions. It is very likely that in those gap areas of GHGs observation, lack of institute and hard environmental conditions prevent establishments of measurement systems.

We have been developing a CO_2 measurement system to fill up the demand of expanding CO_2 observation in the gap areas. The main feature of the instrument is described as self-sustain power securement, little electric power consumption, satellite date communication, and portability in addition to obtain of accurate date. The first instrument was designed for areas with low temperature. The CO_2 measurement device itself is 33cm/33cm/33cm(W/D/H), 9kg weight, and it uses Li840(LICOR Bioscience, USA) as Non-Dispersive Infra-Red CO_2 analyzer, a membrane dryer(AGC Engineering Co., LTD, JPN) and silica gel for dehumidification, and ORBCOMM for satellite date transmission. A 20w small heater is equipped which works below 0 degree C. The power is supplied by 12V sealed-lead storage batteries. It was examined that this system operates continuously under -20 degree C environment. Precision of this instrument is plus-minus 0.2ppm.

The summit of Mt, Fuji was chosen as an experimental site for the first place to install that device. Its observation conditions are: 3776 m altitude, no power supply and not being reachable except two months in summer, very low temperature down to -30 degrees C outside during winter and difficulty in material transfer.

Last summer, we set the device on the Mt, Fuji and experimentally operated its measurement for one and half months from mid July to end of September when Mt, Fuji Weather Station was open (NPO Valid Utilization of Mt, Fuji Weather Station).

It showed that the system worked well enough under such a limited condition and data was reliable. This leads to a challenge of whole year observation on Mt, Fuji and installation to other gap areas with similar conditions. Moreover, it approved the usability of summit of Mt, Fuji as an observation site. It is assumed that measured CO_2 concentration on Mt, Fuji can show influences of CO_2 emission from relatively wide area of East Asia due to its high altitude. Therefore this CO_2 measurement on Mt, Fuji will be able to take a role as one of the observation sites to indicate representative CO_2 concentration of mid-latitude Asian atmosphere.