

Proposal of satellite for observing large point sources of carbon dioxide

*Hirofumi Ohyama¹, Tsuneo Matsunaga¹, Isamu Morino¹, Yukio Yoshida¹, Makoto Saito¹

1. National Institute for Environmental Studies

We propose an earth-observing satellite that aims to quantify amounts of atmospheric carbon dioxide (CO₂) emitted from large point sources (LPSs) such as thermal power plants and steel plants, which account for approximately 40% of energy-related CO₂ emissions in the world. In the Global Stocktake Process under the Paris Agreement, each country is required to report sources and sinks of greenhouse gases (inventory) with sufficient accuracy. However, there are large uncertainties in the CO₂ and methane (CH₄) emissions from the LPSs, especially for the developing countries. Space-borne observation could be useful for quantifying and verifying the emissions from the LPSs, given that it provides column abundances in and out a plume with high spatial resolution. With regard to the LPS observation of CH₄, several satellites with a footprint size of less than 1 km² are developed recently: GHGSat series (2016 and 2019, GHGSat Inc. in Canada), COOL (2020, Bluefield Technologies Inc. in the U.S.), and MethaneSAT (2021, Environmental Defense Fund in the U.S.). That kind of CO₂ satellite is, however, not planned. Our proposed satellite has an ability of measuring back-scattered solar spectra in the near-infrared region with a footprint size of less than 1 km x 1 km (if feasible, hundreds of meters by hundreds of meters) using an imaging grating spectrometer. Additionally, to increase the signal to noise ratio of the spectrum, the satellite is dedicated to a target observation mode that observe an area of ~50 km x ~50 km including the LPSs more than 2 min continuously by using a pointing mechanism as adopted for the Greenhouse gases Observing SATellite (GOSAT) series.

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