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Improvements of Balloon-borne CO₂ instrument for the high accurate measurement of CO₂ vertical profile

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To ascertain the global and geophysical flux values of CO₂ and their seasonal and inter-annual variation, detailed CO₂ measurements including vertical distribution are required. However, nowadays the monitoring sites for CO₂ are mainly ground-based, and air flight measurements are performed only in the restricted areas and seasons. We are developing balloon-borne instruments which can measure the vertical distribution of CO₂ in any places in the world under any weather conditions, like ozone sonde instruments. They will accumulate new scientific knowledge on the global distribution of greenhouse gases and its temporal variations. Further, they can be used for the validation of green-house monitoring satellites such as GOSAT. The CO₂ sensors we developed are based on a non-dispersed infrared absorption spectroscopy technique at the wavelength around 4.3 micrometers. We have measured the CO₂ vertical profile and three axes accelerations simultaneously for precise correction. As a result, we have successfully carried out measurement of the CO₂ vertical profile with the vertical resolution of 270 m with a precision of 2 ppm in Moriya, December 2009.

Keywords: Carbon dioxide, Balloon-borne instrument, Instrument development, Infrared absorption, Satellite validation