

Progress of Retrieval Algorithm Development for GOSAT-GW NO₂ Product

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Abstract

GOSAT-GW is Japan's new satellite mission scheduled to be launched in 2024. The TANSO-3 sensor on board GOSAT-GW measures the Earth's radiance spectra in a push-broom configuration with three bands, i.e., 420-490 nm (Band1) for NO₂, 747-783 nm (Band2) for O₂ A-band and 1594-1650 nm (Band3) for CO₂/CH₄, to simultaneously observe greenhouse gases columns (XCO₂, XCH₄) and vertical column densities (VCDs) of nitrogen dioxide (NO₂), with two observation modes; the Wide Mode (10 x 10 km²) and the Focus Mode (~3 x ~3 km²). The TANSO-3 Level 2 NO₂ product (T3L2NO2) includes total and tropospheric NO₂ VCDs as well as a product quality flag, total and tropospheric air mass factors (AMFs) and uncertainties of the retrieved NO₂ VCD such as root mean square error of the spectral fitting. A retrieval algorithm for T3L2NO2 (GORAL-NO2) is developed based on methods similar to the previous NO₂ satellite sensors, which mainly consists of three parts; a DOAS fitting, a separation of tropospheric and stratospheric NO₂ columns (STS), and a conversion from slant to vertical columns (CSV). Not only the fitting parameters in DOAS but also the input data to the radiative transfer model (VLIDORT) and the chemical transport model (CHASER) are optimized based on the TANSO-3 specification. In STS, stratospheric NO₂ VCD is derived from CHASER using the bias correction method based on data assimilation of total NO₂ VCD. Vertically-resolved AMFs (box-AMFs) are pre-calculated using the VLIDORT and stored in a look-up table (LUT). Then, the tropospheric AMF at each observation point is derived by weighting the box-AMFs, interpolated to the specific state, with the NO₂ profiles derived from the CHASER model, in the CSV procedure. A remarkable feature of this algorithm is to simultaneously retrieve aerosol/cloud optical parameters that affect the accuracy of AMF in operation using a developed LUT-based method.

Early Career Scientist

NO, I am not an early career scientist.

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