

## **Greenhouse gases Observing SATellite (GOSAT) Data Policy**

11 November, 2008

Revision A on 16 April, 2009

Revision B on 28 January, 2016

Japan Aerospace Exploration Agency

National Institute for Environmental Studies

Ministry of the Environment of Japan

### **I. Purpose**

1. This document defines terms and conditions (GOSAT Data Policy) for GOSAT data providing agencies and users, in accordance with the agreement concerning the development and utilization of the Greenhouse gases Observing SATellite (GOSAT) sensor (1<sup>st</sup> August, 2005).

### **II. Background**

2. The GOSAT data will be distributed on the “non-discriminatory” basis as provided for in the Principles Relating to Remote Sensing of the Earth from Space issued by the United Nations
3. The GOSAT data will be processed in a prompt manner with the help from inside and outside Japan and will be provided at large, thereby promoting the use of the GOSAT data (as mentioned by the three organizations at the Space Activities Commission’s second task force meeting held on 17<sup>th</sup> August, 2004.)
4. The GOSAT Data Policy refers to how to utilize the GOSAT data to be obtained after the launch, with a view to the evolution of research and development into the future, while maintaining the balance between international cooperation and national interests,.  
(Raised as one of the points to be noted in the evaluation of the Project at the 60<sup>th</sup> gathering of the Council for Science and Technology Policy held on 27<sup>th</sup> October, 2006.)
5. The GOSAT Data Policy takes into consideration the following missions of Japan Aerospace Exploration Agency (hereinafter referred to as “JAXA”), National Institute for Environmental Studies (NIES), and Ministry of the Environment of Japan (MOE) (hereafter collectively called as the “Three Parties”), to the maximum extent possible.
  - (1) JAXA, as a space agency, promotes the use of the GOSAT data inside and outside of Japan by providing relevant GOSAT data users with the data in a substantial quantity in a prompt manner, for best results of the Project.
  - (2) NIES, as an institute for the sciences, promotes the use of the GOSAT data especially in scientific fields by distributing reliable data products to registered investigators and general

users upon carefully evaluating the data quality, for best results of the Project.

- (3) MOE will use the GOSAT data in its environmental administration through the data use inside and outside of Japan for scientific purposes and consequently the minimizing of uncertainties with respect to global warming, while maintaining the balance between international cooperation and national interests.

### **III. GOSAT Data Policy**

#### **6. Purpose of data use**

The purposes of using the GOSAT data are categorized as follows:

- (1) [Purpose] Development of Earth observing systems and Earth science researches

- (i) Technical development

Upgrading of evaluation and analysis techniques concerning development of Earth observing satellites and space-borne sensors, and contribution of outcomes to next-generation Earth observing satellites and ground systems.

- (ii) Research on and demonstration of exploitation of the data

Research on and demonstration of exploitation of the data in the Earth environmental study fields.

- (iii) Research on Earth science, etc.

Research which will contribute to the development of Earth science and to the solution to global environmental issues, by clarifying Earth environment change mechanisms, etc.

- (iv) Other purposes that are relevant to the activities of JAXA, NIES, and MOE

Use of the data in a way that will contribute to the public relations and the enlightenment of the activities of the Three Parties, and to the educational activities by the Third Parties, etc.

- (2) [Purpose] Other purposes than those described in (1) above

#### **7. Policies on when to start the distribution**

- (1) The data distribution to all users will start immediately after the completion of the calibration and validation work.
- (2) The data will be provided with priority to internal users, research investigators or research organizations approved in research announcements (RA users), the members of the Science Team, and Alliance Organizations, which are collaborating in the aspects of sensor development, scientific research, data processing, and necessary data distribution, earlier than the other users, in cases where such data distribution is necessary for data processing tasks in terms of calibration, validation, etc. and where such data distribution contributes to the development of the GOSAT sensor or the research on utilization of the GOSAT data.

## 8. How to distribute the GOSAT data

Data users shall conclude an arrangement with JAXA or NIES in the forms of agreement, contract, agreeing to the terms and conditions online, etc. before receiving data products on line, in principle, in accordance with the stipulations set forth in Article 14 hereunder.

When a large number of data products are to be provided, there will be a possibility that JAXA or NIES may provide the data through a private data distributor selected by JAXA or NIES.

## 9. Types and definitions of GOSAT data

Table 1 lists the types of GOSAT data products to be distributed by JAXA and NIES. There are several “Levels” of GOSAT data in accordance with data processing steps: Level 1 products are data representing physical quantities converted from the voltage and current values measured by the sensor; Level 2 products are processed from Level 1 products and show column abundances of greenhouse gases; Level 3 products are data on the global distribution of column abundances obtained by applying a statistical processing to Level 2 products taken over a certain period of time; and Level 4 products provide greenhouse gas fluxes assessed based on Level 2 products.

All GOSAT data products at these different levels are classified into three product categories: standard, research and internal products. Each category is described and defined as follows:

### (i) Standard products

Standard products are calibrated, validated, and compared(\*1), and are to be distributed to all users. The Three Parties guarantee the accuracy of these products.

(\*1) “Comparison” here means that the adequacy of Level 3 and 4 products is confirmed by an equivalent means to the validation of Level 2 products.

### (ii) Research products

Research products are to be distributed to a limited community of users for research on calibration, validation, data processing algorithms and data utilization, and other scientific researches. The Three Parties are not required to carry out validation or comparison or to guarantee the accuracy of these products.

### (iii) Internal products

Internal products are to be provided to limited research investigators and research organizations that collaborate with the Three Parties with respect to calibration or research on FTS’s L1 processing algorithms, solely for the purpose of carrying out such activities.

Table 1 List of GOSAT data products

Processing level	Sensor /band	Product Name	Category	Unit	Format
L1A	FTS	FTS L1A data	Internal	FTS scene	HDF5
	CAI	CAI L1A data	Internal	CAI scene	
L1B	FTS	FTS L1B data	Standard	FTS scene	
	CAI	CAI L1B data	Standard	CAI frame	
L1B+	CAI	CAI L1B+ data	Standard		
L2	FTS SWIR	L2 CO2 column amount (SWIR)	Standard	1 - multiple scans	
		L2 CH4 column amount (SWIR)	Standard		
		L2 H2O column amount (SWIR)	Standard		
	FTS TIR	L2 CO2 profile (TIR) <sup>(Note 1)</sup>	Standard		
		L2 CH4 profile (TIR) <sup>(Note 1)</sup>	Standard		
		L2 H2O column amount (TIR)	Research		
	CAI	L2 cloud flag	Standard	CAI frame	
		L2 cloud property	Research		
		L2 aerosol property	Research		
L3	FTS SWIR	L3 global CO2 distribution (SWIR)	Standard	Global (monthly average)	
		L3 global CH4 distribution (SWIR)	Standard		
	CAI	L3 global radiance distribution	Standard	Global	
		L3 global reflectance distribution	Standard		
		L3 NDVI	Standard		Lat. 30°× Lon. 60°
L4A	—	L4A global CO2 flux	Standard	64 regions across the globe, 1° mesh (annual)	Text or Net CDF
		L4A global CH4 flux	Standard	43 regions across the globe, 1° mesh (annual)	
L4B	—	L4B global CO2 distribution	Standard	Global 2.5° mesh (monthly)	Net CDF
		L4B global CH4 distribution	Standard		

\* "L" is an abbreviation for "Level." E.g., "L1" means "Level 1."

(Note 1) Formerly defined research products of "FTS TIR L2 temperature profile" and "FTS TIR L2 H2O profile" are no longer defined as discrete products. However, this information is included in data records "FTS TIR L2 CO2 profile" and "FTS TIR L2 CH4 profile".

Standard products are provided at different stages in accordance with the progress of calibration, validation and comparison. These stages are defined per each level as described in Table 2 – Table 5. As for Internal products, there is no such stage to be defined. Stages of research products are defined appropriately by those who deliver them.

Table 2-1 Definitions of the calibration stages for L1 standard products (at initial stage)

Calibration stage	Definition	Target schedule for data distribution (months after the launch)
Unchecked(U)	Products are generated by simply processing the observation data.	
Preliminarily checked(P)	Products visually checked and found as reliable.	3
Calibrated(Ca)	Products provided after calibrating the sensors and verifying the appropriateness.	6
Confirmed(C)	Products with necessary corrections made to remedy the problems reported during the certain period of time by the limited users of the calibrated products.	9

Table 2-2 Definitions of the calibration stages for L1 standard products (at version upgrade stage)

Calibration stage	Definition
Unchecked(U)	Products are generated by simply version-upgrading the observation data.
Preliminarily checked(P)	Products visually checked and found as reliable after version-upgrade.
Calibrated(Ca)	Products provided after calibrating the sensors and verifying the appropriateness after version upgrade processing.
Confirmed(C)	Products with no corrections necessitated or with necessary corrections made to remedy the problems reported during the certain period of time by the limited users of the calibrated products.

Table 3-1 Definitions of the validation stages for L2 standard products (at initial stage)

Validation stage	Definition	Target schedule for data distribution (months after the launch)
Unchecked(U)	Products simply processed from Level 1.	
Preliminarily checked(P)	Products that are processed from Level 1 and seem reliable by visual checking.	4
Validated(V)	Products compared with other products acquired by higher-accuracy methods (e.g., ground-based observation) and deemed as sufficiently accurate.	9
Confirmed(C)	Products with necessary corrections made to remedy the problems reported during the certain period of time by the limited users of the validated products.	12

Table 3-2 Definitions of the validation stages for L2 standard products (at version upgrade stage)

Validation stage	Definition
Unchecked(U)	Products simply processed by the version-upgraded procedure.
Preliminarily checked(P)	Products visually checked and found as reliable after being processed by the version upgrade procedure.
Validated(V)	Products whose validity is ensured by comparing/analyzing with other observation data of higher precision such as ground-based data.
Confirmed(C)	Products with corrections necessitated or with necessary corrections made to remedy the problems reported during the certain period of time by the limited users of the validated products.

Table 4 Definitions of the evaluation stages for L3 standard products

Evaluation stage	Definition
Unchecked(U)	Products are generated by simply processing L1 or L2 products.
Evaluated(E)	Products visually checked and found as reliable after processing L1 or L2 products.
Confirmed(C)	Products with corrections necessitated or with necessary corrections made to remedy the problems reported and users' comments logged as points to be noted, during the certain period of time by the limited users of the evaluated products.

Table 5 Definitions of the check stages for L4 standard products

Check stage	Definition
Unchecked(U)	Products are generated by simply processing L2 products and ground-based observation or other data using carbon balance analyzing algorithm.
Preliminary checked(P)	Products visually checked and found as reliable after processing L2 products and ground-based observation or other data using carbon balance analyzing algorithm.
Checked(Ch)	Products with no corrections necessitated or with necessary corrections made to remedy the problems reported and users' comments logged as points to be noted, during the certain period of time by the professional users of the preliminary checked products.
Confirmed(C)	Products with no corrections necessitated or with necessary corrections made to remedy the problems reported and users' comments logged as points to be noted, during the certain period of time by the limited users of the checked products.

## 10. User Category

Table 6 shows the categories of GOSAT data users.

Table 6 User categories

User Category <sup>(Note 2)</sup>	Definition
Project Staff(PS)	Researchers, scientists, staff members, etc. who belong to the GOSAT Project implementation body (Three Parties) and engage in the GOSAT Project or those who belong to other organizations but engage in the GOSAT Project as contractors to any of the Three Parties.
RA Investigator(RA)	PI and Co-I <sup>(Note 3)</sup> approved and registered by all of the Three Parties.
RA* Investigator(RA*)	An RA Investigator who is engaged in a research theme in the algorithm or calibration/validation fields and is approved and registered by all of the Three Parties.
Science Team Member(ST)	A member of the GOSAT Science Team organized by the Three Parties. (Includes leaders and sub-leaders of working groups.)
Alliance Organizations (sensor development, research, data processing, provision of necessary data)(AO1)	An organization which has signed a cooperative agreement with any of the Three Parties under approval of the Three Parties concerning the collaboration in the aspect of sensor development, calibration/validation, research, and data processing or provision of data necessary for the GOSAT data processing. Note that an investigator <sup>(Note 4)</sup> with whom an AO1 has concluded an agreement solely for the purpose of carrying out the above-mentioned activities and who is recognized by all of the Three Parties is regarded as a member of the AO1.
Alliance Organizations (data distribution)(AO2)	An organization which has signed a cooperative agreement with any of the Three Parties under approval of the Three Parties concerning the collaboration in the aspect of distribution of the GOSAT data.
General User(GU)	All data users other than those defined above.

(Note 2) The parenthesized characters in “User Category” are the abbreviation for each User Category.

(Note 3) PI stands for Principal Investigator representing a research theme approved by the Three Parties as a result of the RA selection. Co-I stands for Co-Investigator participating in a research theme approved by the Three Parties as a result of the RA selection.

(Note 4) An investigator here may be a user of higher-level data processed by an AO1.

## 11. Release of GOSAT data products

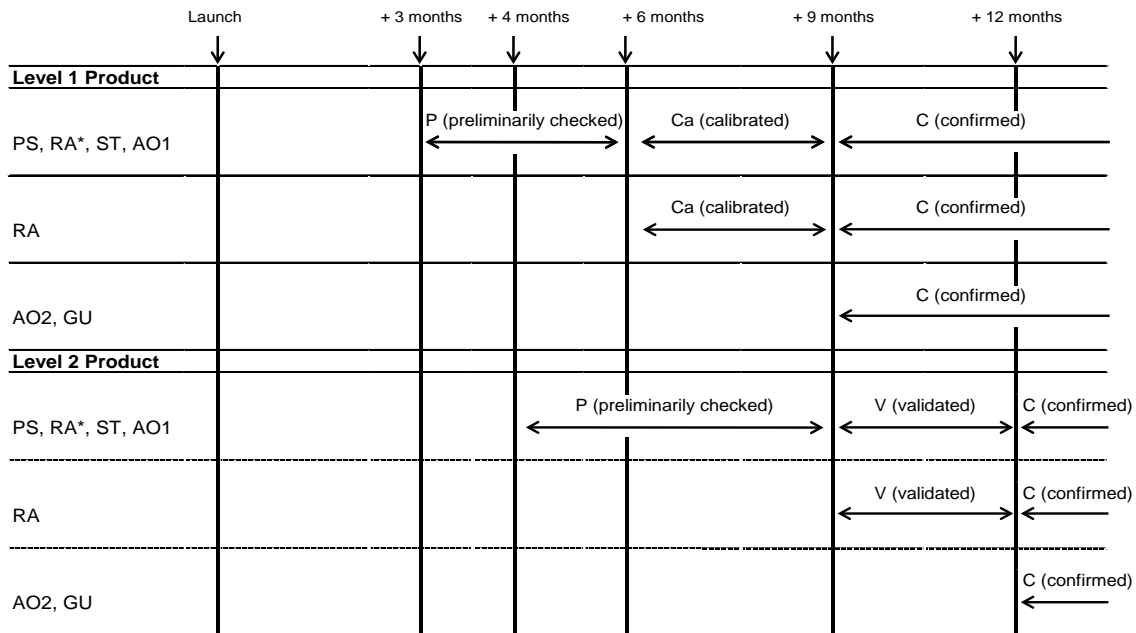
This section of the document defines the timing of data release as follows:

### (1) Release of data products

#### (a) Standard products

Figure 1 shows a timeline for releasing Level 1 and Level 2 products at initial stage.

Figure 1 Release of Level 1 and Level 2 products



At initial stage, as for Level 1 products, unchecked products are scheduled to be released to PS, RA\*, ST, and AO1, three (3) months after the launch, and calibrated products to RA six (6) months after the launch when the calibration is completed. Confirmed products will be released to AO2 and GU, targeting nine (9) months after the launch.

At initial stage, Level 2 products are planned to be released to PS, RA\*, ST, and AO1 four (4) months after the launch with respect to preliminarily checked products, to RA nine (9) months after the launch as to validated products, and to AO2 and GU twelve (12) months after the launch regarding confirmed products.

After initial stage, the same procedure as the initial stage is taken when products are version-upgraded, however, the timing of product release at each stage is determined by the Three Parties.

Level 3 and Level 4 products will be released following the stages as shown in Table 9 and 10.

Table 7 – Table 10 show relationships between stages of product availability and user categories.

Table 7 Relationships between stages of L1 standard product availability and user categories

User Category	Stages of product availability		
PS, ,RA*, ST, AO1	P(Preliminary checked)	Ca(Calibrated)	C(Confirmed)
RA except RA*		Ca(Calibrated)	C(Confirmed)
AO2, GU			C(Confirmed)



Table 8 Relationships between stages of L2 standard product availability and user categories

User Category	Stages of product availability		
PS, RA*, ST, AO1	P(Preliminary checked)	V(Validated)	C(Confirmed)
RA except RA*	V(Validated)		C(Confirmed)
AO2, GU	C(Confirmed)		

Table 9 Relationships between stages of L3 standard product availability and user categories

User Category	Stages of product availability	
PS, RA, ST, AO1	E(Evaluated)	C(Confirmed)
AO2, GU	C(Confirmed)	

Table 10 Relationships between stages of L4 standard product availability and user categories

User Category	Stages of product availability		
PS, (part of)RA <sup>(Note 5)</sup>	P(Preliminary checked)	Ch(Checked)	C(Confirmed)
RA, AO1, ST	Ch(Checked)		C(Confirmed)
AO2, GU	C(Confirmed)		

(Note 5) PIs and Co-Is who belong to “carbon balance estimation” or “atmospheric transport models” fields of research.

(b) Research products

Level 2 – Level 4 products, to an extent necessary for research activities, will be provided to PS, RA, ST, and AO1 at an appropriate time.

(c) Internal products

Level 1A products, to an extent necessary, will be provided to special users approved by JAXA at an appropriate time.

12. Expense charged for GOSAT data products distribution

Users will be charged actual expenses necessary for reproduction of the data, etc. In case of on-line distribution, however, the data will be provided free of charge.

Incidentally, a limited number of products will be distributed for free for the purposes of promotion and education that contribute to the activities of the Three Parties.

13. Rights associated with the GOSAT data

- (1) The Three Parties shall own all intellectual property rights including but not limited to copyrights in relation to all the data they provide.

- (2) When a user has generated a higher-level, value-added data product<sup>(Note 6)</sup>, the Three Parties shall not exercise their copyrights, i.e., rights as the copyright holders of the original data, to the derivative data and the user may use the value-added data based on his/her own copyrights as the developer of the data.
- (3) The Three Parties shall be entitled to use the higher-level, value-added data products generated by RA or AO1 only when the Three Parties use such data for the development of Earth-observing systems or Earth science research.

(Note 6) High-level, value-added products are, of modified products, those that have been modified by applying high-level data processing and which are irreversible to the original data. High-level data processing here includes data analyses or a combination of satellite data acquired by different missions, image processing based on external information other than the original data, conversion to physical quantities, and so forth.

#### 14. Terms and conditions concerning the use of the GOSAT data

- (1) The use of the data for any purpose in opposition to peaceful use is prohibited.
- (2) Any publication of outcomes obtained in consequence of the use of the data must be accompanied by any one of the following indications.
  - (a) JAXA/NIES/MOE
  - (b) Japan Aerospace Exploration Agency / National Institute for Environmental Studies / Ministry of the Environment

The user is also required to indicate that the original data are provided by JAXA/NIES/MOE, if he or she has generated higher-level, value-added data and wishes to provide a third party with the value-added data or publish them.

When each indication required above is difficult, as in the case of an academic paper for example, it is to be shown at the end of the paper or anywhere appropriate.

- (3) Users are allowed to redistribute standard products to a third party; as for products other than standard, users are prohibited to use the data for any other purpose than the users' and to redistribute the data to a third party.
- (4) No usage fee is charged except for the expense for distribution mentioned at 12 above on the standpoint of promoting the use of the GOSAT data.
- (5) Use of the GOSAT data and/or higher-level, value-added data under the mechanisms of the Kyoto Protocol, namely the Joint Implementation (Article 6 thereof), Clean Development Mechanism (Article 12 thereof), and the International Emissions Trading (Article 17 thereof), is prohibited without consent of the Three Parties. Any use for such a purpose may be allowed if the PI obtains an approval of and concludes a contract with the Three Parties in advance.
- (6) Users who obtain the GOSAT data for the purposes of earth observing system development and geoscience research are required to report on or publish their research results. In a case where

a user wishes to publish his/her outcomes from the use of the data from three (3) to nine (9) months after the launch, he or she is required to send a copy of the outcomes to the Third Parties.

- (7) The Three Parties shall not be liable for any missing data, degradation of data quality, delay in data delivery, or any other situation in which the data cannot be provided, as a result of problems that occur to the spacecraft or the ground facilities.

- 15. JAXA and NIES shall not exchange the personal information of their users with each other. If necessary, JAXA or NIES will inform the other of statistical information on the types of users and products with regard to the data provided.

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