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AHA! OF THE MONTH 1

A Series: Ground-based Observation Sites for "IBUKI"'s Validation
"Lauder Atmospheric Research Station - New Zealand"

— Dr. Tomohiro Nagai
Senior Researcher, Meteorological Research Institute (MRI), Japan Meteorological Agency

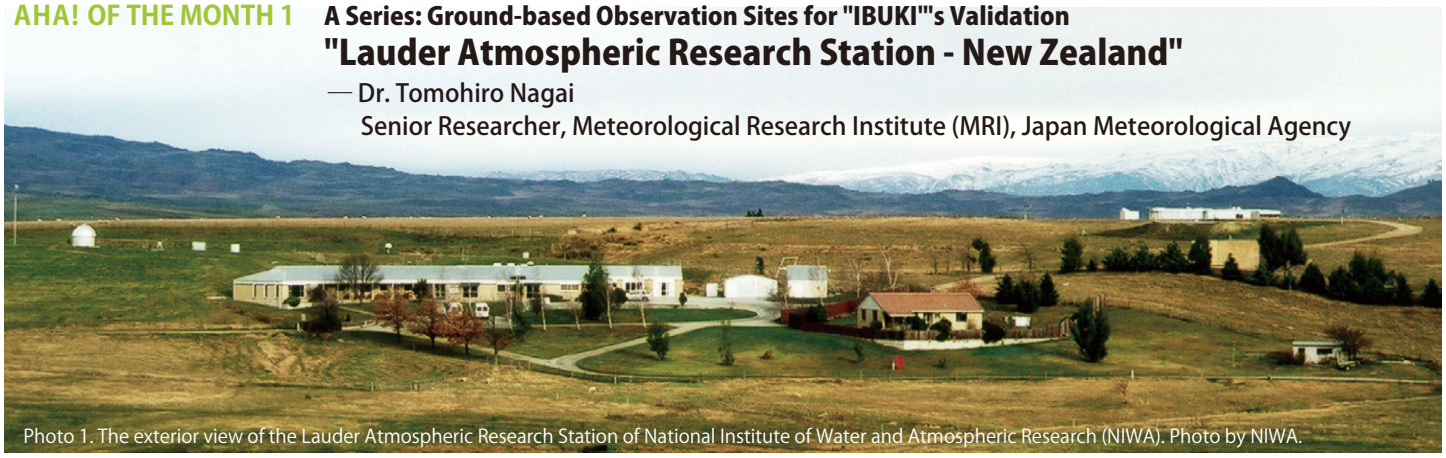


Photo 1. The exterior view of the Lauder Atmospheric Research Station of National Institute of Water and Atmospheric Research (NIWA). Photo by NIWA.

The Lauder Atmospheric Research Station of National Institute of Water and Atmospheric Research (NIWA) in New Zealand is located in the middle of the South Island at 45 degrees south latitude. Since the clear atmospheric environment of Lauder was suitable for optical observations, the station was built for the optical observation of the aurora in 1961. In the late 1970's, the first atmospheric observation, measurement of nitrogen dioxide (NO_2) was started. Since then, measurement of ozone (O_3) and ultraviolet radiation as well as other atmospheric trace gases associated with ozone depletion and global warming have been carried out continuously.

Ground-based observations are conducted at different locations across the world for validation of "IBUKI"'s data products. At a ground-based observation site, the solar radiation spectra are observed using a high-resolution Fourier transform spectrometer (FTS), aerosols by Skyradiometer, and vertical profiles of aerosols and cirrus clouds by LIDAR for the purpose of validating the concentrations of CO_2 and CH_4 measured by FTS installed on "IBUKI." At Lauder, as one of the validation sites, observation has been carried out using a high-resolution FTS by NIWA, a Skyradiometer by the National Institute for Environmental Studies (NIES), and a LIDAR by Meteorological Research Institute (MRI) of Japan and NIES.

In November 1992, following the 1991 eruption of Mount Pinatubo in Philippines, MRI started

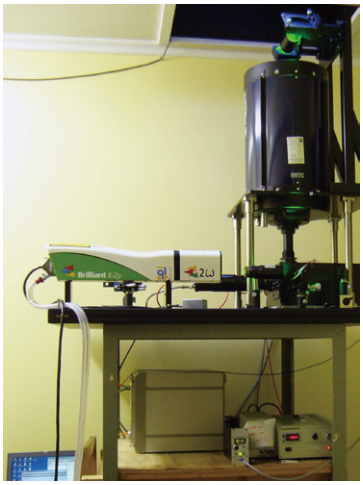


Photo 2. Improved LIDAR instrument. Photo by Tomohiro Nagai.

Photo 3. A Skyradiometer installed on the rooftop of the Optics Laboratory of the Lauder Atmospheric Research Station. Photo by Tomohiro Nagai.

Photo 4. A high-resolution FTS installed in the Optics Laboratory of the Lauder Atmospheric Research Station. Photo by Tomohiro Nagai

the LIDAR observation of stratospheric aerosols. Its aim was to understand the variation of aerosols produced from the volcanic ashes and gases emitted into the atmosphere by the eruption. The purpose of this LIDAR observation was to capture the variation of aerosols mainly in the stratosphere, and the LIDAR was not suitable for observation of thin clouds and aerosols in the troposphere. However, the validation of "IBUKI"'s data products and improvement of its algorithms require precise measurements of thin clouds and aerosols in the troposphere. For this reason, improvements on LIDAR receiver were made to enable observations of the troposphere in February 2009, and to improve the received data quality by replacing the laser transmitters for a less noisy model in October 2009. Precise measurements of aerosols and cirrus clouds in the atmosphere between a few hundred meters above the ground and the stratosphere is now possible because of these improvements. In October 2011, a Skyradiometer was installed by NIES and the Japan Aerospace Exploration Agency, and observation using the Skyradiometer was started (Photo 3). Observation using FTS has been continued by NIWA for long time (Photo 4).

Such observations are conducted mainly during the time when "IBUKI" flies over the area. The observations are to understand the vertical profiles of aerosols, thin cirrus clouds, optical thickness of aerosols, and the CO_2 and CH_4 concentrations. If continued, these observation contributes to the validation of "IBUKI"'s data and improvement of their quality.

ACTIVITIES

Report: SPIE Remote Sensing

- Hiroshi Watanabe
NIES GOSAT Project Office Manager

I attended the last year's SPIE Remote Sensing, held in Toulouse, France. This year again, I attended SPIE Remote Sensing 2011, held from September 19 to September 22, 2011 in Prague, Czech Republic. SPIE is the abbreviation of its original organization, the Society of Photo-optical Instrumentation Engineers, and it is a place for discussions mainly on optical instruments. The themes addressed at the "remote sensing" meeting include the satellite remote sensing. One of its conferences that I participated, "Sensors, Systems, and Next-Generation Satellites," included presentations on ongoing and future satellite remote sensing projects by the United States, Europe, and Japan, and attracted a great number of attendees. In general, there are a large number of presentations on the U.S. and European satellite missions that attract a large audience. This year, there was one session on American satellite mission, two sessions on European mission, and three sessions on Japanese mission. The sessions on Japanese mission was chaired by Chairperson of GOSAT RA Selection and Evaluation Committee (RA Committee), Prof. Haruhisa Shimoda of Tokai University. The discussion topics included current status of ASTER, ALOS and GOSAT, as well as near-future satellites and sensors from Japan. Among all, the presentations from the GOSAT Project were the following three: "On-orbit status of TANSO onboard GOSAT" by Masakatsu Nakajima GOSAT Mission Manager of the Japan Aerospace Exploration Agency (JAXA), "Update of the GOSAT higher level product status 2.5 years after the launch" by Hiroshi Watanabe of the National Institute for Environmental Studies, and "Airborne flight campaign for GOSAT validation" by Daisuke Sakaizawa of JAXA.

My presentation introduced the latest versions of FTS L2 SWIR (column amounts) upgraded in summer 2010 and the spatial and temporal variations of XCO_2 and XCH_4 revealed by those data, as well as CAI L3 global radiance and global reflectance distribution that were publicly released after fall 2010. The presentation also dealt with the current status of FTS L2 TIR (vertical profiles), CAI L3 NDVI, L4A (global CO_2 flux), and L4B (three-dimensional global CO_2 distribution) that were released to the selected researchers of the GOSAT research announcement (RA). I also talked about the upcoming version upgrades of L1 and L2 data products as a response to the chairperson of the European satellite session, Roland Meynart of European Space Agency (ESA), the prospects of bias reduction of FTS L2 SWIR data products.

The Brevnov Monastery where the banquet for SPIE Remote Sensing 2011 was held in Prague, Czech Republic. Photo by Hiroshi Watanabe.

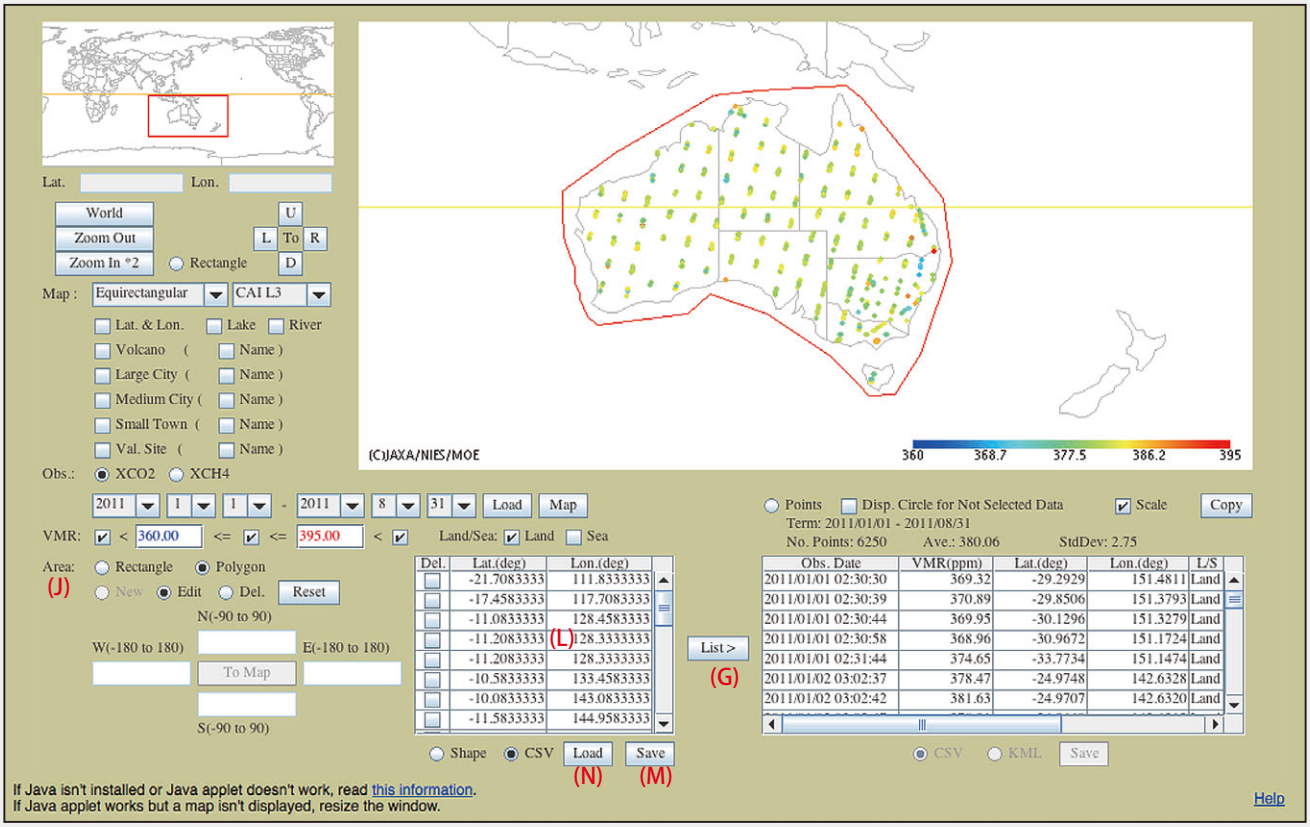
While there were many sessions on applications of each sensor, I received an impression that there were more sessions on sensors' calibration. With the ASTER and MODIS sensors onboard Terra and Aqua that have been operating for more than 10 years, it was shown that the careful calibration needed for long-term operation has been carried out.

The city of Prague still retains the atmosphere of ancient capital of the Middle Ages. While the city is known for its Astronomical Clock and other attractions in the old town, the banquet on the first night was held at the Brevnov Monastery located outside the city. I had a fun experience taking a trip out of the usual tourist attractions.

AHA! OF THE MONTH 2

A Series: How to Use GUIG Tool "SWIR L2 Global Distribution Map" - 3 -

- Kenji Hayashi, NIES GOSAT Project Office



A screenshot of the Tool with a search result of the area specified with a polygon (near Australia) after searching for XCO_2 only for the land between January 1, 2011 and August 31, 2011.

In this series of articles, I will take you step by step through the process of using the "SWIR L2 Global Distribution Map" tool (hereafter referred to as the Tool) on the GOSAT User Interface Gateway (GUIG). The main functions of the Tool are as follows.

1) Search/display concentration data: you can search and display the latest version of SWIR Level 2 column-averaged mixing ratios (XCO_2, XCH_4) of the points that were observed by "IBUKI."

2) Save displayed data: you can download the displayed data as CSV file format or KML file format (for Google Earth).

3) Display CAI data as background: you can display CAI Level 3 satellite images (global radiance distribution (3 days' composite) , or global reflectance distribution (30 days' composite) as a background of the map. The CAI images are from the same observation periods as the displayed SWIR Level 2 data.

This month, I would like to demonstrate the main functions of the Tool as the part three regarding 1) Search/display concentration data (for requirements and how to start the Tool, please refer to the two previous issues (August 2011, September 2011)). 2) and 3) will be demonstrated in the coming issues. For more detailed instructions on how to use the Tool, please also refer to the "Help" in the right bottom of the Tool page.

1) Search/display concentration data (part 3)

In the August 2011 issue, we introduced how to search and display the concentration data products for a specific time period, and then in September 2011, how to search under even narrower conditions, or for a specific area defined by a rectangle. This rectangle can be freely transformed.

To free-transform a search area, use "Polygon" in the "Area" (J) section in the bottom left. Select "Polygon" and "New," and click where you would like the first corner of the polygon to be on the map. Then, each following click will create another corner of polygon. Double-clicking on the map connects the corners and creates a polygon. The latitude and longitude of each corner selected is listed in the table (L) in the middle of screen. By checking the "Del." box, you can delete the corner in case you clicked on a wrong spot. By selecting "Edit" in the "Area" (J), you can make adjustments to the polygon on the map in following manners. 1) Click on a corner to re-enter new latitude and longitude information. 2) Click and drag a corner to move to a desired position. 3) Click on a line connecting two corners to create a corner that breaks the line.

If you click and drag a cursor when you make the first corner, you can create a pseudo circle (drawn with 24 points) as a search area. The list of information on selected corners of polygon can be saved as a Shape file or CSV file by clicking "Save" button (M). You can load the saved information on the map by clicking "Load" button (N).

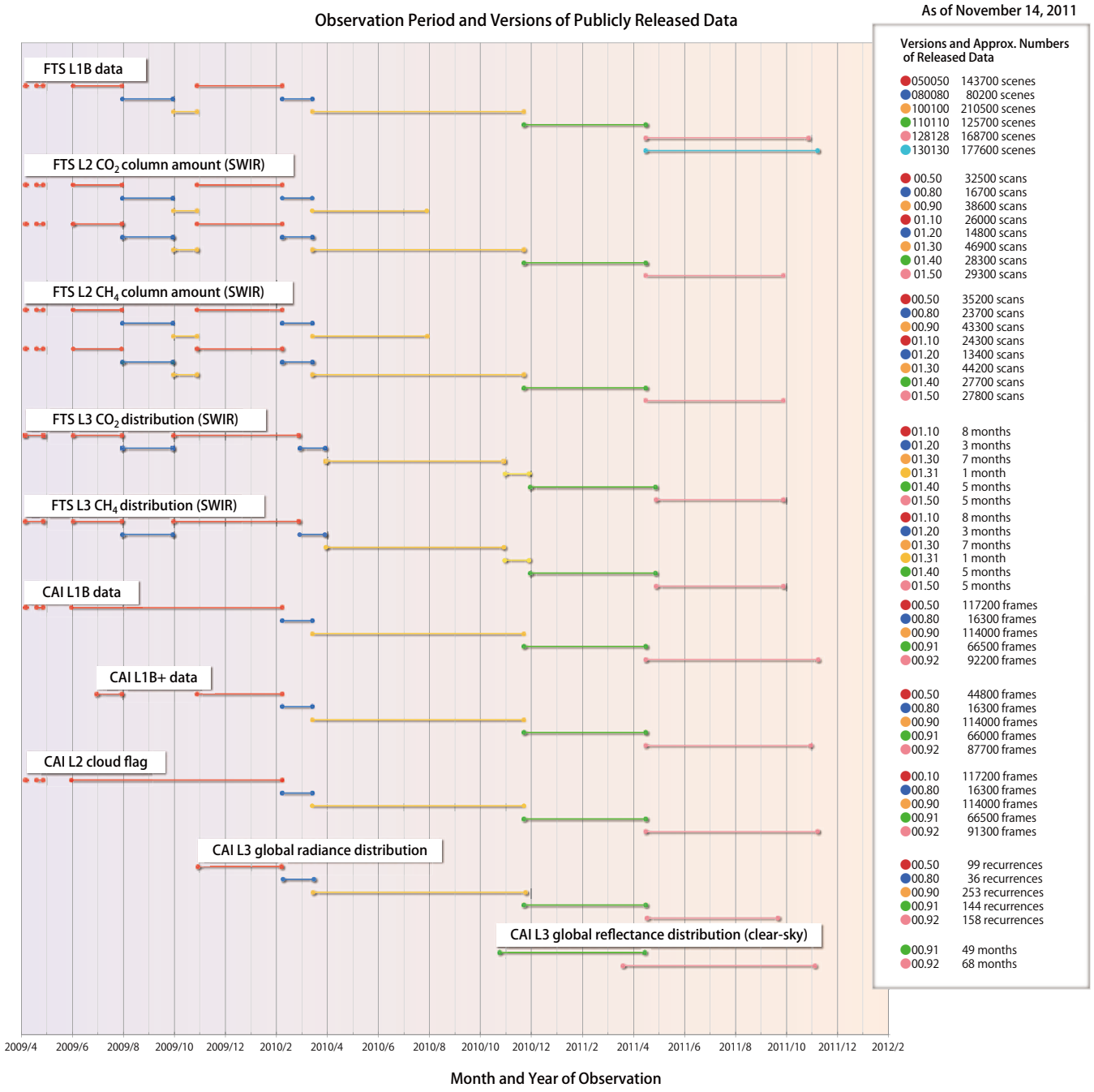
Finally, clicking on "List >" button (G) will plot the data only inside the specified polygon as a search result on the map. The corresponding values will be also displayed in the table in the bottom right.

(The image is a screenshot of the Tool with a search result of the area specified with a polygon (near Australia) after searching for XCO_2 data only for the land between January 1, 2011 to August 31, 2011.)

DATA PRODUCT UPDATE

DATA PROCESSING STATUS UPDATE FROM GOSAT PROJECT OFFICE

- Fumie Kawazoe, Specialist, NIES GOSAT Project Office



Here we report an update on data processing status for late September, October and early November.

Continued from last month, we are processing and releasing the V128.128 and V130.130 for FTS L1B data product, V00.92 for CAI L1B, L1B+, L2 cloud flag, L3 global radiance distribution and L3 global reflectance distribution data products, and V01.50 for FTS L2 CO_2/CH_4 column amounts (SWIR). We have newly released the FTS L2 CO_2/CH_4 column amounts, and FTS L3 global CO_2/CH_4 distribution for the months of July, August, and September. The FTS L2 CO_2/CH_4 column amounts are produced from the V128.128 of FTS L1B data products.

The number of registered users is 1143 as of November 10, 2011.

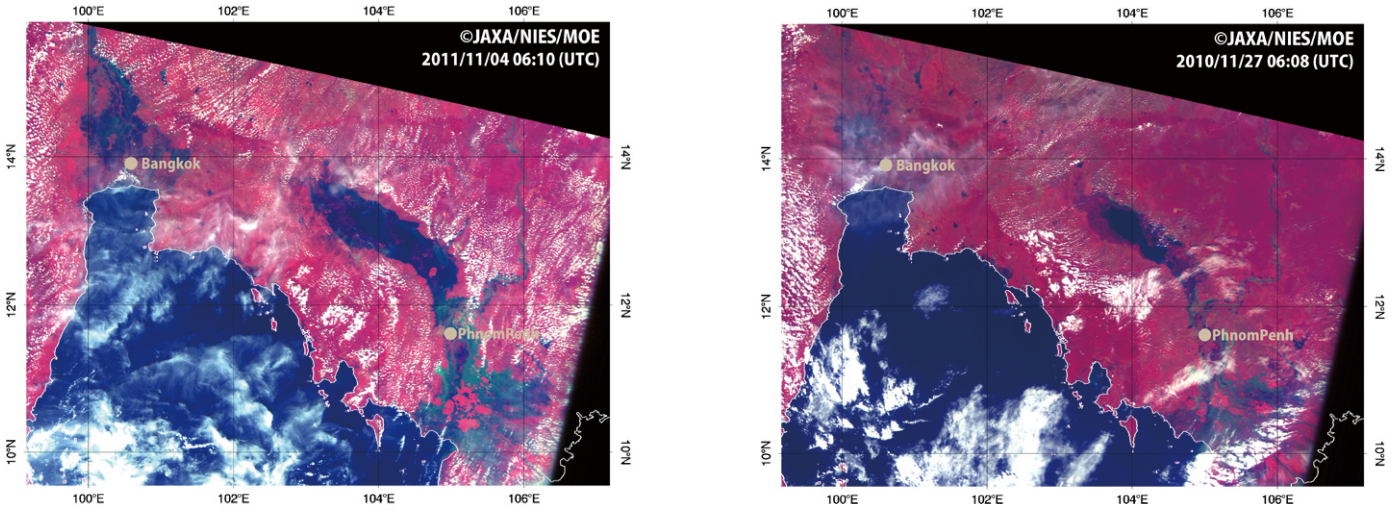
ANNOUNCEMENT

Correction and Apology

In the article "Data Processing Status Update from GOSAT Project Office" of July, August, and September issues (Issue#19, #20, and #21) of NIES GOSAT PROJECT NEWSLETTER, we reported the wrong version numbers for the latest CAI L3 global radiance distribution and CAI L3 global reflectance in the table section. The correct number is "00.92" while it was listed as "00.91." Also, in September issue, the latest version of FTS L3 CO_2/CH_4 data product (for the months of May and June) was reported wrong. It was reported as "V01.40," however; the correct version number is "V01.50." We apologize to the readers for any inconvenience caused by this article. The issues online were revised on November 28 and 29, 2011.

IMAGES OF THE MONTH

FLOODINGS IN THAILAND AND CAMBODIA



The images are made from CAI data acquired by "IBUKI" when it flew over Thailand and Cambodia on November 04, 2011 06:10 (UTC) (left) and on November 27, 2010 06:08 (UTC) (right). The water is shown in blue, terrestrial vegetation in red, and clouds in white. The white line is the contour line of mean sea level. Blue = Band1, Green = Band 2, Red = Band 3.

The Greenhouse Gases Observing Satellite (GOSAT, "IBUKI") captured the floodings in Thailand and Cambodia. The Cloud and Aerosol Imager (CAI) on "IBUKI" acquired the above images on November 4, 2011 (left) and on November 21, 2010 (right). From these two images, it is possible to see that the larger area is colored blue (indicating water) this year. On November 04, 2011, in Bangkok's vicinity at the lower reach of the Chao Phraya river, the red areas (indicating vegetation) are barely visible, and the large area is colored blue in the Ayutthaya province located around 70 km north of Bangkok city. In the 2011 image, not only in Thailand, but also in Cambodia, the blue area spreads wide along the margin of the lake Tonle Sap located north west of Phnom Penh, and in the lower reach of Mekong River that drains out from Phnom Penh southeastward.

PUBLISHED PAPERS etc.

Field of Research: carbon balance estimation, atmospheric transport models
Name of Journal : Scientific Online Letters on the Atmosphere (SOLA)
(Volume 7, pages 161-164)
Title: On the Benefit of GOSAT Observations to the Estimation of Regional CO_2 Fluxes
Author: H. Takagi, T. Saeki, T. Oda, M. Saito, V. Vinu, D. Belikov, R. Saito, Y. Yoshida, I. Morino, O. Uchino, R.J. Andres, T. Yokota, and S. Maksyutov

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Field of Research: data application
Name of Journal: Journal of Applied Meteorology and Climatology
(Volume 50, Issue 7, pages 1571-1586)
Title: Investigation of GOSAT TANSO-CAI Cloud Screening Ability through an Intersatellite Comparison
Author: H. Ishida, T. Y. Nakajima, T. Yokota, N. Kikuchi, and H. Watanabe

Field of Research: validation
Name of Journal: Journal of the Remote Sensing Society of Japan
(Volume 31, No. 4, pages 435-445) (in Japanese)
Title: Development of a mobile LIDAR for GOSAT product validation
Author: O. Uchino, T. Sakai, T. Nagai, M. Nakazato, I. Morino, T. Yokota, T. Matsunaga, N. Sugimoto, K. Arai, and H. Okumura

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Field of Research: other (tutorial paper)
Name of Journal: Journal of the Society of Instrument and Control Engineers
(Volume 50, Number 10, pages 832-839) (in Japanese)
Title: Satellite measurement of atmospheric greenhouse gases in Japan
Author: T. Yokota

CALENDAR

2011/12/5 - 9
Participation at the American Geophysical Union (AGU) 2011 Fall Meeting held in San Francisco, USA.

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