Thermal And Near infrared Sensor for carbon Observation (TANSO)
onboard
the Greenhouse gases Observing SATellite (GOSAT)

Research Announcement

Appendix F

User Category, Glossary and Abbreviation List

F.1 User Category

Users of GOSAT products are categorized as follows.

F.1-1 Categories of GOSAT product users

User category	Description
Project staff (PS)	Researchers, scientists, staff members, etc. who belong to the GOSAT Project implementation body (Three Parties) or those who belong to other organizations but engage in the GOSAT Project as contractors to the Three Parties.
RA Investigator (RA)	A researcher carrying out the research on a theme accepted in the RA who is registered as PI (Principal Investigators) or Co-I (Co-Investigators) and given approval to obtain the GOSAT data by the Three Parties.
RA* Investigator (RA*)	An RA Investigator who researches on a theme in the data processing algorithm, calibration, or validation fields.
RA+ Investigator (RA+)	An RA Investigator who researches on a theme in the carbon balance estimation and atmospheric transport models or data application fields.
RA-Mo Investigator (RA-Mo)	An RA Investigator who researches on a theme in the carbon balance estimation and atmospheric transport models field.
Science Team member (ST)	Member of the GOSAT Science Team.
Science Team member* (ST*)	A Science Team member who especially researches on a theme in the data processing algorithm, calibration, or validation fields.
General user (GU)	A general GOSAT data user who does not fall under any of the above categories.

F.2 Glossary and Abbreviations List

The following tables list up and explain the terms and abbreviations used in the RA.

Table F.2-1 Glossary

Term	Description
RA Investigator	An investigator who carries out the research on a theme selected in the RA and is registered as PI (Principal Investigators) or Co-I (Co-Investigators) by the Three Parties.

Term	Description
RA Selection and Evaluation Committee (The Committee)	A committee which selects research proposals submitted in response to the RA and provides the Three Parties with advice in the process of selecting research themes. The committee also evaluates the research progress as well as results reported by the RA Investigators and advises the Three Parties of the evaluation results.
Apodization	It represents a convolution procedure using a pseudo weighting function (apodizing function) as a function of the optical path difference when the interferogram is Fourier-transformed into the spectrum. The interferogram is multiplied by the apodizing function before the Fourier transform. In the case of no apodization, the instrumental line shape function is the sinc function. Generally, the apodization makes the full width at half maximum of a instrumental line shape function larger, although unphysical oscillation of the sinc function is suppressed.
Along-track direction	Flight direction of the satellite on the spacecraft fixed coordinates.
Interferogram	Patterns of interferometric light obtained as a result of the following steps: i) split incident light into two beams using the beam splitter, ii) change one of the path lengths of the two split beams, and iii) let the two beams of light interfere with each other again.
Inverse model	A method (model) to estimate the sources and sinks and the emission and absorption of atmospheric constituents of interest, such as CO_2, using observation data such as the GOSAT data, with the combined use of atmospheric transport models and statistical techniques.
Aerosol	A microscopic liquid or solid particle floating in the atmosphere.
Original data	GOSAT data products provided by JAXA or NIES. This should be distinguished from the data obtained as a result of the research carried out by RA Investigators.
Observation request	A request for specific data acquisition for a specific purpose, such as an observation over a calibration/validation site, which is not covered by GOSAT's routine observation (in lattice point).
Geometric correction	A process of correcting the positional information in observation data, such as band-to-band registration, correction of the latitude and longitudes of observation points based on elevation information, etc.
Gaseous column amount (column abundance)	The total amount of gas present in the vertical air column per unit area. (Number of molecules per unit area).

Term	Description
Gaseous concentration profile	Vertical distribution of gaseous concentrations (Number of molecules per unit area or volumetric ratio of the target species per unit area)
Rectangle	A rectangle (60 deg. x 30 deg. (lat. x lon.)) is the unit to archive CAI L3 normalized-difference vegetation index (NDVI) product. The globe is divided into 36 rectangles, separating from 25 degree west by 60 degree in longitudinal eastward direction, and from 90 degree north by 30 degree in latitudinal southward direction.
Region	A region is the unit defined for L4A data product. The globe is divided into 64 sub-continental regions and a net source and sink of greenhouse gases is estimated per each region. L4A data product shows the monthly estimated net source and sink of greenhouse gases for 64 regions in a global map.
Cross-track direction	The direction perpendicular to the flight direction of the satellite on the satellite fixed coordinates.
Gain	The signal amplification factor used for amplifying signals to an appropriate signal processing level (voltage), set up by using commands for every brightness (light intensity) of observation targets. For GOSAT, there are three gain setting levels each for FTS and CAI: L (Low), M (Middle), and H (High).
Check stage	GOSAT L4 data products will undergo the following three check steps before released and distributed to users. (i) Initial check Visual check on the result of the product generated by the carbon balance analysis calculated from the L2 products and data of the ground-based observation stations. (ii) Check analysis: Check the preliminarily checked products by the expert users for a certain period of time. (iii) Confirmation after the distribution: Check to be performed after releasing the products to limited users, to see if any problem with the products is reported or not after a certain period of time. The products are categorized into four stages in the process of these check steps, namely U (Unchecked), P (Preliminarily checked), Ch (Checked), and C (Confirmed). These stages are termed the “check stages”.

Term	Description
Validation stage	GOSAT L2 and L3 products will undergo the following three validation steps before released and distributed to users. (i) Initial check Visual check on the result of processing of certain observation data, in order to confirm the validity of calibration of the sensor characteristics and data processing algorithms. (ii) Validation analysis: Comparison of GOSAT observation data with validation data, in order to evaluate the reliability of the products. (iii) Confirmation after the release: Check to be performed after releasing the products to limited users, to see if any problem with the products is reported after a certain period of time. The products are categorized into four stages in the process of these validation steps, namely U (Unchecked), P (Preliminarily checked), V (Validated), and C (Confirmed). These stages are termed the "validation stages".
Co-I (Co-Investigator)	An investigator who carries out the research on a theme selected in the RA and is approved and registered as Co-I (Co-Investigators) by the Three Parties.
Calibration stage	GOSAT L1 data products will undergo the following three calibration steps before released and distributed to users. (i) Initial check Visual check on the result of processing of certain observation data, in order to confirm calibration results of the sensor characteristics. (ii) Calibration analysis: Check the preliminarily checked products after the initial sensor calibration activity. (iii) Confirmation after the release: Check to be performed after releasing the products to limited users, to see if any problem with the products is reported or not after a certain period of time. The products are categorized into four stages in the process of these calibration steps, namely U (Unchecked), P (Preliminarily checked), Ca (Calibrated), and C (Confirmed). These stages are termed the "calibration stages".

Term	Description
Corner cube	A trihedral made up of three planer reflectors which are perpendicular to each other. The light injected into the trihedral bounces on each of the three planes and will always return to the incident direction.
Science Team	An organization established for the purpose of providing the GOSAT Project with scientific advice.
Sunglint	Specular reflection of the sunlight on the water surface, in general. In this phenomenon, the specular reflection point is on the same plane as the sun and the sensor, and the reflection angle is the same as the incidence angle. However, as the intensity of the reflected light reaching the sensor is the strongest in the vicinity of such a reflection point, FTS observes the vicinity of specular reflection points for its water-surface observation.
Scene	(i) FTS scene FTS scene of L1 data product is defiened to have a span covered by the observation performed in a time 1/60 of the one-revolution period; the start of the first scene corresponds to the ascending node passing time. A scene of FTS data is the unit to achive FTS L1 data products. (ii)CAI scene A CAI scene is defined to have a span covered by the observation performed in one-revolution; the start of the scene corresponds to the ascending node. A scene of CAI data is the unit to archive CAI L1A products. TANSO-CAI usually acquires data during the daytime area on the ground ; accordingly, a CAI scene has a strech of data for the continuous daytime area (nighttime area are not included).
Scan	The unit of acquisition of one interferogram by FTS.
Instrument function calibration	Calibration performed with consideration given to the wavelength dependence of the sensitivity.
Atmospheric transport model	A numerical model to estimate the distribution of an atmospheric constituent of interest (e.g., CO_2, CH_4) and its variation under certain condition. In case of CO_2 (or CH_4), the model simulates the variation of its concentration based on the existing flux data, with meteorological data (air temperature, wind parameters, etc.) and chemical reactions in the atmosphere taken into consideration.
Dichroic filter	An optical filter which passes only light with specific wave number band and reflects the other.

Term	Description
Sun-synchronous sub-recurrent orbit	An orbit combining a sun-synchronous orbit and a sub-recurrent orbit, having the characteristics of the two. In the former orbit, the orbital plane of the satellite rotates once while the earth revolves the sun once (one revolution). In the latter orbit, the satellite returns to almost the same orbit at a certain interval (recurrence). GOSAT returns to almost the same footprint after 44 orbits in three days. The descending node time (local solar time) is adjusted to around 13 o'clock, and the local time at the nadir point of the satellite is almost the same time at medium and low latitudes.
Carbon flux estimation model	A model to estimate the emission and absorption of carbons for a region (a certain scale which the entire globe is divided into), based on the distributions of CO_2, etc. in the atmosphere obtained by GOSAT or otherwise together with meteorological data.
Observation in lattice point	Regular observation of FTS on the fixed ground points (lattice points). In all the five pointing modes (depending on the number of points per scan, 1, 3, 5, 7, or 9), the sensor observes the same footprint every recurrence after three days.
Specific point observation	Observation over specific ground points other than the lattice points observed in the routine observation, such as calibration/validation sites, observation points along a natural gas pipeline, etc.
Carbon emission inventory	Information on the human-induced emission of carbon dioxide etc. for areas obtained based on the investigation.
(Light) Band pass filter	An optical filter which passes only light with a certain wavelength range and rejects (attenuates) light with wave numbers outside that range.
Full-width at half maximum (FWHM)	An indicator of the spread (width) of a chevron-shaped function, such as instrument function. It is defined as the difference in the wavelengths or wave numbers at the two points where the value of the unimodal function marks a half of its maximum.
PI (Principal Investigator)	The abbreviation of the Principal Investigator, who represents the group of investigators who engage in the research activities on the research theme adopted in the RA and serves as the contact person to the Three Parties on all matters relating to the joint research agreement.

Term	Description
Beam splitter	An optical device which splits a light flux into two. A part of the light injected into the beam splitter reflects back and the other part penetrates. A beam splitter which splits polarization components is called a polarized beam splitter.
Evaluation stage	GOSAT L3 products will undergo the following two evaluation steps before released and distributed to users. (i) Initial check Visual check of L3 products processed from certain L2 products, in order to evaluate the results. (ii) Confirmation after the release: Check to be performed after releasing the products to limited users, to see if any problem with the products is reported or not after a certain period of time. The products are categorized into three stages in the process of these validation steps, namely U (Unchecked), E (Evaluated), and C (Confirmed). These stages are termed the "evaluation stages".
Fourier Transform Spectrometer (FTS)	An observing instrument which observes the incident interfering signal (interferogram) acquired with the interferometer, and Fourier-transforms the signal into radiance spectra. In the GOSAT Project, the spectrometer is applied to measure the absorption or radiance spectra of CO_2, CH_4, etc.
Product	Digital information or its electronic file, containing the processed results of GOSAT observation data, prepared in the predetermined format for distribution to users. Product is also said as data product.
Product distribution request	A request made by an RA investigator for provision of data products necessary for implementing the research on the selected theme.
Frame	A frame is the unit for CAI products, defined by dividing one revolution length of GOSAT's trajectory mapped on the ground surface into 60. A frame of CAI data is the minimum unit to archive CAI L1B, CAI L1B+, and most of CAI L2 products.
Spectral resolution	The minimum difference in wavelength, in case of the wavelength resolution, or wave number, in case of the wave number resolution, that the spectrometer can determine.
Polarization	Light of which the electric or magnetic field oscillates in a specific direction.

Term	Description
Radiometric calibration	Conducting correct engineering conversion of integer numbers (digital numbers, DN) to radiance values, by using various kinds of observation data and conversion formula.
Maneuver	An activity to control the attitude, speed, etc., consequently orbit, of the spacecraft, by thrusting its control engine, etc. It is performed in order to maintain or change the spacecraft to the expected attitude or orbit.
Land ecosystem model	A model which expresses the exchange processes of heat, water, carbon, etc. (e.g., photosynthesis, respiration) between the land vegetation ecosystem, comprised of forest, pasture, etc., and the atmosphere.

Table F.2-2 Abbreviation List

Abbreviation	Description
ADEOS	ADvanced Earth Observation Satellite
ADEOS-II/GLI	ADvanced Earth Observation Satellite-II/GLobal Imager
AERONET	AErosol RObotic NETwork
AIRS	Atmospheric InfraRed Sounder
ALOS	Advanced Land Observing Satellite
ASE	Association of Space Explorers
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ASTER GDEM	ASTER Global Digital Elevation Model
AT	Along Track
CAI	(See TANSO-CAI)
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation
CAM	monitor CAMera
CME	Continuous CO2 Measuring Equipment
CNES	Centre National d'Etudes Spatiales (in French) : National Center of Space Studies (in English)
CSIRO	Commonwealth Scientific and Industrial Research Organization
CT	Cross Track
DB	Diode Box
DEM	Digital Elevation Model
ENVISAT	ENVIronmental SATellite
EOS	Earth Observing System (NASA Project)
FFT	Fast Fourier Transform
FTS	Fourier Transform Spectrometer, or see TANSO-FTS
GAW	Global Atmosphere Watch (WMO Project)
GCP	Ground Control Point
GOME	Global Ozone Monitoring Experiment
GOSAT	Greenhouse gases Observing SATellite
GSFC	Goddard Space Flight Center(NASA)
GSHHS	Global Self-consistent Hierarchical High-resolution Shorelines
HDF	Hierarchical Data Format
HITRAN	HIgh-resolution TRANsmission molecular absorption database

Abbreviation	Description
HSTAR	High-resolution System for Transfer of Atmospheric Radiation
IASI	Infared Atmospheric Sounding Interferometer
IGM	InterferoGraM
IIR	Imaging Infrared Radiometer
ILAS	Improved Limb Atmospheric Spectrometer
ILS	Instrument Line Shape
IMG	Interferometric Monitor for Greenhouse Gas
IRS	Indian Remote Sensing satellite
JAXA	Japan Aerospace Exploration Agency
JERS	Japanese Earth Resources Satellite
JPL	Jet Propulsion Laboratory
LLM	Light Load Mode
LUT	Look Up Table
MAP	Maximum A Posteriori
MDP	Mission Data Processor
MODIS	MODerate resolution Imaging Spectroradiometer
MOE	Ministry Of the Environment of Japan
MOS	Marine Observation Satellite
MTF	Modulation Transfer Function
NDACC	Network for the Detection of Atmospheric Composition Change
NDVI	Normalized Difference Vegetation Index
NetCDF	Network Common Data Form
NIES	National Institute for Environmental Studies (Japan)
NIR	Near InfraRed
NOAA	National Oceanic and Atmospheric Administration
OCO	Orbiting Carbon Observatory (NASA Spacecraft)
OMI	Ozone Monitoring Instrument
POLDER	POLarization and Directionality of the Earth's Reflectances
PPDF	Photon Pathlength Distribution Function
PRISM	Panchromatic Remote sensing Instrument for Stereo Mapping
RA	Research Announcement

Abbreviation	Description
RAMCES	Reseau Atmospherique de Mesure des Composes a Effet de Serre (in French) : Near Real Time CO2 Concentration (in English)
ROLO	RObotic Lunar Observatory
RSTAR	Remote sensing System for Transfer of Atmospheric Radiation
SAR	Synthetic Aperture Radar
SCIAMACHY	SCanning Imaging Absorption spectroMeter for Atmospheric CartograpHY
S-LLM	Super-Light Load Mode
SNR	Signal to Noise Ratio
SPOT	Satellite Pour l'Observation de la Terre
SPRINTARS	Spectral Radiation-Transport Model for Aerosol Species
SRTM	Shuttle Radar Topographic Mission
SST	Sea Surface Temperature
ST	Science Team
SWIR	Short Wavelength InfraRed / Short Wave Infrared Radiometer
TANSO	Thermal And Near infrared Sensor for carbon Observation
TANSO-CAI	TANSO－Cloud and Aerosol Imager
TANSO-FTS	TANSO－Fourier Transform Spectrometer
TCCON	Total Carbon Column Observing Network
TES	Tropospheric Emission Spectrometer
TIR	Thermal Infrared Radiometer
TOMS	Total Ozone Mapping Spectrometer
TRANSCOM	atmospheric tracer TRANSport model interCOMparison project
TRMM	Tropical Rainfall Measuring Mission
U, E, C	Unchecked, Evaluated, Confirmed (Stages of Evaluation)
U, P, Ca, C	Unchecked, Preliminarily checked, Calibrated, Confirmed (Stages of Calibration)
U, P, Ch, C	Unchecked, Preliminarily checked, Checked, Confirmed (Stages of Check)
U, P, V, C	Unchecked, Preliminary checked, Validated, Confirmed (Stages of Validation); Unchecked, Preliminary checked, Validated nominally (for L2 research products)
USGS	U.S. Geological Survey
VGA	Video Graphics Array

Abbreviation	Description
WDCGG	World Data Centre for Greenhouse Gases
WFC	high-resolution Wide Field Camera
WMO	World Meteorological Organization
WWW	World Wide Web
ZPD	Zero Path Difference