Initial Calibration of Observation Data (CO_2 Concentrations) from the Greenhouse gasses Observing SATellite "IBUKI" (GOSAT)

September 18th, 2009

GOSAT Project Office
Center for Global Environmental Research
National Institute for Environmental Studies
Satellite Remote Sensing Section leader: Tatsuya Yokota
(029-850-2550)
GOSAT Project Office manager: Hiroshi Watanabe
(029-850-2035)

Japan Aerospace Exploration Agency
Public Affairs, Press Group
Press Group manager: Tatsuo Oshima
(03-6266-6413)
Person in charge: Asuka Hagiwara
(03-6266-6414)

The Japan Aerospace Exploration Agency (JAXA), the National Institute for Environmental Studies (NIES), and the Ministry of the Environment (MOE) are jointly promoting the Greenhouse gasses Observing SATellite "IBUKI" Project (GOSAT, launched on January 23, 2009). Recently, an initial calibration of the level 1 data products has been completed.

Figures presented at this press release are a set of (not-validated) global maps derived from CO_2 column averaged dry air mole fraction (XCO_2) for cloud-free scenes over land and sea, using the data reflecting the initial calibration (not-validated).
Details of this analysis are also available at the following websites:
http://www.gosat.nies.go.jp/ or http://www.jaxa.jp/

From this day forth, the level 2 data (CO_2 column abundance data), which is processed from the level 1 data (spectral radiance data) reflecting the Initial Calibration results, is under validation. In near future, the level 1 data, further calibrated from now on, will

be released to the general users. In addition, newly calibrated level 1 data will be analyzed and processed to the level 2 data (CO_2 column abundance data), which will be distributed to the general users after a series of validation processes.

Attachment 1: Global distribution of XCO_2 derived from the short wavelength infrared (SWIR) band data obtained with TANSO-FTS* mounted on IBUKI for cloud-free scenes over land and sea for a one-month period between August 1 and 31, 2009.

Attachment 2: Smoothed global distribution of XCO_2, which is spatially inter- and extrapolated.

[Reference Information]
Current status of the data analysis of the Greenhouse gases Observing SATellite "IBUKI" (GOSAT)

Initial calibration mode of IBUKI has been completed and IBUKI is currently operating nominally. Routine data processing of the observed data are on going at JAXA and NIES. In the mean time, the validation of XCO_2 is conducted at NIES (note 1).

The figure in attachment 1 shows global distribution of clear-sky XCO_2 derived from the data acquired over land for a one-month period between August 1 and 31, 2009. The figure in attachment 2 is a smoothed global distribution of XCO_2, which is spatially inter- and extrapolated. (Both figures are not validated yet). These XCO_2 data show a hemispheric gradient, with smaller values in the Northern hemisphere at high latitude due to more active plant photosynthesis as being summer than the Southern hemisphere. This result is broadly in agreement with existing ground-based measurements. It should be acknowledged that the current analysis is based on not-validated data and consequently it is not appropriate to scientifically interpret estimated individual XCO_2 value as well as details in its global distributions. Future work will include a reanalysis of these data, accounting for the results of validation activities, and adjusting the data processing parameters.

(Note 1) Column average dry air mole fraction(XCO_2) : The fraction of moles of a particular component of air divided by the total number of moles of gas in the same sample bound by a vertical column extending to the upper air, and not just on the ground surface.

In the future, after confirming the accuracy of processing activities for observation data and of validation activities based on comparison with ground-based observations, calibrated observation spectrum data (TANSO-FTS data) and observation image data (TANSO-CAI data) (level 1 product) will be distributed to registered general users nine months after the satellite launch (late October 2009). Validated carbon dioxide and methane column abundances and cloud flag data (level 2 product) will be distributed 12 months after the satellite launch (early February, 2010).

Furthermore, monthly distribution data of greenhouse gas concentration will be generated. In future work, level 2 products from IBUKI and concentration data measured at ground-based monitoring stations will be combined to generate a product showing surface fluxes of carbon on a regional basis over the globe.

*TANSO-FTS: Thermal And Near Sensor for carbon Observation – Fourier Transform Spectrometer)
*TANSO-CAI: Thermal And Near infrared Sensor for carbon Observation – Cloud and Aerosol Imager)

Attachment 1: Global distribution of XCO_2 from level 2 data of TANSO-FTS SWIR derived from initially calibrated level 1 data (Not validated)
(This is calculated based on the observation data for a one-month period between August 1 and 31, 2009)

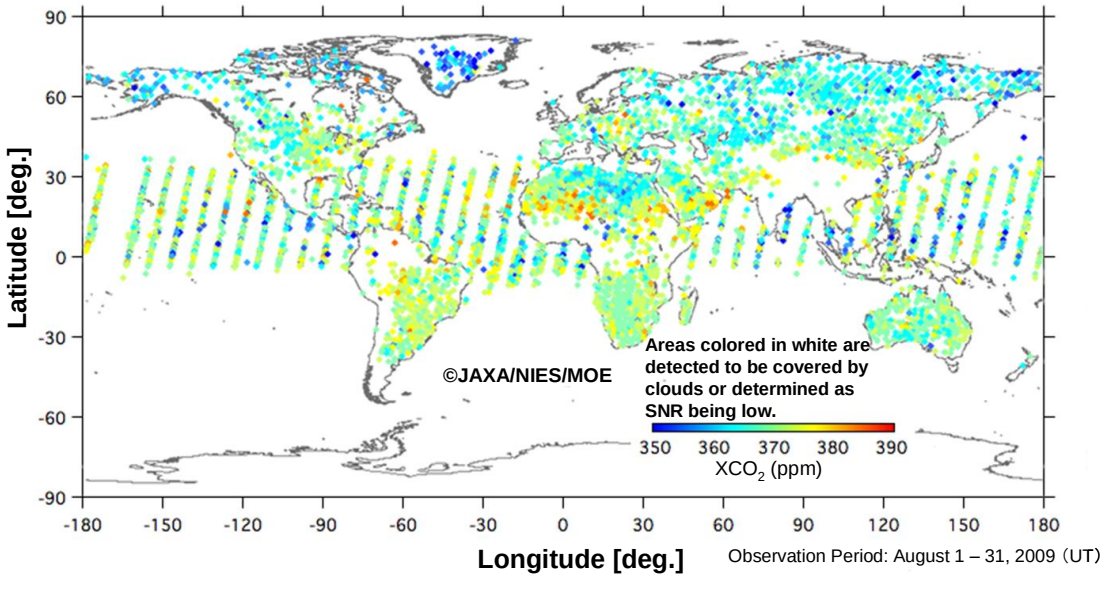
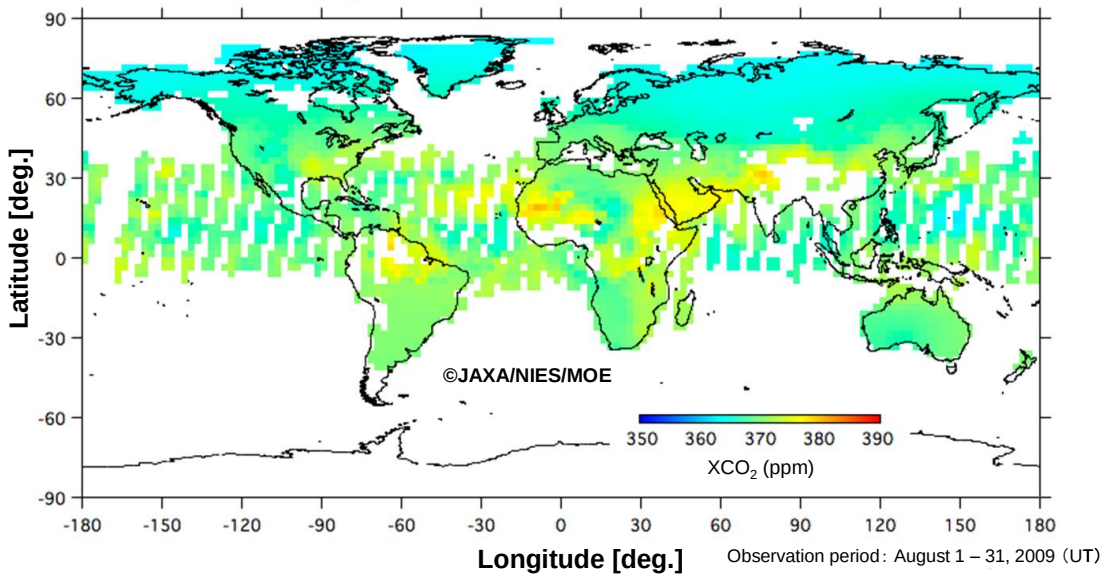


Figure: Global distribution of XCO_2 for clear-sky scenes analyzed using observations at shortwave infrared bands (initially calibrated spectral radiance data) from the IBUKI greenhouse gas observation sensor (TANSO-FTS). Clear-sky scenes at individual TANSO-FTS observation points are determined using measurements from the cloud/aerosol sensor (TANSO-CAI). Data are excluded where clouds are detected, and where noise is relatively large due to weak ground surface reflection.

Regarding the surfaces of oceans, FTS observes the vicinity of specular reflection points of the sunlight over water (Sunglint observation). Valid data is available only where the sun elevation is high.

These XCO_2 data show a hemispheric gradient, with smaller values in the Northern hemisphere at high latitude due to more active plant photosynthesis as being summer than the Southern hemisphere. This result is broadly in agreement with existing ground-based measurements. It should be acknowledged that the current analysis is based on not-validated data and consequently it is not appropriate to scientifically interpret estimated individual XCO_2 value as well as details in its global distributions. Future work will include a reanalysis of these data, accounting for the results of validation activities, and adjusting the data processing parameters.

Attachment 2: Smoothed global distribution of XCO_2, which is spatially inter- and extrapolated. (Not validated)
(This is calculated based on the observation data for a one-month period between August 1 and 31, 2009)



This figure shows a smoothed XCO_2 distribution with mesh of latitude 2.5° x longitude 2.5°, calculated by applying statistical approach called Kringing method, which is essentially spatial inter- and extrapolation. Where observation points do not exist within 250km, the cell is shown as white.

These XCO_2 data show a hemispheric gradient, with smaller values in the Northern hemisphere at high latitude due to more active plant photosynthesis as being summer than the Southern hemisphere. This result is broadly in agreement with existing ground-based measurements. It should be acknowledged that the current analysis is based on not-validated data and consequently it is not appropriate to scientifically interpret estimated individual XCO_2 value as well as details in its global distributions. Future work will include a reanalysis of these data, accounting for the results of validation activities, and adjusting the data processing parameters. Additionally, considering the properties of actual observation data, the data processing parameters for inter- and extrapolation method and smoothing will be further improved.

Kringing method: A technique to estimate a value at an arbitrary non-observed point without bias, by taking weighting average of limited number of observation data. In order to estimate accurate value at areas other than the observing points, the analyzing process should require modeling the relationship of the values between neighboring points in space.