

NIES-GOSAT2-SYS-20250324-026-02

Release Note

GOSAT-2 TANSO-FTS-2 SWIR L2
Column-averaged Dry-air Mole Fraction Product

Product version 02.20

July 2026

National Institute for Environmental Studies
GOSAT-2 Project

Revision History

Version	Revised	Page	Description
00	Mar. 2025	-	-
01	Jun. 2025	p.1	Fixed part of the change of input data
		p.2	Added part of the important information
		p.3	Added that released to General users
02	Jul. 2026	p.2, p.3, p.4, p.5	Added bias correction formulas and correction coefficients to the important information

1 Introduction

The purpose of this document is to provide considerations for the Greenhouse gases Observing SATellite-2 (hereinafter referred to as “GOSAT-2”) products generated by the National Institute for Environmental Studies, Japan.

The product and its version described in this document are listed in Table 1-1.

Table 1-1 Product and version

Product name	Product version
GOSAT-2 TANSO-FTS-2 SWIR L2 Column-averaged Dry-air Mole Fraction Product	02.20

2 Difference from previous version

The difference between the previous version (02.10) and this version (02.20) is shown as follows:

2.1 Change of processing algorithm

There is no change in the processing algorithm for generating this product.

2.2 Change of input data

The change in the input data is shown as follows:

- (1) TANSO-CAI-2 L2 Cloud Discrimination Product referred in the retrieval processing was updated (V01.20/V01.21).
- (2) The meteorological reanalysis data used in the retrieval processing were switched from JRA-55 to JRA-3Q. In addition, the corresponding variance-covariance matrices were updated to those calculated based on JRA-3Q.
- (3) The vertical profiles of CO₂ and CH₄ concentrations, and the corresponding variance-covariance matrices used in the retrieval processing were updated.

2.3 Change of file format

There is no change in the file format of the product.

3 Important information

The important information for this version is shown as follows:

- (1) The L1 product version corresponding to this version is shown below.
 - TANSO-FTS-2 L1B Product: 220.220

Note: The spectra before sensitivity correction stored under SoundingData/RawSpectrum is used in the retrieval processing of this product. The instrument characteristic information used in retrieval processing of products of this version is the same those used for the conversion of the sensitivity-corrected spectra stored under SoundingData/Radiance of TANSO-FTS-2 L1B V220.221.
- (2) The wavenumber range of TANSO-FTS-2 SWIR observed radiance spectrum, used in the retrieval processing of this version, consists of 12950-13200cm⁻¹ (Band 1), 6180-6380cm⁻¹ (Band 2), 5900-6150cm⁻¹ (Band 2), 4800-4900 cm⁻¹ (Band 3), and 4200-4300cm⁻¹ (Band 3), which correspond to the sub-band 1, 2, 3, 4, and 5, respectively.
- (3) The following TANSO-FTS-2 Instrument characteristic information was used in the retrieval processing of this version.
 - Instrument line shape function (ILSF) date version: May 25, 2020
 - Radiance conversion coefficient (RAD_CNV) date version: Jan. 11, 2022
 - Time-dependent radiance correction coefficient (RAD_Time_Wave_Deg) date version: Mar. 27, 2024
 - Complex refractive index of the scanner mirror (SCANNER_REFRACTION) date version: Oct. 10, 2018
- (4) The following datasets store invalid value.
 - CloudInformation/FTS-2_TIR
 - RetrievalResult/wind_speed
 - RetrievalResult/wind_speed_apriori
 - RetrievalResult/wind_speed_uncert
- (5) Only each data of "Good" quality flag should be used, although xco2_quality_flag, xch4_quality_flag, xco_quality_flag, and xh2o_quality_flag under RetrievalResult store four-level quality flags: "Good", "Fair", "Poor", and "NG".
- (6) The empirical bias correction formulas and correction coefficients based on multiple regression analysis, which were evaluated by considering TCCON data (version GGG2020) as the true value, are as follows. Note that all column-averaged dry-air mole fractions are in [ppm].

XCO₂ over Land

$$XCO_2^{Bias-corrected} = XCO_2 + A_0 + A_1 \cdot SZA \text{ [degrees]} + A_2 \cdot AOT + A_3 \cdot \Delta P_S + A_4 \cdot \Delta T + A_5 \cdot \alpha_{SB1} + A_6 \cdot \alpha_{SB5} + A_7 \cdot (fILS_{SB1} - 1) + A_8 \cdot (fILS_{SB2} - 1) + A_9 \cdot (fILS_{SB3} - 1) + A_{10} \cdot (fILS_{SB4} - 1) + A_{11} \cdot (fILS_{SB5} - 1) + A_{12} \cdot XH_2O$$

$A_0 = -4.69986E+00$	$A_1 = 2.48169E-02$	$A_2 = -8.14959E+00$
$A_3 = 1.84051E-01$	$A_4 = -4.39630E-01$	$A_5 = 6.70495E-01$
$A_6 = -3.07922E+00$	$A_7 = 2.03070E+02$	$A_8 = 4.43848E+02$
$A_9 = 4.77228E+02$	$A_{10} = 1.61213E+02$	$A_{11} = 3.40890E+02$
$A_{12} = 6.97117E-05$		

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XCO₂ over Ocean

$$XCO_2^{Bias-corrected} = XCO_2 + B_0 + B_1 \cdot AM + B_2 \cdot AOT + B_3 \cdot \Delta P_S + B_4 \cdot \alpha_{SB5} \\ + B_5 \cdot (fILS_{SB1} - 1) + B_6 \cdot (fILS_{SB2} - 1) + B_7 \cdot (fILS_{SB4} - 1) \\ + B_8 \cdot XH_2O$$

$B_0 = -6.03307E+00$	$B_1 = 1.87514E+00$	$B_2 = -1.25267E+01$
$B_3 = 1.16424E-01$	$B_4 = -1.80857E+01$	$B_5 = 3.90888E+02$
$B_6 = 4.73211E+02$	$B_7 = 1.13028E+02$	$B_8 = 3.31016E-04$

XCH₄ over Land

$$XCH_4^{Bias-corrected} = XCH_4 + C_0 + C_1 \cdot AOT + C_2 \cdot \Delta P_S + C_3 \cdot \Delta T + C_4 \cdot \alpha_{SB1} \\ + C_5 \cdot (fILS_{SB1} - 1) + C_6 \cdot (fILS_{SB3} - 1) + C_7 \cdot (fILS_{SB5} - 1) \\ + C_8 \cdot XH_2O$$

$C_0 = -2.79232E-03$	$C_1 = 6.31538E-02$	$C_2 = 7.59175E-04$
$C_3 = 1.78891E-03$	$C_4 = -2.04277E-02$	$C_5 = 4.52560E-01$
$C_6 = 4.88906E-01$	$C_7 = 9.08188E-01$	$C_8 = 2.69023E-06$

XCH₄ over Ocean

$$XCH_4^{Bias-corrected} = XCH_4 + D_0 + D_1 \cdot SZA \text{ [degrees]} + D_2 \cdot AOT + D_3 \cdot \Delta P_S \\ + D_4 \cdot (fILS_{SB1} - 1) + D_5 \cdot (fILS_{SB5} - 1) + D_6 \cdot XH_2O$$

$D_0 = -4.65263E-03$	$D_1 = 1.19360E-04$	$D_2 = 6.48142E-02$
$D_3 = 1.31437E-03$	$D_4 = 1.29216E+00$	$D_5 = 4.06057E-01$
$D_6 = 2.99053E-06$		

XCO over Land

$$XCO^{Bias-corrected} = XCO + E_0 + E_1 \cdot SZA \text{ [degrees]} + E_2 \cdot AOT + E_3 \cdot \Delta P_S + E_4 \cdot \Delta T \\ + E_5 \cdot \alpha_{SB1} + E_6 \cdot (fILS_{SB1} - 1) + E_7 \cdot (fILS_{SB3} - 1) \\ + E_8 \cdot (fILS_{SB5} - 1) + E_9 \cdot XH_2O$$

$E_0 = 2.81992E-03$	$E_1 = -1.26277E-04$	$E_2 = -1.26935E-01$
$E_3 = -4.15303E-04$	$E_4 = -3.23469E-03$	$E_5 = -1.58071E-02$
$E_6 = 4.42327E-01$	$E_7 = -3.91807E-01$	$E_8 = -1.18681E+00$
$E_9 = 3.42543E-07$		

XCO over Ocean

$$XCO^{Bias-corrected} = XCO + F_0 + F_1 \cdot \Delta T + F_2 \cdot (fILS_{SB4} - 1)$$

$F_0 = -1.43424E-03$	$F_1 = 3.45601E-03$	$F_2 = 1.10073E+00$
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$$AM \text{ (Airmass)} = \frac{1}{\cos(SZA \text{ [radians]})} + \frac{1}{\cos(VZA \text{ [radians]})}$$

$$AOT = \sum_{i=1}^{15} AOT_{T1}[i] + \sum_{i=1}^{15} AOT_{T2}[i]$$

$$\Delta P_S = P_S - P_S^{a \text{ priori}}$$

$$\alpha_{SB1} = \frac{2 \cdot \sum_{i=1}^{nALB_{SB1}} ALB_{SB1}[i] - ALB_{SB1}[1] - ALB_{SB1}[nALB_{SB1}]}{2 \cdot (nALB_{SB1} - 1)}$$

$$\alpha_{SB5} = \frac{2 \cdot \sum_{i=1}^{nALB_{SB5}} ALB_{SB5}[i] - ALB_{SB5}[1] - ALB_{SB5}[nALB_{SB5}]}{2 \cdot (nALB_{SB5} - 1)}$$

The correspondence between each symbol and dataset is shown in the table below.

Symbol	Dataset
XCO_2	RetrievalResult/xco2
XCH_4	RetrievalResult/xch4
XCO	RetrievalResult/xco
XH_2O	RetrievalResult/xh2o
SZA	SoundingGeometry/solarZenith
VZA	SoundingGeometry/viewZenith
AOT_{T1}	RetrievalResult/aerosol_profile_type1
AOT_{T2}	RetrievalResult/aerosol_profile_type2
P_S	RetrievalResult/surface_pressure
$P_S^{a \text{ priori}}$	RetrievalResult/surface_pressure_apriori
ΔT	RetrievalResult/temperature_shift
ALB_{SB1}	RetrievalResult/albedo_subband01
ALB_{SB5}	RetrievalResult/albedo_subband05
$nALB_{SB1}$	SceneAttribute/numAlb_SB1
$nALB_{SB5}$	SceneAttribute/numAlb_SB5
$fILS_{SB1}$	RetrievalResult/ils_stretch_factor_subband01
$fILS_{SB2}$	RetrievalResult/ils_stretch_factor_subband02
$fILS_{SB3}$	RetrievalResult/ils_stretch_factor_subband03
$fILS_{SB4}$	RetrievalResult/ils_stretch_factor_subband04
$fILS_{SB5}$	RetrievalResult/ils_stretch_factor_subband05

4 Version upgrade history

The version upgrade history of the product described in this document is shown in Table 4-1.

Table 4-1 Version upgrade history

Product version	Date	Remarks
01.01	Nov. 2019	Release to RA users
01.04	Oct. 2020	Changed processing algorithm Changed input data Changed important information Release to RA users
	Nov. 2020	Release to General users
01.07	Oct. 2021	Changed input data Changed important information Release to RA users
	Dec. 2021	Release to General users
02.00	Jul. 2022	Changed processing algorithm Changed input data Changed file format Changed important information Release to RA users
	Aug. 2022	Release to General users
	Oct. 2023	Changed important information
02.10	Feb. 2025	Changed processing algorithm Changed input data Release to General users
02.20	Mar. 2025	Changed input data Release to RA users
	Jun. 2025	Released to General users
	Jul. 2026	Changed important information

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