

NIES GOSAT-GW
Greenhouse Gas Observation Mission Project
Level 2 (GHG) Product Format Descriptions

Version C September 2025

Version B March 2025

Version A March 2024

First version March 2023

National Institute for Environmental Studies
Satellite Observation Center
GOSAT-GW Project

(Blank)

Revision History

Version	Date of Establishment	Revised Section	Description of Revision, Reason
First Version	March 2023	-	—
Version A	March 2024	Section 2.1 Main Text	Removed time information from file naming convention in (6).
		Section 3.1 Table 3-1	- Changed Storage location for No. 3 from "PathInfo" to "L1bproductInfo". - Added "Dimension" to No. 23. - Added notes regarding dimensions at the bottom of the table.
		Section 3.3 Main Text	Changed "Table 3-3_1 to Table 3-3_22" to "Table 3-3_1 to Table 3-3_23" in the main text.
		Section 3.3 Table 3-3_1	- Corrected Attribute Name for No. 12 from "standard_names_vocabulary" to "standard_names_vocabulary". - Corrected "seconds" to "milliseconds" in Explanation for No. 19 and No. 20. - Deleted the description "Fixed at 0 in this product" in Explanation for No. 25 and No. 26. - Deleted rows for "geospatial_bounds" and "geospatial_bounds_crs". - Adjusted overall No.
		Section 3.3 Table 3-3_2	Corrected "L2" to "Level2" in Explanation for No. 5.
		Section 3.3 Table 3-3_3	- Changed Group for No. 1 from "PathInfo" to "L1bproductInfo". - Changed Dataset for No. 2 from "pathNum" to "l1bfileNum". - Changed Dataset for No. 3 from "observationStartTime" to "observationStartDateTime". Changed Dimension size from "pathNum" to "l1bfileNum". In Explanation, changed "start frame of the path" to "start frame of the L1B product used for creation" and corrected "seconds" to "milliseconds". In Description, changed "for each path" to "for each L1B product file". - Changed Dataset for No. 4 from "observationEndTime" to "observationEndDateTime". Changed Dimension size from "pathNum" to "l1bfileNum". In Explanation, changed "start frame of the path" to "start frame of the L1B product used for creation" and corrected "seconds" to "milliseconds". In Description, changed "for each pathj" to "for each L1B product file". - Changed Dimension size for No. 5 from "pathNum" to "l1bfileNum". - Changed Dimension size for No. 6 from "pathNum" to "l1bfileNum". - Changed Dataset name from "L1B product file granule ID" to "L1B product granule ID". - Deleted the "pathNo" row. - Adjusted overall No. - Changed the notes at the bottom of the table to match the above.
		Section 3.3 Table 3-3_4	- Added row for No. 4 "frameNum". - Corrected "seconds" to "microseconds" in Explanation for No. 5 and No. 6. - Deleted the "geospatial_bounds" row. - Adjusted overall No. - Changed the notes at the bottom of the table to match the above.
		Section 3.3 Table 3-3_5	- No. 2 Changed Datatype from "H5T_STD_I16LE" to "H5T_STD_I32LE". Changed validRange Max from "9,999" to "99,999". - Added "Numbered starting from 1 in chronological order of observation time for each L1B product used for creation." to Explanation for No. 3. Added "Numbering from 1 for each L1B product for each L1B product" to Description. - Added row for No. 4 "obsID". - Adjusted overall No. - Changed the notes at the bottom of the table to match the above.

Version	Date of Establishment	Revised Section	Description of Revision, Reason
		Section 3.3 Table 3-3_6	• Changed validRange Max for No. 1 from "999,999" to "9,999,999". • Corrected "seconds" to "microseconds" in Explanation for No. 4. • Added row for No. 6 "latitudePixelBounds". • Added row for No. 8 "longitudePixelBounds". • Changed the notes at the bottom of the table to match the above.
		Section 3.3 Table 3-3_7	• Changed Datatype for No. 3, No. 4, No. 6, No. 7, No. 9, and No. 10 from "H5T_STD_I16LE" to "H5T_STD_F32LE". Changed validRange Max from "999" to "999.0".
		Section 3.3 Table 3-3_10	• Corrected Group for No. 1 from "RetrievalConfigurtion_FP" to "RetrievalConfiguration_FP".
		Section 3.3 Table 3-3_11	• Changed Dataset for No. 41 from "aerosolPeakHeight_apriori" to "aerosolPeakHeight_apriori_fp". • Changed Dataset for No. 44 from "surfacePressure_apriori" to "surfacePressure_apriori_fp". • Changed Dataset for No. 53 from "sifSlope_fp" to "sifSlope_fp_apriori_fp". • Corrected Dataset for No. 63 from "wavelengthStretch_uncer_fp" to "wavelengthStretch_uncert_fp". • Changed Dimension size for No. 66 from "pixel,numSubBand" to "pixel,numSubBand_fp".
		Section 3.3 Table 3-3_14	• Corrected Group for No. 1 from "RetrievalConfiguration_SIF" to "RetrievalConfiguration_SIF".
		Section 3.3 Table 3-3_16	• Corrected Group for No. 1 from "RetrievalConfiguration_Ps" to "RetrievalConfiguration_Ps". • Corrected Dataset for No. 7 from "wavelengthStretch_aprior_ps" to "wavelengthStretch_apriori_ps".
		Section 3.3 Table 3-3_17	• Corrected Dataset for No. 23 from "wavelengthStretch_aprior_ps" to "wavelengthStretch_apriori_ps".
		Section 3.3 Table 3-3_18	• Corrected Group for No. 1 from "RetrievalConfiguration_PR_CO2" to "RetrievalConfiguration_PR_CO2".
		Section 3.3 Table 3-3_20	• Corrected Group for No. 1 from "RetrievalConfiguration_PR_CH4" to "RetrievalConfiguration_PR_CH4".
		Section 3.3 Table 3-3_21	• Changed Dataset for No. 3 from "xch4_apriori_pr_CH4" to "xch4_apriori_pr_ch4". • Changed Dataset for No. 5 from "xch4_dfs" to "xch4_dfs_pr_ch4". • Changed Dataset for No. 9 from "xh2o_dfs" to "xh2o_dfs_pr_ch4". • Corrected Dataset for No. 17 from "wavelengthStretch_aprior_pr_ch4" to "wavelengthStretch_apriori_pr_ch4".
		Section 3.3 Table 3-3_23	• Added table.
Version B	March 2025	2.1.(7)	• Added file size and removed "(TBD)".
		Section 3.3 Table 3-3_1	• Added "Value:(TBD)" to Explanation for No. 37.
		Section 3.3 Table 3-3_3	• Changed Dataset for No. 2 from "l1bfileNum" to "numL1bfile". • Changed Dimension size for No. 3-4 from "l1bfileNum" to "numL1bfile". • Changed Dimension size for No. 5-6 from "l1bfileNum" to "numL1bfile". Changed invalid Value from "N/A" to "-".

Version	Date of Establishment	Revised Section	Description of Revision, Reason
		Section 3.3 Table 3-3_4	• Changed Dimension size for No. 3 from "sounding" to "numSounding". Changed Datatype from "H5T_STD_I16LE" to "H5T_STD_U16LE". Added "(1-65533)" to Explanation. • Changed Dataset for No. 4 from "frameNum" to "numFrameSounding". Changed Dimension size from "sounding" to "numSounding". • Changed Dimension size for No. 5-6 from "sounding" to "numSounding".
		Section 3.3 Table 3-3_5	• Changed Dimension size for No. 2 from "band" to "numBand". • Changed Dimension size for No. 3 from "frame" to "numFrame". • Changed "1" to "0001" in Explanation and description. • Changed Dimension size for No. 4 from "frame" to "numFrame". Changed Datatype from "H5T_STD_I16LE" to "H5T_STD_U16LE". Added "(1-65533)" to Explanation. • Changed Dimension size for No. 5-6 from "frame" to "numFrame". Changed unit from "deg" to "degree". • Changed Dimension size for No. 7 from "frame" to "numFrame".
		Section 3.3 Table 3-3_6	• Changed Dimension size for No. 3 from "pixel" to "numPixel". Changed invalid Value from "N/A" to "-". • Changed Dimension size for No. 4, No. 9-12, No. 17, No. 19, No. 22-24 from "pixel" to "numPixel". • Changed Dimension size for No. 5, No. 7, No. 13-16, No. 18 from "pixel" to "numPixel". Changed unit from "deg" to "degree". • Changed Dimension size for No. 6, No. 8 from "pixel,numNcorner" to "numPixel,numNcorner". Changed unit from "deg" to "degree". • Changed Dimension size for No. 20-21 from "pixel,numBand" to "numPixel, numBand".
		Section 3.3 Table 3-3_7	• Changed Dimension size for No. 2-13 from "pixel" to "numPixel".
		Section 3.3 Table 3-3_9	• Changed Dimension size for No. 2 from "pixel,numLayer+1" to "numPixel, numLayer+1". • Changed Dimension size for No. 3, No. 9-11 from "pixel,numLayer" to "numPixel, numLayer". • Corrected Dimension Rank for No. 4 from "1" to "2". Changed Dimension size from "pixel,numLayer" to "numPixel,numLayer". • Changed Dimension size for No. 5-8, No. 14-15 from "pixel" to "numPixel". • Changed Dimension size for No. 12-13 from "pixel,numAerType" to "numPixel, numAerType".
		Section 3.3 Table 3-3_11	• Changed Dimension size for No. 2-5, No. 7-13, No. 15-21, No. 23, No. 26-27, No. 43-46, No. 48-49, No. 51-52, No. 54, No. 58-60, No. 64-65 from "pixel" to "numPixel". • Changed Dimension size for No. 6, No. 14, No. 22, No. 25, No. 28-36 from "pixel,numLayer" to "numPixel,numLayer". • Changed Dimension size for No. 24 from "pixel,numLayer+1" to "numPixel, numLayer+1". • Changed Dimension size for No. 37-42 from "pixel,numAerType" to "numPixel,numAerType". • Changed Dataset for No. 53 from "sifSlope_fp_apriori_fp" to "sifSlope_apriori_fp". • Corrected Dimension size for No. 55-57 from "pixel,numWavelengthAlbedoMax_fp, numSubBand_fp" to "numPixel, numWavelengthAlbedoMax_fp,numSubBand_fp". • Changed Dimension size for No. 61, No. 63, No. 66 from "pixel,numSubBand_fp" to "numPixel,numSubBand_fp".

Version	Date of Establishment	Revised Section	Description of Revision, Reason
		Section 3.3 Table 3-3_12	Changed Dimension size for No. 2-5 from "pixel" to "numPixel".
		Section 3.3 Table 3-3_13	Changed Dimension size for No. 2-4 from "pixel" to "numPixel".
		Section 3.3 Table 3-3_15	- Changed Dimension size for No. 2, No. 4-5, No. 9-12, No. 14-18 from "pixel" to "numPixel". - Changed Dimension size for No. 6-8 from "pixel,numWavelengthAlbedo_sif" to "numPixel, numWavelengthAlbedo_sif".
		Section 3.3 Table 3-3_17	- Changed Dimension size for No. 2-7, No. 9-10, No. 12-13, No. 15, No. 19-22, No. 24-26 from "pixel" to "numPixel". - Changed Dimension size for No. 16-18 from "pixel,numWavelengthAlbedo_ps" to "numPixel, numWavelengthAlbedo_ps".
		Section 3.3 Table 3-3_19	- Changed Dimension size for No. 2-9, No. 13-16, No. 18-20 from "pixel" to "numPixel". - Changed Dimension size for No. 10-12 from "pixel,numWavelengthAlbedo_pr_co2" to "numPixel, numWavelengthAlbedo_pr_co2". - Corrected Dataset for No. 4 from "wavelengthStretch_aprior_pr_co2" to "wavelengthStretch_apriori_pr_co2".
		Section 3.3 Table 3-3_21	- Changed Dimension size for No. 2-9, No. 13-16, No. 18-20 from "pixel" to "numPixel". - Changed Dimension size for No. 10-12 from "pixel, numWavelengthAlbedo_pr_ch4" to "numPixel, numWavelengthAlbedo_pr_ch4".
		Section 3.3 Table 3-3_22	- Changed Dimension size for No. 3-12, No. 15-17, No. 19-21 from "pixel" to "numPixel". - Changed Dimension size for No. 13 from "pixel" to "numPixel". - Changed invalid Value from "-999.0" to "-1".
		Section 3.3 Table 3-3_23	- Changed invalid Value for No. 3 from "N/A" to "-128". - Added "Stored from the short wavelength side." to Description for No. 10, No. 12, No. 14, No. 16, No. 18, No. 20. - Changed Dataset for No. 23 from "libfileNum" to "numLibfile". - Added "Pixels within the same frame are stored in the order of the spatial division index assigned in the LIB product, and these are stored in chronological order for each frame." to Description for No. 24.
Version C	September 2025	Section 2.1	- Removed "Retrieval processing results are stored only for observation points that have passed various screenings such as cloud screening and quality checks" from (1) - Removed "(proxy method)" from (2) - Removed "S1, Ax, Cx, D1, B1" from Observation/Configuration Mode Type in (6). Removed "WF: Wide non-binning", "FF: Fine non-binning" from Imaging Mode/Resolution.
		Section 3.1 Table 3-1	- Removed "using proxy method" from Main contents for No. 14, No. 15, No. 16, No. 17. - Removed "(proxy method)" from Main contents for No. 16, No. 17, No. 19, No. 21.
		Section 3.3 Table 3-3_3	Changed "libfileNum" to "numLibfile" in the notes at the bottom of the table.
		Section 3.3 Table 3-3_7	- Removed lines "averagedRadiance_B1", "averagedRadiance_B2", "averagedRadiance_B3", and "diffSurfacePressure" - Adjust the values of column "No."
		Section 3.3 Table 3-3_9	- Removed line "windSpeed_apriori" - Adjust the values of column "No."

Version	Date of Establishment	Revised Section	Description of Revision, Reason
		Section 3.3 Table 3-3_11	- Removed lines "xco2_uncertBiasCorrected_fp", "xch4_uncertBiasCorrected_fp", "xh2o_columnAveragingKernel_fp", "dryAirColumn_apriori_fp", "co2_uncert_fp", "ch4_uncert_fp", "h2o_fp", "h2o_apriori_fp", "h2o_uncert_fp", "aot_apriori_fp", "aot_uncert_fp", "aerosolPeakHeight_apriori_fp", "aerosolPeakHeight_uncert_fp", "surfacePressure_apriori_fp", "surfacePressure_uncert_fp", "temperatureShift_apriori_fp", "temperatureShift_uncert_fp", "sif755_apriori_fp", "sif755_uncert_fp", "sifSlope_apriori_fp", "sifSlope_uncert_fp", "albedo_apriori_fp", "albedo_uncert_fp", "windSpeed_fp", "windSpeed_apriori_fp", "windSpeed_uncert_fp", "wavelengthStretch_apriori_fp", and "wavelengthStretch_uncert_fp" - Adjust the values of column "No." - Removed "wavenumber" from Explanation for No.33
		Section 3.3 Table 3-3_15	- Removed lines "sif_raw_apriori_sif", "albedo_apriori_sif", "albedo_uncert_sif", "windSpeed_sif", "windSpeed_apriori_sif", "windSpeed_uncert_sif", "wavelengthStretch_apriori_sif", "wavelengthStretch_uncert_sif" - Adjust the values of column "No."
		Section 3.3 Table 3-3_17	- Removed lines "surfacePressure_apriori_ps", "surfacePressure_uncert_ps", "temperatureShift_apriori_ps", "temperatureShift_uncert_ps", "sif755_apriori_ps", "sif755_uncert_ps", "sifSlope_apriori_ps", "sifSlope_uncert_ps", "albedo_apriori_ps", "albedo_uncert_ps", "windSpeed_ps", "windSpeed_apriori_ps", "windSpeed_uncert_ps", "wavelengthStretch_apriori_ps", "wavelengthStretch_uncert_ps" - Adjust the values of column "No."
		Section 3.3 Table 3-3_19	- Removed lines "xco2_apriori_pr_co2", "xh2o_apriori_pr_co2", "albedo_apriori_pr_co2", "albedo_uncert_pr_co2", "windSpeed_pr_co2", "windSpeed_apriori_pr_co2", "windSpeed_uncert_pr_co2", "wavelengthStretch_apriori_pr_co2", "wavelengthStretch_uncert_pr_co2" - Adjust the values of column "No."
		Section 3.3 Table 3-3_21	- Removed lines "xch4_apriori_pr_ch4", "xh2o_apriori_pr_ch4", "albedo_apriori_pr_ch4", "albedo_uncert_pr_ch4", "windSpeed_pr_ch4", "windSpeed_apriori_pr_ch4", "windSpeed_uncert_pr_ch4", "wavelengthStretch_apriori_pr_ch4", "wavelengthStretch_uncert_pr_ch4" - Adjust the values of column "No."
		Section 3.3 Table 3-3_23	Changed Dimension size for No. 22 from "l1bfileNum" to "numL1bfile".

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1. Introduction

1.1. Purpose of this document

This document defines the format of the GOSAT-GW TANSO-3 Level 2 (GHG) product ("L2 Product (GHG)"), a product of the Global Observing SATellite for Greenhouse gases and Water cycle ("GOSAT-GW") created by the National Institute for Environmental Studies ("NIES").

1.2 Product and version

The product and its product versions described in this document are shown in Table 1-1.

Table 1-1 Managed Products

Product	Product Version
GOSAT-GW TANSO-3 Level 2 (GHG) Product Monthly Wide-area Observation Mode Level 2 (GHG) Product Monthly Fine Observation Mode Level 2 (GHG) Product Preliminary Wide-area Observation Mode Level 2 (GHG) Product Preliminary Fine Observation Mode Level 2 (GHG) Product	(TBD)

2. Overview

2.1. Overview of L2 Product (GHG)

This section describes the L2 Product (GHG), its provision unit, file naming convention, etc.

(1) Product description

The L2 Product (GHG) is a product that stores the column-averaged dry-air mole fraction of carbon dioxide and methane (XCO₂, XCH₄) estimated from the radiance spectra acquired by TANSO-3. A single file contains XCO₂ and XCH₄ estimated by the full-physics method, and XCH₄ estimated by the proxy method. It also stores processing results for simultaneously estimated parameters such as XH₂O and chlorophyll fluorescence (SIF).

(2) Main contents

XCO₂ (full-physics method), XCH₄ (full-physics method, proxy method), XH₂O (full-physics method), chlorophyll fluorescence

(3) Category

Standard

(4) Unit

Wide Mode: Daily (UTC)

Focus Mode (1km, 2km, 3km): Scene unit

(5) Format

HDF5 format

(6) File naming convention

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
T	A	N	S	O	3	_	Y	Y	Y	Y	M	M	D	D	_	X	x	x	y	y	z	n	n	n	n	_	0	2	G	H	G	P	_	V	M	M	N	N	R	R	m	o	o	o	.	h	5

TANSO3: Sensor name (Fixed)

YYYYMMDD: Observation date of the first frame (Year•Month•Day) (UTC)

X: Observation request source

J: JAXA

N: NIES

I: Satellite control system (Wide mode)

xxyyz: Operation mode

xx: Observation/Calibration mode type (O1)

yy: Imaging mode/Resolution

WD: Wide Mode

F1: Focus 1km Mode

F2: Focus 2km Mode

F3: Focus 3km Mode

z: Wavelength binning state (1-c)

nnnn: Observation request number (0001-9999)

02GHG: Product name (Fixed)

P: Product type

M: Standard

Q: Quick Delivery

V: Processing category

V: Standard processing, Reprocessing

T: Test processing, etc.

MMNNRR: Product version

MM: Major version (01-99)

NN: Minor version (00-99)

RR: Revision (00-99)

mo00: Input dataset version

m: Imaging mode type, Standard/Quick Delivery type

0-1: Wide Mode, Standard

2-3: Wide Mode, Quick Delivery

4-6: Focus Mode, Standard

7-9: Focus Mode, Quick Delivery

* If numbers are insufficient, lowercase letters a-z will be used.

ooo: Version number (001-999)

h5: File extension (Fixed)

(7) File size (max)

1.1GB

* For uncompressed files

2.2 Correspondence between L1 and L2 Products (GHG)

The correspondence of creation units between L1 and L2 products (GHG) is shown in Table 2-1.

Table 2-1 Correspondence of Creation Units between L1 and L2 products (GHG)

Observation mode	L1 Product	L2 Product (GHG)
Wide Mode	Path unit	Daily (UTC)
Focus Mode (1km, 2km, 3km)	Scene unit	Scene unit

* Scene: Observation identified by observation request ID

* Path: Observation from one ascending node to the next

3. Product format

3.1 Product dataset structure

The product dataset structure is shown in Table 3-1.

Table 3-1 Product dataset structure (1/3)

No.	Storage location	Main contents
1	GlobalAttribute	Metadata based on the Climate and Forecast Convention (CF Convention) 1.7 and ADD (Attribute Conventions for Data Discovery) 1.3 are set as global attributes. The following data is stored. · Product name · Organization name/Project name/Contact email · Product ID · Observation range · Decimation method flag · Data processing rate
2	Metadata	Stores a description of the product type, contents, etc. The following data is stored. · Granule ID · Satellite name/Sensor name · Processing level · Gas type · Operation mode · Processing category · Processing algorithm version · Product Version · Number of bands · Geodetic datum
3	L1bproductfileInfo	Stores mainly the following as information related to the observation. · Number of TANSO-3 L1B product files · Observation start/end time of TANSO-3 L1B product · Observation request ID corresponding to TANSO-3 L1B product · Granule ID of TANSO-3 L1B product
4	SoundingInfo	Stores mainly the following as information related to the observation. · Number of observation IDs · Observation ID · Observation start/end time of the observation ID in the observation plan · Operation mode for each observation ID

Table 3-1 Product dataset structure (2/3)

No.	Storage location	Main contents
5	FrameInfo	Stores mainly the following as information related to the observation. · Number of frames · Frame ID · Field-of-view direction AT/CT angles
6	PixelInfo	Stores mainly the following as information related to the observation. · Number of spatial pixels · Spatial pixel ID · Latitude/Longitude/Altitude of pixel center · Land/Water flag · Solar zenith/azimuth angle, Satellite zenith/azimuth angle · Sunlint flag · Saturation/Missing flag · SNR for each band · Processing result storage flag
7	CloudScreening	Stores the following mainly as information related to cloud screening. · Cloud flag by reflectance test · Cloud flag by surface pressure estimation
8	RetrievalCommonInfo	Stores the following mainly as information common to retrieval. · Number of retrieval layers (vertical) · Aerosol reference wavelength
9	ReferencedData	Stores the following mainly as information on data referenced during retrieval. · Various a priori values
10	RetrievalConfigurtion_FP	Stores information related to the retrieval settings using the full-physics method.
11	RetrievalResult_FP	Stores the following mainly as information related to the retrieval results from the full-physics method. · Retrieved value of XCO₂ · Retrieved value of XCH₄ (full-physics method) · Retrieved value of XH₂O
12	RetrievalResult_PR	Stores the following mainly as information related to the retrieval results from the proxy method. · Retrieved value of XCH₄ (proxy method)
13	Corrected_SIF	Stores the following mainly as information related to the retrieval results. · Retrieved value of corrected SIF
14	RetrievalConfigurtion_SIF	Stores information related to the SIF retrieval settings.
15	RetrievalResult_SIF	Stores the following mainly as information related to the SIF retrieval results. · Retrieved value of SIF under clear-sky and aerosol-free conditions
16	RetrievalConfigurtion_Ps	Stores information related to the surface pressure retrieval settings.
17	RetrievalResult_Ps	Stores the following mainly as information related to the surface pressure retrieval results. · Retrieved value of surface pressure under clear-sky and aerosol-free conditions
18	RetrievalConfigurtion_PR_CO2	Stores information related to the retrieval settings using the proxy method.
19	RetrievalResult_PR_CO2	Stores the following mainly as information related to the retrieval results using the proxy method. · Retrieved value of XCO₂ under clear-sky and aerosol-free conditions
20	RetrievalConfigurtion_PR_CH4	Stores information related to the retrieval settings using the proxy method.

Table 3-1 Product dataset structure (3/3)

No.	Storage location	Main contents
21	RetrievalResult_PR_CH4	Stores the following mainly as information related to the retrieval results using the proxy method. · Retrieved value of XCH ₄ under clear-sky and aerosol-free conditions
22	MainResult	Stores the following mainly as information related to retrieval results. · Estimated values of XCO ₂ , XCH ₄ , and XH ₂ O by the full-physics method · Estimated value of XCH ₄ by the proxy method · Estimated value of corrected SIF
23	Dimension	Stores a one-dimensional array dataset of the same size as each dimension of each dataset, and also stores a scalar value of the number of array elements. The dataset is stored directly under the root group.

- Each group from No. 15, 17, 19, and 21 corresponds to an independent derivation process. Note that since each derivation process is performed under clear-sky and aerosol-free conditions, the derivation results include the effects of clouds and aerosols.
- Note that the variables set in the Dimension size of the dataset in each path are those defined by the dimension. (Some dimensions may have different information stored even if they have the same name as the dataset.)

Special notes for groups are shown below.

(1) RetrievalResult_FP

xco2_fp, xch4_fp, and xh2o_fp under RetrievalResult_FP are the derived column-averaged dry-air mole fractions. Since these datasets may contain low-quality case data or invalid values, refer to their respective quality flags (*_qualityFlag_fp).

In the L2 processing, the partial column-averaged dry-air mole fraction for each layer is treated as a state vector element, not the gas concentration at the boundary layer. Therefore, the following formula is used when calculating the column-averaged dry-air mole fraction from the vertical profiles of gas concentrations obtained from observations or models.

Letting $C_{user,i}$ be the average concentration of the target gas in the i -th layer of N vertical layers, $C_{apr,i}$ be the a priori value of the average gas concentration, a_i be the element of the column averaging kernel, and h_i be the pressure weighting function, the column-averaged concentration is obtained from the following.

$$X_{gas} = \sum_{i=1}^N \{ [C_{user,i} + (C_{user,i} - C_{apr,i})a_i] h_i \}$$

The i -th layer is the layer defined by the i -th and $(i+1)$ -th boundary pressures included in the product.

(2) RetrievalResult_PR

xch4_proxy under RetrievalResult_PR is the ratio of xch4_pr_ch4 under RetrievalResult_PR_CH4 to xco2_pr_co2 under RetrievalResult_PR_CO2, multiplied by xco2_model under RetrievalResult_PR.

Since the dataset contains low-quality case data and invalid values, refer to the quality flag (xch4_qualityFlag_proxy).

(3) Corrected_SIF

sif755_corrected under Corrected_SIF is obtained by correcting sif_raw_sif under RetrievalResult_SIF and converting it to Solar-induced chlorophyll fluorescence (SIF). Since it contains low-quality data and invalid values, refer to the quality flag (sif755_qualityFlag_corrected).

(4) RetrievalResult_Ps, RetrievalResult_PR_CO2, RetrievalResult_PR_CH4

The results of each derivation process are stored under the datasets above. Note that these results are estimated under clear-sky and aerosol-free conditions and include effects from optical path length fluctuations.

3.2. Definition of Stored Data Types

The definitions of the data types for the stored data in the L2 Product (GHG) are shown in Table 3-2.

Table 3-2 Data type definition

HDF5 Datatype	Definition
H5T_STRING	String with a length of 1 byte or more
H5T_STD_I8LE	Signed 1-byte integer (-128 to 127)
H5T_STD_I16LE	Signed 2-byte integer (-32768 to 32767)
H5T_STD_I32LE	Signed 4-byte integer (-2147483648 to 2147483647)
H5T_IEEE_F32LE	4-byte floating-point number (7 significant decimal digits. Max absolute value: 3.402823e+38, Min absolute value greater than 0: 1.175494e-38)
H5T_IEEE_F64LE	8-byte floating-point number 15 significant decimal digits. Max absolute value: 1.797693e+308, Min absolute value greater than 0: 2.225074e-308)

* The definitions in Table 3-2 are valid for HDF5 library version 1.12 or higher.

3.3. Product format details

Tables 3-3_1 to 3-3_23 show the product format details.

Table 3-3_1 Level 2 Product Global Attribute

No.	Attribute Name	Data Type	Name	Explanation
1	Conventions	H5T_STRING	Convention	CF Convention.Stores the version of ACDD. "CF-1.7, ACDD-1.3" (Fixed)
2	title	H5T_STRING	Product name	Stores the product name with the following value. "GOSAT-GW/TANSO-3 L2 (GHG)" (Fixed)
3	institution	H5T_STRING	Organization name	Sets the name of the organization that created the product. "National Institute for Environmental Studies (NIES)" (Fixed)
4	project	H5T_STRING	Project name	Describes the name of the project that created the product. "NIES GOSAT-GW Project" (Fixed)
5	summary	H5T_STRING	Summary	Describes the summary of the file.
6	license	H5T_STRING	Data rights	Stores the data rights, terms of use, or the URL of the website where they are posted.
7	creator_name	H5T_STRING	Product creation organization	Describes the name of the entity that created the product. "National Institute for Environmental Studies (NIES)" (Fixed)
8	creator_type	H5T_STRING	Organization type	Stores the type of the entity that created the product. "institution" (Fixed)
9	creator_email	H5T_STRING	Creation organization contact email	Stores the contact email of the entity that created the product.
10	creator_url	H5T_STRING	Creating organization website	Stores the URL of the website where information about the entity that created the product can be accessed.
11	keywords	H5T_STRING	Keywords	Stores keywords representing the file content, separated by commas.
12	standard_names_vocabulary	H5T_STRING	Vocabulary citing standard_name	Stores the name and version of the vocabulary citing standard_name. "CF Standard Name Table (v49, 12 February 2018)" (Fixed)
13	id	H5T_STRING	Product ID	Stores the granule ID.
14	naming_authority	H5T_STRING	Organization name	Stores the name of the organization providing the product in a format with the DNS name reversed.
15	source	H5T_STRING	Data generation method	Stores the version of the algorithm theoretical basis document as the method used to generate the data.
16	processing_level	H5T_STRING	Processing level	Stores the processing level in the following format. "Level2" (Fixed)
17	comment	H5T_STRING	Comment	Stores comments not included in other attributes.
18	date_created	H5T_STRING	Creation date/time	Stores the file creation date and time (UTC) in the format "YYYY-MM-DDThh:mm:ssZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) Z: "Z" (Fixed)

Table 3-3_1 Level 2 Product Global Attribute

No.	Attribute Name	Data Type	Name	Explanation
19	time_coverage_start	HST_STRING	Observation start date/time	Stores the observation date and time of the start of the data in the format "YYYY-MM-DDThh:mm:ss.uuuZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) uuu: 000 to 999 (Millisecond) Z: "Z" (Fixed)
20	time_coverage_end	HST_STRING	Observation end date/time	Stores the observation date and time of the end of the data in the format "YYYY-MM-DDThh:mm:ss.uuuZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) uuu: 000 to 999 (Millisecond) Z: "Z" (Fixed)
21	geospatial_lat_min	HST_IEEE_F32LE	Northernmost latitude of observation range	Stores the latitude of the northernmost pixel center in the range of -90.0 to 90.0.
22	geospatial_lat_max	HST_IEEE_F32LE	Southernmost latitude of observation range	Stores the latitude of the southernmost pixel center in the range of -90.0 to 90.0.
23	geospatial_lon_min	HST_IEEE_F32LE	Westernmost longitude of observation range	Stores the longitude of the westernmost pixel center in the range of -180.0 to 180.0.
24	geospatial_lon_max	HST_IEEE_F32LE	Easternmost longitude of observation range	Stores the longitude of the easternmost pixel center in the range of -180.0 to 180.0.
25	geospatial_vertical_min	HST_IEEE_F32LE	Minimum altitude of observation range	Stores the minimum altitude of the data in the range of 0 to 6000.
26	geospatial_vertical_max	HST_IEEE_F32LE	Maximum altitude of observation range	Stores the maximum altitude of the data in the range of 0 to 6000.
27	geospatial_vertical_positive	HST_STRING	Vertical direction value interpretation, Altitude/Depth identification	Stores the identification for altitude/depth. "up" (Fixed)
28	language	HST_STRING	Language	Stores the language used. "en" (Fixed)
29	topicCategory	HST_STRING	Category code	Stores the optimal discipline code from the ISO 19115 topic category code table (see Section 8.8), separated by commas. "004,007" (Climatology, Oceans: Fixed)
30	Role	HST_STRING	Role code	Stores the ISO 19115 role code. "003" (Owner of information: Fixed)
31	history	HST_STRING	File revision history	Stores the file revision history with one record per line for each modification.
32	characterSet	HST_STRING	Character code	Stores the corresponding code from the ISO-19115 character code table. "004" (UTF-8: Fixed)
33	acknowledgement	HST_STRING	Project supplementary information	Stores supplementary information about the project.
34	publisher_name	HST_STRING	Name of responsible person	Stores the name of the person responsible for data publication.
35	publisher_email	HST_STRING	Responsible person email address	Stores the contact email address of the person responsible for data publication.
36	publisher_url	HST_STRING	Responsible person website URL	Stores the URL of the website of the person responsible for data publication.

Table 3-3_1 Level 2 Product Global Attribute

No.	Attribute Name	Data Type	Name	Explanation
37	decimationFlag	HST_STD_I8LE	Decimation method flag	Stores the decimation method used during data processing. Value: (To be described once determined)
38	ProcessingRatio	HST_IEEE_F32LE	Data processing rate	Stores the percentage of data that was processed without being decimated.

Table 3-3_2 Level 2 Product Metadata Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute					
			Rank	Size				unit	validRange		invalid Value	description	
									Min	Max			
1	G	/Metadata											
2		granuleID	0	scalar	H5T_STRING	Granule ID	Stores the ID that uniquely identifies the observation.	N/A	N/A	N/A	N/A	File identifier of the product	
3		satelliteName	0	scalar	H5T_STRING	Satellite name	Stores the satellite name. "GOSAT-GW" (Fixed)	N/A	N/A	N/A	N/A	Satellite name: "GOSAT-GW" - Global Observing SATellite for Greenhouse gases and Water cycle (Fixed)	
4		sensorName	0	scalar	H5T_STRING	Sensor name	Stores the sensor name. "TANSO-3" (Fixed)	N/A	N/A	N/A	N/A	Sensor name: "TANSO-3" - Total Anthropogenic and Natural emissions mapping SpectrOmeter-3 (Fixed)	
5		processingLevel	0	scalar	H5T_STRING	Processing level	Stores the processing level. "Level2" (Fixed)	N/A	N/A	N/A	N/A	Processing level: "Level2" (Fixed)	
6		gasType	0	scalar	H5T_STRING	Gas type	Stores the gas type. "GHG" (Fixed)	N/A	N/A	N/A	N/A	Gas type: "GHG" - Greenhouse Gases (Fixed)	
7		operationMode	0	scalar	H5T_STRING	Operation mode	Stores the operation mode in the following format. "xyyz" xx: Observation/Calibration mode yy: Imaging mode/Resolution z: Wavelength binning state	N/A	N/A	N/A	N/A	Operation mode of TANSO-3	
8		processingClassification	0	scalar	H5T_STRING	Processing category	Stores the processing category with the following value. V: Standard processing, Reprocessing T: Test processing	N/A	N/A	N/A	N/A	Product processing classification	
9		productionDateTime	0	scalar	H5T_STRING	Product creation date/time (UTC)	Stores the product creation date/time (UTC) in the following format. "YYYY-MM-DDThh:mm:ssZ" YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) Z: "Z" (Fixed)	N/A	N/A	N/A	"-"	Date and time product created	
10		programVersion	0	scalar	H5T_STRING	Program version	Stores the program version.	N/A	N/A	N/A	N/A	Version of processing program	
11		productVersion	0	scalar	H5T_STRING	Product Version	Stores the product version.	N/A	N/A	N/A	N/A	Version of output product	
12		inputDataVersion	0	scalar	H5T_STRING	Input dataset version	Stores the input dataset version.	N/A	N/A	N/A	N/A	Version of input data list	
13		band	0	scalar	H5T_STD_I8LE	Number of bands	Stores the number of bands. "3" (Fixed)	N/A	3	3	N/A	Number of TANSO-3 bands: "3" (Fixed)	
14		geodeticDatum	0	scalar	H5T_STRING	Geodetic datum	Stores the ellipsoid model/reference coordinate system. "WGS84 / WGS84" (Fixed)	N/A	N/A	N/A	N/A	Reference ellipsoid model/frame of reference: "WGS84/ WGS84" (Fixed)	

Table 3-3_3 Level 2 Product LibproductfileInfo Group Details

No.	Group	Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
									Min	Max		
1	G	/L1bproductfileInfo										
2		numL1bfile		scalar	H5T_STD_I8LE	Number of L1B product files	Stores the number of L1B product files used for creation.	N/A	0	99	-128	Number of L1B product file
3		observationStartDateTime		numL1bfile	H5T_STRING	Observation start time	Stores the observation date and time of the start frame of the L1B product used for creation in the format "YYYY-MM- DDThh:mm:ss.uuuZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) uuu: 000 to 999 (Millisecond) Z: "Z" (Fixed)	UTC	N/A	N/A	"-"	Observation start date and time for each L1B product file
4		observationEndDateTime		numL1bfile	H5T_STRING	Observation end time	Stores the observation date and time of the start frame of the L1B product used for creation in the format "YYYY-MM- DDThh:mm:ss.uuuZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) uuu: 000 to 999 (Millisecond) Z: "Z" (Fixed)	UTC	N/A	N/A	"-"	Observation end date and time for each L1B product file
5		observationRequestID		numL1bfile	H5T_STRING	Observation request ID	Stores the observation request ID.	N/A	N/A	N/A	"-"	Observation request ID
6		level1BgranuleID		numL1bfile	H5T_STRING	L1B product granule ID	Stores the granule ID of the L1B product used for creation.	N/A	N/A	N/A	"-"	Granule ID of L1B product

* If numL1bfile is "-128", the following datasets are not created.
observationStartDateTime、observationEndDateTime、observationRequestID、level1BgranuleID

Table 3-3_4 Level 2 Product Soundinginfo Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
				Min	Max							
1	G	/SoundingInfo										
2		sounding	0	scalar	H5T_STD_I16LE	Number of observation IDs	Stores the number of observation IDs included in the product.	N/A	0	9,999	-999	Number of observation ID in the product file
3		obsID	1	numSounding	H5T_STD_U16LE	Observation ID	Stores the observation ID (1 to 65533).	N/A	N/A	N/A	N/A	Observation ID
4		numFrameSounding	1	numSounding	H5T_STD_I16LE	Number of frames	Stores the number of frames included in the observation ID.	N/A	0	9,999	-999	Number of frames in the Observation ID
5		planStartDateTime	1	numSounding	H5T_STRING	Observation start time in the observation plan	Stores the observation start time of each observation ID in the observation plan in the format "YYYY-MM-DDThh:mm:ss.ffffffZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) ffffff: 000000 to 999999 (Microsecond) Z: "Z" (Fixed)	UTC	N/A	N/A	"-"	Planned observation start date and time for each scene
6		planEndDateTime	1	numSounding	H5T_STRING	Observation end time in the observation plan	Stores the observation end time of each observation ID in the observation plan in the format "YYYY-MM-DDThh:mm:ss.ffffffZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) ffffff: 000000 to 999999 (Microsecond) Z: "Z" (Fixed)	UTC	N/A	N/A	"-"	Planned observation end date and time for each scene

* If sounding is "-999", the following datasets are not created.
obsID, frameNum, planStartDateTime, planEndDateTime

Table 3-3_5 Level 2 Product Frameinfo Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
									Min	Max		
1	G	/FrameInfo										
2		frame	1	numBand	H5T_STD_I32LE	Number of frames	Stores the number of frames included in the product file.	N/A	0	99,999	-999	Number of frames in the product file
3		frameID	1	numFrame	H5T_STRING	Frame ID	Stores the frame ID. Numbered starting from 0001 in chronological order of observation time for each L1B product unit used for creation.	N/A	N/A	N/A	N/A	Frame ID, Numbering from 0001 for each L1B product for each L1B product
4		obsID	1	numFrame	H5T_STD_U16LE	Observation ID	Stores the observation ID (1 to 65533).	N/A	N/A	N/A	N/A	Observation ID
5		angleAT	1	numFrame	H5T_IEEE_F32LE	Field-of-view direction AT angle	Stores the field-of-view direction AT angle in the following range. -180 < angleAT ≤ 180	degree	-180.0	180.0	-999.0	Along-track angle: -180 < angleAT ≤ 180
6		angleCT	1	numFrame	H5T_IEEE_F32LE	Field-of-view direction CT angle	Stores the field-of-view CT angle in the following range. -180 < angleCT ≤ 180	degree	-180.0	180.0	-999.0	Cross-track angle: -180 < angleAT ≤ 180
7		yawSteeringFlag	1	numFrame	H5T_STD_I8LE	Yaw steering flag	Stores the yaw steering state for each frame with the following value. 0: OFF 1: ON	N/A	0	1	-128	Whether yaw-steering mode is operated for each frame: 0: off 1: on

* If frame is "-999", the following datasets are not created.
frameID、obsID、angleAT、angleCT、yawSteeringFlag

Table 3-3_6 Level 2 Product Pixelinfo Group Details

No.	Group	Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute					
			Rank	Size				unit	validRange		invalid Value	description	
									Min	Max			
1	G	/PixelInfo											
2		pixel	0	scalar	H5T_STD_I32LE	Number of spatial divisions	Stores the number of spatial pixels included in the product.	N/A	0	9,999,999	-999	Number of spatial pixels in the product file	
3		pixelID	1	numPixel	H5T_STRING	Spatial division ID	Stores the spatial pixel ID.	N/A	N/A	N/A	"-"	Pixel ID	
4		obsTime	1	numPixel	H5T_STRING	Observation time	Stores the observation time of each spatial pixel in the format "YYYY-MM-DDThh:mm:ss.ffffffZ". YYYY: Year MM: 01 to 12 (Month) DD: 01 to 31 (Day) T: "T" (Fixed) hh: 00 to 23 (Hour) mm: 00 to 59 (Minute) ss: 00 to 60 (Second) ffffff: 000000 to 999999 (Microsecond) Z: "Z" (Fixed)	N/A	N/A	N/A	"-"	Observation time for each pixel	
5		latitude	1	numPixel	H5T_IEEE_F32LE	Latitude	Stores the center latitude of the spatial pixel in the following range. -90 S 1 atitude S 90	degree	-90.0	90.0	-999.0	Latitude at pixel center: -90 ≧ latitude ≦ 90	
6		latitudePixelBounds	2	numPixel, numNcorner	H5T_IEEE_F32LE	Latitude per division (four corners of the division)	Stores the latitude of the four corners of the spatial pixel in the following range. -90 S 1 atitude S 90	degree	-90.0	90.0	-999.0	Latitude at pixel bounds: -90 ≧ latitude ≦ 90	
7		longitude	1	numPixel	H5T_IEEE_F32LE	Longitude	Stores the center longitude of the spatial pixel in the following range. -180 < l ongitude S 180	degree	-180.0	180.0	-999.0	Longitude at pixel center: -180 < longitude <= 180	
8		longitudePixelBounds	2	numPixel, numNcorner	H5T_IEEE_F32LE	Longitude per division (four corners of the division)	Stores the longitude of the four corners of the spatial pixel in the following range. -90 S 1 atitude S 90	degree	-180.0	180.0	-999.0	Longitude at pixel bounds: -180 < longitude <= 180	
9		height	1	numPixel	H5T_IEEE_F32LE	Altitude	Stores the average altitude within the spatial pixel.	m	-500.0	9,999.0	-999.0	Mean altitude within each pixel	
10		heightStandardDeviation	1	numPixel	H5T_IEEE_F32LE	Standard deviation of altitude	Stores the standard deviation of altitude within the spatial pixel.	m	0	N/A	-999.0	Standard deviation of altitude within each pixel	
11		landwaterFlag	1	numPixel	H5T_STD_I8LE	Land/Water flag	Stores the land/water flag with the following value. 0: Land 1: Water 2: Mixed	N/A	0	2	-128	Surface type within pixel: 0: land surface 1: water surface 2: mixed	
12		landFraction	1	numPixel	H5T_IEEE_F32LE	Land fraction	Stores the percentage of land area within the pixel.	%	0.0	100.0	-999.0	Land coverage within each pixel	
13		solarZenith	1	numPixel	H5T_IEEE_F32LE	Solar zenith angle	Stores the solar zenith angle at the observation point in the following range. 0 S solarZenith S 180	degree	0.0	180.0	-999.0	Solar zenith angle at observation point: 0 <= solarZenith <= 180	
14		solarAzimuth	1	numPixel	H5T_IEEE_F32LE	Solar azimuth angle	Stores the solar azimuth angle at the observation point in the following range. 0 S solarAzimuth < 360	degree	0.0	360.0	-999.0	Solar azimuth angle at observation point: 0 <= solarAzimuth < 360	
15		viewZenith	1	numPixel	H5T_IEEE_F32LE	Satellite zenith angle	Stores the satellite zenith angle at the observation point in the following range. 0 S viewZenith S 180	degree	0.0	180.0	-999.0	Satellite zenith angle at observation point: 0 <= viewZenith <= 180	
16		viewAzimuth	1	numPixel	H5T_IEEE_F32LE	Satellite azimuth angle	Stores the satellite azimuth angle at the observation point in the following range. 0 S viewAzimuth < 360	degree	0.0	360.0	-999.0	Satellite azimuth angle at observation point: 0 <= viewAzimuth < 360	
17		sunlintFlag	1	numPixel	H5T_STD_I8LE	Sunglint flag	Stores the state of whether the observation point is in a sunglint area with the following value. No distinction is made between land and water. 0: Not sunglint 1: Sunglint -128: Undeterminable (missing data, etc.)	N/A	0	1	-128	Flag whether observation point is sunglint observation or not: 0: not sunglint 1: sunglint 2: undecidable	

Table 3-3_6 Level 2 Product Pixelinfo Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
18		specularViewVectorAngle	1	numPixel	H5T_IEEE_F32LE	Angle between specular reflection and line-of-sight	Stores the angle between the specular reflection vector and the line-of-sight vector at the time of observation in the following range. 0 S specularViewVectorAngle < 180	degree	0.0	180.0	-999.0	Angle between specular reflection vector and view vector: 0 <= specularViewVectorAngle < 180
19		solarDistance	1	numPixel	H5T_IEEE_F64LE	Solar distance	Stores the distance between the sun and the observation point at the time of observation.	AU	N/A	N/A	-999.0	Distance from sun to observation point
20		spcQualityFlag	2	numPixel, numBand	H5T_STD_I8LE	Saturation/Missing flag for each spatial division and band	Stores a flag indicating whether there are saturated, missing, or defective pixels in the wavelength range used, with the following value. 0: None 1: Saturation only 2: Missing only 3: Defective only 4: Saturation and missing 5: Saturation and defective 6: Missing and defective 7: Saturation, missing, and defective 8: Undeterminable (not used, etc.)	N/A	0	8	-128	Flag whether saturated, missing, or defective pixel are contained in the wavelength range used in the processing: 0: None 1: Saturation only 2: Missing only 3: Defective only 4: Saturation and missing 5: Saturation and defective 6: Missing and defective 7: Saturation, missing, and defective 8: Undeterminable (not used, etc.)
21		snr	2	numPixel, numBand	H5T_IEEE_F64LE	SNR	Stores the SNR estimated for each band.	N/A	N/A	N/A	-999.0	SNR for each band
22		refTestResult	1	numPixel	H5T_STD_I8LE	Reflectance test result storage flag	Stores the state of whether the processing result of the reflectance test is stored, with the following value. 0: No result 1: Result present	N/A	0	1	-128	Whether a result of reflectance test is stored: 0: No result 1: Result present
23		proxyResult	1	numPixel	H5T_STD_I8LE	Proxy result storage flag	Stores the state of whether the processing result of the proxy method (including SIF) is stored, with the following value. 0: No result 1: Result present	N/A	0	1	-128	Whether a result of SIF/proxy retrieval is stored: 0: No result 1: Result present
24		FPResult	1	numPixel	H5T_STD_I8LE	FP result storage flag	Stores the state of whether the processing result of the full-physics method is stored, with the following value. 0: No result 1: Result present	N/A	0	1	-128	Whether a result of full physics retrieval is stored: 0: No result 1: Result present

* If pixel is "-999", the following datasets are not created.

pixelID、obsTime、latitude、latitudePixelBounds、longitude、longitudePixelBounds、height、heightStandardDeviation、landwaterFlag、landFraction、solarZenith、solarAzimuth、viewZenith、viewAzimuth、sunglintFlag、specularViewVectorAngle、solarDistance、spcQualityFlag、snr、refTestResult、proxyResult、FPResult

Table 3-3_7 Level 2 Product CloudScreening Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/CloudScreening										
2		surfaceReflectance_B1	1	numPixel	H5T_IEEE_F32LE	Estimated reflectance (Band1)	Stores the surface reflectance of Band1 estimated by the reflectance test.	N/A	N/A	N/A	-999.0	Estimated surface reflectance in Band1
3		refSurfaceReflectance_B1	1	numPixel	H5T_IEEE_F32LE	Reference reflectance (Band1)	Stores the surface reflectance of Band1 based on reference data.	N/A	N/A	N/A	-999.0	Surface reflectance in Band1 from reference data
4		surfaceReflectance_B2	1	numPixel	H5T_IEEE_F32LE	Estimated reflectance (Band2)	Stores the surface reflectance of Band2 estimated by the reflectance test.	N/A	N/A	N/A	-999.0	Estimated surface reflectance in Band2
5		refSurfaceReflectance_B2	1	numPixel	H5T_IEEE_F32LE	Reference reflectance (Band2)	Stores the surface reflectance of Band2 based on reference data.	N/A	N/A	N/A	-999.0	Surface reflectance in Band2 from reference data
6		surfaceReflectance_B3	1	numPixel	H5T_IEEE_F32LE	Estimated reflectance (Band3)	Stores the surface reflectance of Band3 estimated by the reflectance test.	N/A	N/A	N/A	-999.0	Estimated surface reflectance in Band3
7		refSurfaceReflectance_B3	1	numPixel	H5T_IEEE_F32LE	Reference reflectance (Band3)	Stores the surface reflectance of Band3 based on reference data.	N/A	N/A	N/A	-999.0	Surface reflectance in Band3 from reference data
8		cloudFlag_reflectanceTest	1	numPixel	H5T_STD_I8LE	Reflectance cloud flag	Stores the cloud flag from the reflectance test with the following value. 0: Cloudy 1: Clear	N/A	0	1	-128	Cloud flag by reflectance test: 0: clouds are detected 1: clouds are not detected
9		cloudFlag_surfacePressure	1	numPixel	H5T_STD_I8LE	Ps cloud flag	Stores the cloud flag based on surface pressure with the following value. 0: Cloudy 1: Clear	N/A	0	1	-128	Cloud flag by surface pressure cloud screening: 0: clouds are detected 1: clouds are not detected

Table 3-3_8 Level 2 Product RetrievalCommonInfo Group Details

No.	diag	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
				Min	Max							
1	G	/Retrieval Commoninfo										
2		numLayer	0	scalar	H5T_STD_I8LE	Number of retrieval layers	Stores the number of vertical layers. "15" (Fixed)	N/A	15	15	-128	Number of vertical layers: "15" (fixed)
3		numAerType	0	scalar	H5T_STD_I8LE	Number of aerosol particle types	Stores the number of aerosol particle types. "2" (Fixed)	N/A	2	2	-128	Number of aerosol particle types (large and small): "2" (fixed)
4		aerWavelengthRef	0	scalar	H5T_IEEE_F32LE	Aerosol reference wavelength	Stores the reference wavelength for aerosol optical properties.	nm	N/A	N/A	-999.0	Reference wavelength for aerosol optical properties

Table 3-3_9 Level 2 Product ReferencedData Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
				Min	Max							
1	G	/ReferencedData										
2		pressureLevel_apriori	2	numPixel, numLayer+1	H5T_IEEE_F32LE	A priori boundary layer pressure	Stores the pressure at the layer boundary from the reference data (lower end = Ps).	hPa	N/A	N/A	-999.0	Vertical pressure grid from reference data
3		pressureWeightingFunction_apriori	2	numPixel, numLayer	H5T_IEEE_F32LE	A priori pressure weighting function	Stores the pressure weighting function for the reference data.	N/A	N/A	N/A	-999.0	Pressure weighting function from reference data
4		temperature_apriori	2	numPixel, numLayer	H5T_IEEE_F32LE	A priori temperature value	Stores the a priori value of the temperature profile.	K	N/A	N/A	-999.0	A priori value of temperature profile
5		dryAirColumn_apriori	1	numPixel	H5T_IEEE_F32LE	Dry air column	Stores the a priori value of the dry air column.	molecule/cm^2	N/A	N/A	-999.0	A priori value of vertical column of dry air
6		xco2_apriori	1	numPixel	H5T_IEEE_F32LE	A priori value of XCO2	Stores the a priori value of XCO2.	ppm	N/A	N/A	-999.0	A priori value of XCO2
7		xch4_apriori	1	numPixel	H5T_IEEE_F32LE	A priori value of XCH4	Stores the a priori value of XCH4.	ppm	N/A	N/A	-999.0	A priori value of XCH4
8		xh2o_apriori	1	numPixel	H5T_IEEE_F32LE	A priori value of XH2O	Stores the a priori value of XH2O.	ppm	N/A	N/A	-999.0	A priori value of XH2O
9		co2_apriori	2	numPixel, numLayer	H5T_IEEE_F32LE	A priori value of CO2 profile	Stores the a priori value of the CO2 profile.	ppm	N/A	N/A	-999.0	A priori value of CO2 profile
10		ch4_apriori	2	numPixel, numLayer	H5T_IEEE_F32LE	A priori value of CH4 profile	Stores the a priori value of the CH4 profile.	ppm	N/A	N/A	-999.0	A priori value of CH4 profile
11		h2o_apriori	2	numPixel, numLayer	H5T_IEEE_F32LE	A priori value of H2O profile	Stores the a priori value of the H2O profile.	ppm	N/A	N/A	-999.0	A priori value of H2O profile
12		aot_apriori	2	numPixel, numAerType	H5T_IEEE_F32LE	A priori value of aerosol optical thickness	Stores the a priori value of the aerosol optical thickness at the reference wavelength.	N/A	N/A	N/A	-999.0	A priori value of aerosol optical thickness at reference wavelength
13		aerosolPeakHeight_apriori	2	numPixel, numAerType	H5T_IEEE_F32LE	A priori value of aerosol peak altitude	Stores the a priori value of the peak altitude of the aerosol optical thickness assuming the Gaussian distribution.	hPa	N/A	N/A	-999.0	A priori value of aerosol peak height
14		surfacePressure_apriori	1	numPixel	H5T_IEEE_F32LE	A priori value of surface pressure	Stores the a priori value of the surface pressure.	hPa	N/A	N/A	-999.0	A priori value of surface pressure

Table 3-3-10 Level 2 Product RetrievalConfiguration_FP Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
									Min	Max		
1	G	/RetrievalConfiguration_FP										
2		numSubBand_fp	0	scalar	H5T_STD_I8LE	Number of sub-bands	Stores the number of sub-bands.	N/A	N/A	N/A	-128	Number of sub-bands for full physics retrieval
3		numWavelengthAlbedoMax_fp	0	scalar	H5T_STD_I8LE	Maximum number of albedo points	Stores the maximum number of wavelength points where albedo was estimated.	N/A	N/A	N/A	-128	Maximum number of wavelength points for albedo for full physics retrieval
4		numWavelengthAlbedo_fp	1	numSubBand_fp	H5T_STD_I8LE	Number of albedo points	Stores the number of wavelength points where albedo was estimated.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for full physics retrieval
5		wavelengthAlbedo_fp	2	numWavelengthAlbedoMax_fp, numSubBand_fp	H5T_IEEE_F32LE	Albedo wavelength points	Stores the wavelength points where albedo was estimated.	nm	N/A	N/A	-999.0	Wavelength points for albedo for full physics retrieval
6		temperatureShift_apriori_fp	0	scalar	H5T_IEEE_F32LE	A priori value of temperature shift	Stores the a priori value of the simultaneously estimated temperature shift.	K	N/A	N/A	-999.0	A priori value of temperature shift for full physics retrieval
7		sif755_apriori_fp	0	scalar	H5T_IEEE_F32LE	A priori value of SIF (reference wavelength)	Stores the a priori value of the simultaneously estimated chlorophyll fluorescence at the reference wavelength.	W/m^2/sr/micron	N/A	N/A	-999.0	A priori value of SIF at the reference wavelength for full physics retrieval
8		sifSlope_apriori_fp	0	scalar	H5T_IEEE_F32LE	A priori value of SIF slope	Stores the a priori value of the slope for the wavenumber of the simultaneously estimated chlorophyll fluorescence.	N/A	N/A	N/A	-999.0	A priori value of fluorescence slope for full physics retrieval
9		wavelengthStretch_apriori_fp	1	numSubBand_fp	H5T_IEEE_F32LE	A priori value of wavelength stretch factor	Stores the a priori value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	A priori value of wavelength stretch factor for full physics retrieval

Table 3-3-11 Level 2 Product RetrievalResult_FP Group Details

No.	diag	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute					
			Rank	Size				unit	validRange		invalid Value	description	
		Min			Max								
1	G	/RetrievalResult_FP											
2		xco2_fp	1	numPixel	H5T_IEEE_F32LE	XCO2	Stores the derived value of XCO2.	ppm	N/A	N/A	-999.0	Retrieved XCO2 from full physics retrieval	
3		xco2_apriori_fp	1	numPixel	H5T_IEEE_F32LE	A priori value of XCO2	Stores the a priori value of XCO2.	ppm	N/A	N/A	-999.0	A priori value of XCO2 for full physics retrieval	
4		xco2_uncert_fp	1	numPixel	H5T_IEEE_F32LE	XCO2 uncertainty	Stores the uncertainty of XCO2.	ppm	N/A	N/A	-999.0	Uncertainty of XCO2 from full physics retrieval	
5		xco2_dfs_fp	1	numPixel	H5T_IEEE_F32LE	XCO2 DOFS	Stores the degree of freedom for signal for XCO2.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for XCO2 from full physics retrieval	
6		xco2_columnAveragingKernel_fp	2	numPixel, numLayer	H5T_IEEE_F32LE	XCO2 column averaging kernel	Stores the column averaging kernel for XCO2.	N/A	N/A	N/A	-999.0	Column averaging kernel of XCO2 from full physics retrieval	
7		xco2_qualityFlag_fp	1	numPixel	H5T_STD_I8LE	Quality flag for XCO2	Stores the quality flag for XCO2 with the following values. 0: Good 1: Fair 2: Poor 3: NGNG	N/A	0	3	-1	Quality flag for XCO2 from full physics retrieval: 0: Good 1: Fair 2: Poor 3: NG	
8		xco2_biasCorrected_fp	1	numPixel	H5T_IEEE_F32LE	XCO2 (after bias correction)	Stores the derived value of XCO2 (after bias correction).	ppm	N/A	N/A	-999.0	bias-corrected XCO2 from full physics retrieval	
9		xch4_fp	1	numPixel	H5T_IEEE_F32LE	XCH4	Stores the derived value of XCH4.	ppm	N/A	N/A	-999.0	Retrieved XCH4 from full physics retrieval	
10		xch4_apriori_fp	1	numPixel	H5T_IEEE_F32LE	A priori value of XCH4	Stores the a priori value of XCH4.	ppm	N/A	N/A	-999.0	A priori value of XCH4 for full physics retrieval	
11		xch4_uncert_fp	1	numPixel	H5T_IEEE_F32LE	XCH4 uncertainty	Stores the uncertainty of XCH4.	ppm	N/A	N/A	-999.0	Uncertainty of XCH4 from full physics retrieval	
12		xch4_dfs_fp	1	numPixel	H5T_IEEE_F32LE	XCH4 DOFS	Stores the degree of freedom for signal for XCH4.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for XCH4 from full physics retrieval	
13		xch4_columnAveragingKernel_fp	2	numPixel, numLayer	H5T_IEEE_F32LE	XCH4 column averaging kernel	Stores the column averaging kernel for XCH4.	N/A	N/A	N/A	-999.0	Column averaging kernel of XCH4 from full physics retrieval	
14		xch4_qualityFlag_fp	1	numPixel	H5T_STD_I8LE	Quality flag for XCH4	Stores the quality flag for XCH4 with the following values. 0: Good 1: Fair 2: Poor 3: NGNG	N/A	0	3	-1	Quality flag for XCH4 from full physics retrieval: 0: Good 1: Fair 2: Poor 3: NG	
15		xch4_biasCorrected_fp	1	numPixel	H5T_IEEE_F32LE	XCH4 (after bias correction)	Stores the derived value of XCH4 (after bias correction).	ppm	N/A	N/A	-999.0	bias-corrected XCH4 from full physics retrieval	
16		xh2o_fp	1	numPixel	H5T_IEEE_F32LE	XH2O	Stores the derived value of XH2O.	ppm	N/A	N/A	-999.0	Retrieved XH2O from full physics retrieval	
17		xh2o_apriori_fp	1	numPixel	H5T_IEEE_F32LE	A priori value of XH2O	Stores the a priori value of XH2O.	ppm	N/A	N/A	-999.0	A priori value of XH2O for full physics retrieval	
18		xh2o_uncert_fp	1	numPixel	H5T_IEEE_F32LE	XH2O uncertainty	Stores the uncertainty of XH2O.	ppm	N/A	N/A	-999.0	Uncertainty of XH2O from full physics retrieval	
19		xh2o_dfs_fp	1	numPixel	H5T_IEEE_F32LE	XH2O DOFS	Stores the degree of freedom for signal for XH2O.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for XH2O from full physics retrieval	
20		xh2o_qualityFlag_fp	1	numPixel	H5T_STD_I8LE	Quality flag for XH2O	Stores the quality flag for XH2O with the following values. 0: Good 1: Fair 2: Poor 3: NGNG	N/A	0	3	-1	Quality flag for XH2O from full physics retrieval: 0: Good 1: Fair 2: Poor 3: NG	

Table 3-3-11 Level 2 Product RetrievalResult_FP Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
									Min	Max		
21		pressureLevel_fp	2	numPixel, numLayer+1	H5T_IEEE_F32LE	Layer boundary pressure	Stores the pressure at the layer boundary at the end of derivation.	hPa	N/A	N/A	-999.0	Vertical pressure grid for the retrieved state for full physics retrieval
22		pressureWeightingFunction_fp	2	numPixel, numLayer	H5T_IEEE_F32LE	Pressure weighting function	Stores the pressure weighting function for the derivation result.	N/A	N/A	N/A	-999.0	Pressure weighting function for the retrieved state for full physics retrieval
23		dryAirColumn_fp	1	numPixel	H5T_IEEE_F32LE	Dry air column	Stores the derived value of the dry air column.	molecule/cm^2	N/A	N/A	-999.0	Retrieved vertical column of dry air from full physics retrieval
24		co2_fp	2	numPixel, numLayer	H5T_IEEE_F32LE	CO2 profile	Stores the derived value of the CO2 profile.	ppm	N/A	N/A	-999.0	Retrieved CO2 profile from full physics retrieval
25		co2_apriori_fp	2	numPixel, numLayer	H5T_IEEE_F32LE	A priori value of CO2 profile	Stores the a priori value of the CO2 profile.	ppm	N/A	N/A	-999.0	A priori value of CO2 profile for full physics retrieval
26		ch4_fp	2	numPixel, numLayer	H5T_IEEE_F32LE	CH4 profile	Stores the derived value of the CH4 profile.	ppm	N/A	N/A	-999.0	Retrieved CH4 profile from full physics retrieval
27		ch4_apriori_fp	2	numPixel, numLayer	H5T_IEEE_F32LE	A priori value of CH4 profile	Stores the a priori value of the CH4 profile.	ppm	N/A	N/A	-999.0	A priori value of CH4 profile for full physics retrieval
28		aot_fp	2	numPixel, numAerType	H5T_IEEE_F32LE	Aerosol optical thickness	Stores the derived value of the simultaneously estimated aerosol optical thickness at the reference wavelength.	N/A	N/A	N/A	-999.0	Retrieved aerosol optical thickness at the reference wavelength from full physics retrieval
29		aerosolPeakHeight_fp	2	numPixel, numAerType	H5T_IEEE_F32LE	Aerosol peak altitude	Stores the peak altitude of the aerosol optical thickness at the reference wavelength, simultaneously estimated assuming the Gaussian distribution.	hPa	N/A	N/A	-999.0	Retrieved aerosol peak height from full physics retrieval
30		surfacePressure_fp	1	numPixel	H5T_IEEE_F32LE	Surface pressure	Stores the derived value of the simultaneously estimated surface pressure.	hPa	N/A	N/A	-999.0	Retrieved surface pressure from full physics retrieval
31		temperatureShift_fp	1	numPixel	H5T_IEEE_F32LE	Temperature shift	Stores the derived value of the simultaneously estimated temperature shift.	K	N/A	N/A	-999.0	Retrieved temperature shift from full physics retrieval
32		sif755_fp	1	numPixel	H5T_IEEE_F32LE	SIF (reference wavelength)	Stores the derived value of the simultaneously estimated chlorophyll fluorescence at the reference wavelength.	W/m^2/sr/micron	N/A	N/A	-999.0	Retrieved SIF at reference wavelength from full physics retrieval
33		sifSlope_fp	1	numPixel	H5T_IEEE_F32LE	SIF slope	Stores the derived value of the slope for the wavelength of the simultaneously estimated chlorophyll fluorescence.	N/A	N/A	N/A	-999.0	Retrieved SIF slope from full physics retrieval
34		albedo_fp	3	numPixel, numWavelengthAlbedoMax_fp, numSubBand_fp	H5T_IEEE_F32LE	Albedo	Stores the derived value of the simultaneously estimated surface albedo (for land case).	N/A	N/A	N/A	-999.0	Retrieved surface albedo from full physics retrieval (for land case)
35		wavelengthStretch_fp	2	numPixel, numSubBand_fp	H5T_IEEE_F32LE	Wavelength stretch factor	Stores the derived value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	Retrieved wavelength stretch factor from full physics retrieval
36		qualityFlag_fp	1	numPixel	H5T_STD_I8LE	Quality flag for retrieval	Stores the quality flag for the full-physics retrieval with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for full physics retrieval: 0: Good 1: Fair 2: Poor 3: NG
37		iteration_fp	1	numPixel	H5T_STD_I32LE	Number of iterations	Stores the number of iterations.	N/A	N/A	N/A	-999	Number of iterations for full physics retrieval processing
38		residualReducedChi2_fp	2	numPixel, numSubBand_fp	H5T_IEEE_F32LE	Chi-squared	Stores the normalized spectral residual value.	N/A	N/A	N/A	-999.0	Squares of normalized residuals from full physics retrieval

Table 3-3-12 Level 2 Product RetrievalResult_PR Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
									Min	Max		
1	G	/RetrievalResult_PR										
2		xch4_proxy	1	numPixel	H5T_IEEE_F32LE	XCH4(proxy)	Stores the XCH4 obtained by the proxy method.	ppm	N/A	N/A	-999.0	Retrieved XCH4 from proxy retrieval
3		xco2_model	1	numPixel	H5T_IEEE_F32LE	XCO2(model)	Stores the XCO2 from the atmospheric transport model.	ppm	N/A	N/A	-999.0	A priori value of XCO2
4		xch4_xco2_ratio	1	numPixel	H5T_IEEE_F32LE	XCH4/XCO2 ratio	Stores the ratio of XCH4 and XCO2 estimated assuming clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999.0	Ratio of XCH4 and XCO2 from single-band retrievals without assuming atmospheric particles
5		xch4_qualityFlag_proxy	1	numPixel	H5T_STD_I8LE	Quality flag for XCH4 (proxy)	Stores the quality flag for XCH4 obtained by the proxy method with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for XCH4 retrieved from proxy retrieval: 0: Good 1: Fair 2: Poor 3: NG

Table 3-3-13 Level 2 Product Corrected_SIF Group Details

No.	Group	Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
									Min	Max		
1	G	/Corrected_SIF										
2		sif755_corrected	1	numPixel	H5T_IEEE_F32LE	SIF	Stores the chlorophyll fluorescence at 755nm corrected for the offset output due to instrument characteristics etc., estimated from regions where chlorophyll fluorescence is zero, such as the Antarctic.	mW/m^2/sr/nm	N/A	N/A	-999.0	Retrieved SIF at 755 nm after the correction of zero-level-offset
3		sif755_uncert_corrected	1	numPixel	H5T_IEEE_F32LE	SIF uncertainty	Stores the uncertainty of the chlorophyll fluorescence at 755nm (after correction).	mW/m^2/sr/nm	N/A	N/A	-999.0	Uncertainty of corrected SIF at 755 nm
4		sif755_qualityFlag_corrected	1	numPixel	H5T_STD_I8LE	Quality flag for SIF	Stores the quality flag for the chlorophyll fluorescence at 755nm (after correction) with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for corrected SIF at 755 nm: 0: Good 1: Fair 2: Poor 3: NG

Table 3-3-14 Level 2 Product RetrievalConfiguration_SIF Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/RetrievalConfiguration_SIF										
2		numWavelengthAlbedo_sif	0	scalar	H5T_STD_I8LE	Number of albedo points	Stores the number of wavelength points where albedo was estimated.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band SIF retrieval
3		wavelengthAlbedo_sif	1	numWavelengthAlbedo_sif	H5T_IEEE_F32LE	Albedo wavelength points	Stores the wavelength points where albedo was estimated.	nm	N/A	N/A	-999.0	Wavelength points for albedo for single-band SIF retrieval
4		sif_raw_apriori_sif	0	scalar	H5T_IEEE_F32LE	A priori value of SIF (755nm)	Stores the a priori value of the chlorophyll fluorecence at 755nm.	W/m^2/sr/micron	N/A	N/A	-999.0	A priori value of SIF at 755 nm for single-band SIF retrieval
5		wavelengthStretch_apriori_sif	0	scalar	H5T_IEEE_F32LE	A priori value of wavelength stretch factor	Stores the a priori value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	A priori value of wavelength stretch factor for single-band SIF retrieval

Table 3-3-15 Level 2 Product RetrievalResult_SIF Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute					
			Rank	Size				unit	validRange		invalid Value	description	
		Min			Max								
1	G	/RetrievalResult_SIF											
2		sif_raw_sif	1	numPixel	H5T_IEEE_F32LE	SIF (755nm)	Stores the derived value of the chlorophyll fluorescence at 755nm estimated including the offset output due to instrument characteristics, etc.	W/m^2/sr/micron	N/A	N/A	-999.0	Retrieved SIF at 755 nm including zero-level offset introduced by the instrument characteristics using a single band	
3		sif_raw_uncert_sif	1	numPixel	H5T_IEEE_F32LE	SIF (755nm) uncertainty	Stores the uncertainty of the chlorophyll fluorescence at 755nm (uncorrected).	W/m^2/sr/micron	N/A	N/A	-999.0	Uncertainty of uncorrected SIF at 755 nm for single-band SIF retrieval	
4		sif_raw_dfs_sif	1	numPixel	H5T_IEEE_F32LE	SIF (755nm) DOFS	Stores the degree of freedom for signals for the chlorophyll fluorescence at 755nm (uncorrected).	N/A	N/A	N/A	-999.0	Degree of freedom for signal of uncorrected SIF at 755 nm from single-band SIF retrieval	
5		albedo_sif	2	numPixel, numWavelengthAlbedo_sif	H5T_IEEE_F32LE	Albedo	Stores the derived value of the simultaneously estimated surface albedo (for land case).	N/A	N/A	N/A	-999.0	Retrieved surface albedo from single-band SIF retrieval (for land case)	
6		wavelengthStretch_sif	1	numPixel	H5T_IEEE_F32LE	Wavelength interval correction	Stores the derived value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	Retrieved wavelength stretch factor from single-band SIF retrieval	
7		iteration_sif	1	numPixel	H5T_STD_I32LE	Number of iterations	Stores the number of iterations when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999	Number of iterations for single-band SIF retrieval processing	
8		residualReducedChi2_sif	1	numPixel	H5T_IEEE_F32LE	Chi-squared	Stores the normalized spectral residual value when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999.0	Squares of normalized residuals from single-band SIF retrieval	
9		radianceMax_sif	1	numPixel	H5T_IEEE_F32LE	Maximum radiance	Stores the maximum radiance in the wavelength range used.	N/A	N/A	N/A	-999.0	Maximum radiance in the wavelength range used for single-band SIF retrieval	
10		snr_sif	1	numPixel	H5T_IEEE_F32LE	SNR	Stores the SNR in the wavelength range used.	N/A	N/A	N/A	-999.0	SNR in the wavelength range used for single-band SIF retrieval	

Table 3-3-16 Level 2 Product RetrievalConfiguration_Ps Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/RetrievalConfiguration_Ps										
2		numWavelengthAlbedo_ps	0	scalar	H5T_STD_I8LE	Number of albedo points	Stores the number of wavelength points where albedo was estimated.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band surface pressure retrieval
3		wavelengthAlbedo_ps	1	numWavelengthAlbedo_ps	H5T_IEEE_F32LE	Albedo wavelength points	Stores the wavelength points where albedo was estimated.	nm	N/A	N/A	-999.0	Wavelength points for albedo for single-band surface pressure retrieval
4		temperatureShift_apriori_ps	0	scalar	H5T_IEEE_F32LE	A priori value of temperature shift	Stores the a priori value of the simultaneously estimated temperature shift.	K	N/A	N/A	-999.0	A priori value of temperature shift for single-band surface pressure retrieval
5		sif755_apriori_ps	0	scalar	H5T_IEEE_F32LE	A priori value of SIF (reference wavelength)	Stores the a priori value of the simultaneously estimated chlorophyll fluorescence at the reference wavelength.	W/m^2/sr/micron	N/A	N/A	-999.0	A priori value of SIF at the reference wavelength for single-band surface pressure retrieval
6		sifSlope_apriori_ps	0	scalar	H5T_IEEE_F32LE	A priori value of SIF slope	Stores the a priori value of the slope for the wavenumber of the simultaneously estimated chlorophyll fluorescence.	N/A	N/A	N/A	-999.0	A priori value of fluorescence slope for single-band surface pressure retrieval
7		wavelengthStretch_apriori_ps	0	scalar	H5T_IEEE_F32LE	A priori value of wavelength stretch factor	Stores the a priori value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	A priori value of wavelength stretch factor for single-band surface pressure retrieval

Table 3-3-17 Level 2 Product RetrievalResult_Ps Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/RetrievalResult_Ps										
2		surfacePressure_ps	1	numPixel	H5T_IEEE_F32LE	Surface pressure	Stores the derived value of the surface pressure estimated under clear-sky and aerosol-free conditions.	hPa	N/A	N/A	-999.0	Retrieved surface pressure using a single band without assuming atmospheric particles
3		surfacePressure_dfs_ps	1	numPixel	H5T_IEEE_F32LE	Surface pressure DOFS	Stores the degree of freedom of the surface pressure estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for surface pressure from single-band surface pressure retrieval
4		surfacePressure_qualityFlag_ps	1	numPixel	H5T_STD_I8LE	Quality flag for surface pressure	Stores the quality flag for the surface pressure. 0: Good 1: Fair 2: NG	N/A	0	2	-1	Quality flag for surface pressure from single-band surface pressure retrieval: 0: Good 1: Fair 2: NG
5		temperatureShift_ps	1	numPixel	H5T_IEEE_F32LE	Temperature shift	Stores the derived value of the simultaneously estimated temperature shift.	K	N/A	N/A	-999.0	Retrieved temperature shift for single-band surface pressure retrieval
6		sif755_ps	1	numPixel	H5T_IEEE_F32LE	SIF	Stores the derived value of the simultaneously estimated chlorophyll fluorescence at the reference wavelength.	W/m^2/sr/nm	N/A	N/A	-999.0	Retrieved SIF at reference wavelength from single-band surface pressure retrieval
7		sifSlope_ps	1	numPixel	H5T_IEEE_F32LE	SIF slope	Stores the derived value of the slope for the wavelength of the simultaneously estimated chlorophyll fluorescence.	N/A	N/A	N/A	-999.0	Retrieved SIF slope from single-band surface pressure retrieval
8		albedo_ps	2	numPixel, numWavelengthAlbedo_ps	H5T_IEEE_F32LE	Albedo	Stores the derived value of the simultaneously estimated surface albedo (for land case).	N/A	N/A	N/A	-999.0	Retrieved surface albedo from single-band surface pressure retrieval (for land case)
9		wavelengthStretch_ps	1	numPixel	H5T_IEEE_F32LE	Wavelength stretch factor	Stores the derived value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	Retrieved wavelength stretch factor from single-band surface pressure retrieval
10		iteration_ps	1	numPixel	H5T_STD_I32LE	Number of iterations	Stores the number of iterations when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999	Number of iterations for single-band surface pressure retrieval processing
11		residualReducedChi2_ps	1	numPixel	H5T_IEEE_F32LE	Chi-squared	Stores the normalized spectral residual value when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999.0	Squares of normalized residuals from single-band surface pressure retrieval

Table 3-3-18 Level 2 Product RetrievalConfiguration_PR_CO2 Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/RetrievalConfiguration_PR_CO2										
2		numWavelengthAlbedo_pr_co2	0	scalar	H5T_STD_I8LE	Number of albedo points	Stores the number of wavelength points where albedo was estimated.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band CO2 retrieval
3		wavelengthAlbedo_pr_co2	1	numWavelengthAlbedo_pr_co2	H5T_IEEE_F32LE	Albedo wavelength points	Stores the wavelength points where albedo was estimated.	nm	N/A	N/A	-999.0	Wavelength points for albedo for single-band CO2 retrieval
4		wavelengthStretch_apriori_pr_co2	0	scalar	H5T_IEEE_F32LE	A priori value of wavelength stretch factor	Stores the a priori value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	A priori value of wavelength stretch factor for single-band CO2 retrieval

Table 3-3-19 Level 2 Product RetrievalResult_PR_CO2 Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/RetrievalResult_PR_CO2										
2		xco2_pr_co2	1	numPixel	H5T_IEEE_F32LE	XCO2	Stores the derived value of XCO2 estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	Retrieved XCO2 using a single band without assuming atmospheric particles
3		xco2_uncert_pr_co2	1	numPixel	H5T_IEEE_F32LE	XCO2 uncertainty	Stores the uncertainty of XCO2 estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	Uncertainty of XCO2 for single-band CO2 retrieval
4		xco2_dfs_pr_co2	1	numPixel	H5T_IEEE_F32LE	XCO2 DOFS	Stores the degree of freedom for signals for XCO2.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for XCO2 from single-band CO2 retrieval
5		xh2o_pr_co2	1	numPixel	H5T_IEEE_F32LE	XH2O	Stores the derived value of XH2O estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	Retrieved XH2O from single-band CO2 retrieval
6		xh2o_uncert_pr_co2	1	numPixel	H5T_IEEE_F32LE	XH2O uncertainty	Stores the uncertainty of XH2O estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	Uncertainty of XH2O from single-band CO2 retrieval
7		xh2o_dfs_pr_co2	1	numPixel	H5T_IEEE_F32LE	XH2O DOFS	Stores the degree of freedom for signals for XH2O.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for XH2O for single-band CO2 retrieval
8		albedo_pr_co2	2	numPixel, numWavelengthAlbedo_pr_co2	H5T_IEEE_F32LE	Albedo	Stores the derived value of the simultaneously estimated surface albedo (for land case).	N/A	N/A	N/A	-999.0	Retrieved surface albedo from single-band CO2 retrieval (for land case)
9		wavelengthStretch_pr_co2	1	numPixel	H5T_IEEE_F32LE	Wavelength stretch factor	Stores the derived value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	Retrieved wavelength stretch factor from single-band CO2 retrieval
10		iteration_pr_co2	1	numPixel	H5T_STD_I32LE	Number of iterations	Stores the number of iterations when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999	Number of iterations for single-band CO2 retrieval processing
11		residualReducedChi2_pr_co2	1	numPixel	H5T_IEEE_F32LE	Chi-squared	Stores the normalized spectral residual value when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999.0	Squares of normalized residuals from single-band CO2 retrieval

Table 3-3_20 Level 2 Product RetrievalConfiguration_PR_CH4 Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/RetrievalConfiguration_PR_CH4										
2		numWavelengthAlbedo_pr_ch4	0	scalar	H5T_STD_I8LE	Number of albedo points	Stores the number of wavelength points where albedo was estimated.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band CH4 retrieval
3		wavelengthAlbedo_pr_ch4	1	numWavelengthAlbedo_pr_ch4	H5T_IEEE_F32LE	Albedo wavelength points	Stores the wavelength points where albedo was estimated.	nm	N/A	N/A	-999.0	Wavelength points for albedo for single-band CH4 retrieval
4		wavelengthStretch_apriori_pr_ch4	0	scalar	H5T_IEEE_F32LE	A priori value of wavenumber axis correction factor	Stores the a priori value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	A priori value of wavelength stretch factor for single-band CH4 retrieval

Table 3-3_21 Level 2 Product RetrievalConfiguration_PR_CH4 Group Details

No.	Group	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
		Min			Max							
1	G	/RetrievalResult_PR_CH4										
2		xch4_pr_ch4	1	numPixel	H5T_IEEE_F32LE		Stores the derived value of XCH4 estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	Retrieved XCH4 using a single band without atmospheric particles
3		xch4_uncert_pr_ch4	1	numPixel	H5T_IEEE_F32LE	XCH4 uncertainty	Stores the uncertainty of XCH4 estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	Uncertainty of XCH4 from single-band CH4 retrieval
4		xch4_dfs_pr_ch4	1	numPixel	H5T_IEEE_F32LE		Stores the degree of freedom for signals for XCH4.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for XCH4 from single-band CH4 retrieval
5		xh2o_pr_ch4	1	numPixel	H5T_IEEE_F32LE		Stores the derived value of XH2O estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	XH2O from single-band CH4 retrieval
6		xh2o_uncert_pr_ch4	1	numPixel	H5T_IEEE_F32LE	XH2O uncertainty	Stores the uncertainty of XH2O estimated under clear-sky and aerosol-free conditions.	ppm	N/A	N/A	-999.0	Uncertainty of XH2O from single-band CH4 retrieval
7		xh2o_dfs_pr_ch4	1	numPixel	H5T_IEEE_F32LE	XH2O DOFS	Stores the degree of freedom for signals for XH2O.	N/A	N/A	N/A	-999.0	Degree of freedom for signal for XH2O from single-band CH4 retrieval
8		albedo_pr_ch4	2	numPixel, numWavelengthAlbedo_pr_ch4	H5T_IEEE_F32LE	Albedo	Stores the derived value of the simultaneously estimated surface albedo (for land case).	N/A	N/A	N/A	-999.0	Retrieved surface albedo from single-band CH4 retrieval (for land case)
9		wavelengthStretch_pr_ch4	1	numPixel	H5T_IEEE_F32LE	Wavelength stretch factor	Stores the derived value of the simultaneously estimated wavelength stretch factor.	N/A	N/A	N/A	-999.0	Retrieved wavelength stretch factor from single-band CH4 retrieval
10		iteration_pr_ch4	1	numPixel	H5T_STD_I32LE	Number of iterations	Stores the number of iterations when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999	Number of iterations for single-band CH4 retrieval processing
11		residualReducedChi2_pr_ch4	1	numPixel	H5T_IEEE_F32LE	Chi-squared	Stores the normalized spectral residual value when estimated under clear-sky and aerosol-free conditions.	N/A	N/A	N/A	-999.0	Squares of normalized residuals from single-band CH4 retrieval

Table 3-3_22 Level 2 Product MainResult Group Details

No.	dno	Group / Dataset	Dimension		Datatype	Dataset name	Explanation	Attribute				
			Rank	Size				unit	validRange		invalid Value	description
				Min	Max							
1	G	/MainResult										
2		FullPhysics										
3		xco2_fp	1	numPixel	H5T_IEEE_F32LE	XCO2	Stores the estimated value of XCO2 by the full-physics method.	ppm	N/A	N/A	-999.0	Retrieved XCO2 from full physics retrieval
4		xco2_uncert_fp	1	numPixel	H5T_IEEE_F32LE	XCO2 uncertainty	Stores the uncertainty of XCO2 by the full-physics method.	ppm	N/A	N/A	-999.0	Uncertainty of XCO2 from full physics retrieval
5		xco2_qualityFlag_fp	1	numPixel	H5T_STD_I8LE	Quality flag for XCO2	Stores the quality flag for XCO2 by the full-physics method with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for XCO2 from full physics retrieval: 0: Good 1: Fair 2: Poor 3: NG
6		xco2_biasCorrected_fp	1	numPixel	H5T_IEEE_F32LE	Bias-corrected XCO2	Stores the bias-corrected XCO2 by the full-physics method.	ppm	N/A	N/A	-999.0	Bias-corrected XCO2 from full physics retrieval
7		xch4_fp	1	numPixel	H5T_IEEE_F32LE	XCH4	Stores the estimated value of XCH4 by the full-physics method.	ppm	N/A	N/A	-999.0	Retrieved XCH4 from full physics retrieval
8		xch4_uncert_fp	1	numPixel	H5T_IEEE_F32LE	XCH4 uncertainty	Stores the uncertainty of XCH4 by the full-physics method.	ppm	N/A	N/A	-999.0	Uncertainty of XCH4 from full physics retrieval
9		xch4_qualityFlag_fp	1	numPixel	H5T_STD_I8LE	Quality flag for XCH4	Stores the quality flag for XCH4 by the full-physics method with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for XCH4 from full physics retrieval: 0: Good 1: Fair 2: Poor 3: NG
10		xch4_biasCorrected_fp	1	numPixel	H5T_IEEE_F32LE	Bias-corrected XCH4	Stores the bias-corrected XCH4 by the full-physics method.	ppm	N/A	N/A	-999.0	Bias-corrected XCH4 from full physics retrieval
11		xh2o_fp	1	numPixel	H5T_IEEE_F32LE	XH2O	Stores the estimated value of XH2O by the full-physics method.	ppm	N/A	N/A	-999.0	Retrieved XH2O from full physics retrieval
12		xh2o_uncert_fp	1	numPixel	H5T_IEEE_F32LE	XH2O uncertainty	Stores the uncertainty of XH2O by the full-physics method.	ppm	N/A	N/A	-999.0	Uncertainty of XH2O from full physics retrieval
13		xh2o_qualityFlag_fp	1	numPixel	H5T_STD_I8LE	Quality flag for XH2O	Stores the quality flag for XH2O by the full-physics method with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for XH2O from full physics retrieval: 0: Good 1: Fair 2: Poor 3: NG
14		Proxy										
15		xch4_proxy	1	numPixel	H5T_IEEE_F32LE	XCH4(proxy)	Stores the XCH4 by the proxy method.	ppm	N/A	N/A	-999.0	Retrieved XCH4 from proxy retrieval
16		xch4_xco2_ratio	1	numPixel	H5T_IEEE_F32LE	XCH4/XCO2 ratio	Stores the ratio of XCH4 and XCO2 estimated assuming no clouds or aerosols.	N/A	N/A	N/A	-999.0	Ratio of XCH4 and XCO2 from single-band retrievals without assuming atmospheric particles
17		xch4_qualityFlag_proxy	1	numPixel	H5T_STD_I8LE	Quality flag for XCH4 (proxy)	Stores the quality flag for XCH4 by the proxy method with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for XCH4 retrieved from proxy retrieval: 0: Good 1: Fair 2: Poor 3: NG
18		SIF										
19		sif755_corrected	1	numPixel	H5T_IEEE_F32LE	SIF	Stores the chlorophyll fluorescence at 755nm corrected for the offset output due to instrument characteristics etc., estimated from regions where chlorophyll fluorescence is zero, such as the Antarctic.	mW/m^2/str/micron	N/A	N/A	-999.0	Retrieved SIF at 755 nm after the correction of zero-level-offset
20		sif755_uncert_corrected	1	numPixel	H5T_IEEE_F32LE	SIF uncertainty	Stores the uncertainty of the chlorophyll fluorescence at 755nm (after correction).	mW/m^2/str/micron	N/A	N/A	-999.0	Uncertainty of corrected SIF at 755 nm

Table 3-3_22 Level 2 Product MainResult Group Details

No.	Group	Group / Dataset			Dimension		Datatype	Dataset name	Explanation	Attribute				
					Rank	Size				unit	validRange		invalid Value	description
				Min							Max			
21				sif755_qualityFlag_corrected	1	numPixel	H5T_STD_I8LE	Quality flag for SIF	Stores the quality flag for the chlorophyll fluorescence at 755nm (after correction) with the following values. 0: Good 1: Fair 2: Poor 3: NG	N/A	0	3	-1	Quality flag for corrected SIF at 755 nm: 0: Good 1: Fair 2: Poor 3: NG

Table 3-3-23 Level 2 Product Dimension Details

No.	Group	Group / Dataset	Dimension		Datatype	Name	Number of arrays	Description	Attribute				
			Rank	Size					unit	validRange		invalid Value	description
										Min	Max		
1	G /												
2		band	1	numBand	H5T_IEEE_F32LE	Band	“3” (Fixed)	Stored in the order of Band1, Band2, and Band3.	N/A	0.0	0.0	N/A	TANSO-3 bands
3		numBand	0	scalar	H5T_STD_I8LE	Number of bands	—	Stores the number of bands. “3” (Fixed)	N/A	3	3	-128	Number of TANSO-3 bands: “3” (Fixed)
4		frame	1	numFrame	H5T_IEEE_F32LE	Frame	Number of frames	Stored in chronological order.	N/A	0.0	0.0	N/A	Frames in the product file
5		numFrame	0	scalar	H5T_STD_I32LE	Number of frames	—	Stores the number of frames included in the product file.	N/A	0	99,999	-999	Number of frames in the product file
6		aerType	1	numAerType	H5T_IEEE_F32LE	Aerosol particle type	“2” (Fixed)	Stored in order from large to small.	N/A	0.0	0.0	N/A	Aerosol particle types
7		numAerType	0	scalar	H5T_STD_I8LE	Number of aerosol particle types	—	Stores the number of aerosol particle types. “2” (Fixed)	N/A	2	2	-128	Number of aerosol particle types (large and small): “2” (fixed)
8		layer	1	numLayer	H5T_IEEE_F32LE	Retrieval layer	”15” (Fixed)	Stored in order of altitude.	N/A	0.0	0.0	N/A	Vertical layers
9		numLayer	0	scalar	H5T_STD_I8LE	Number of retrieval layers	—	Stores the number of vertical layers. ”15” (Fixed)	N/A	15	15	-128	Number of vertical layers: ”15” (fixed)
10		subBand_fp	1	numSubBand_fp	H5T_IEEE_F32LE	Sub-band (full-physics method)	Number of sub-bands (full-physics method)	Stored from the short wavelength side.	N/A	0.0	0.0	N/A	Sub-bands for full physics retrieval
11		numSubBand_fp	0	scalar	H5T_STD_I8LE	Number of sub-bands (full-physics method)	—	Stores the number of sub-bands (full-physics method).	N/A	N/A	N/A	-128	Number of sub-bands for full physics retrieval
12		wavelengthAlbedo_pr_ch4	1	numWavelengthAlbedo_pr_ch4	H5T_IEEE_F32LE	Albedo (for CH4 derivation by proxy method)	Number of wavelength points where albedo was estimated in CH4 derivation by the proxy method	Stored from the short wavelength side.	N/A	0.0	0.0	N/A	Wavelength points for albedo for single-band CH4 retrieval
13		numWavelengthAlbedo_pr_ch4	0	scalar	H5T_STD_I8LE	Number of albedo points (for CH4 derivation by proxy method)	—	Stores the number of wavelength points where albedo was estimated in CH4 derivation by the proxy method.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band CH4 retrieval
14		wavelengthAlbedo_pr_co2	1	numWavelengthAlbedo_pr_co2	H5T_IEEE_F32LE	Albedo (for CO2 derivation by proxy method)	Number of wavelength points where albedo was estimated in CO2 derivation by the proxy method	Stored from the short wavelength side.	N/A	0.0	0.0	N/A	Wavelength points for albedo for single-band CO2 retrieval
15		numWavelengthAlbedo_pr_co2	0	scalar	H5T_STD_I8LE	Number of albedo points (for CO2 derivation by proxy method)	—	Stores the number of wavelength points where albedo was estimated in CO2 derivation by the proxy method.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band CO2 retrieval
16		wavelengthAlbedo_ps	1	numWavelengthAlbedo_ps	H5T_IEEE_F32LE	Albedo (for surface pressure derivation by proxy method)	Number of wavelength points where albedo was estimated in surface pressure derivation by the proxy method	Stored from the short wavelength side.	N/A	0.0	0.0	N/A	Wavelength points for albedo for single-band surface pressure retrieval
17		numWavelengthAlbedo_ps	0	scalar	H5T_STD_I8LE	Number of albedo points (for surface pressure derivation by proxy method)	—	Stores the number of wavelength points where albedo was estimated in surface pressure derivation by the proxy method.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band surface pressure retrieval
18		wavelengthAlbedo_sif	1	numWavelengthAlbedo_sif	H5T_IEEE_F32LE	Albedo (for SIF derivation by proxy method)	Number of wavelength points where albedo was estimated in SIF derivation by the proxy method	Stored from the short wavelength side.	N/A	0.0	0.0	N/A	Wavelength points for albedo for single-band SIF retrieval
19		numWavelengthAlbedo_sif	0	scalar	H5T_STD_I8LE	Number of albedo points (for SIF derivation by proxy method)	—	Stores the number of wavelength points where albedo was estimated in SIF derivation by the proxy method.	N/A	N/A	N/A	-128	Number of wavelength points for albedo for single-band SIF retrieval
20		wavelengthAlbedoMax_fp	1	numWavelengthAlbedoMax_fp	H5T_IEEE_F32LE	Maximum albedo (full-physics method)	Number of wavelength points where albedo was estimated by the full-physics method	Stored from the short wavelength side.	N/A	0.0	0.0	N/A	Wavelength points for albedo for full physics retrieval
21		numWavelengthAlbedoMax_fp	0	scalar	H5T_STD_I8LE	Maximum number of albedo points (full-physics method)	—	Stores the maximum number of wavelength points where albedo was estimated by the full-physics method.	N/A	N/A	N/A	-128	Maximum number of wavelength points for albedo for full physics retrieval
22		libfile	1	numLibfile	H5T_IEEE_F32LE	L1B product file	Number of L1B product files	Stored in chronological order.	N/A	0.0	0.0	N/A	L1B product file
23		numLibfile	0	scalar	H5T_STD_I8LE	Number of L1B product files	—	Stores the number of L1B product files used for creation.	N/A	0	99	-128	Number of L1B product file
24		pixel	1	numPixel	H5T_IEEE_F32LE	Spatial division	Number of spatial divisions	Pixels within the same frame are stored in the order of the spatial division index assigned in the L1B product, and these are stored in chronological order for each frame.	N/A	0.0	0.0	N/A	Spatial pixels in the product file

Table 3-3-23 Level 2 Product Dimension Details

No.	Group	Group / Dataset	Dimension		Datatype	Name	Number of arrays	Description	Attribute				
			Rank	Size					unit	validRange		invalid Value	description
										Min	Max		
25		numPixel	0	scalar	H5T_STD_I32LE	Number of spatial divisions	–	Stores the number of spatial divisions contained in the product.	N/A	0	999,999	-999	Number of spatial pixels in the product file
26		Ncorner	1	numNcorner	H5T_IEEE_F32LE	Four corners of space	Number of the four corners of space	Stored in clockwise order.	N/A	0.0	0.0	N/A	Corners in spacial pixel
27		numNcorner	0	scalar	H5T_STD_I16LE	Number of the four corners of space	–	Stores the number of the four corners of space. "4" (Fixed)	N/A	0	9,999	-999	Number of corners in spacial pixel
28		sounding	1	numSounding	H5T_IEEE_F32LE	Observation ID	Number of observation IDs	Stored in chronological order.	N/A	0.0	0.0	N/A	Observation ID in the product file
29		numSounding	0	scalar	H5T_STD_I16LE	Number of observation IDs	–	Stores the number of observation IDs contained in the product.	N/A	0	9,999	-999	Number of observation ID in the product file