Independent Administrative Institution
National Institute for Environmental Studies (NIES)
A newsletter on the Greenhouse gases Observing SATellite (GOSAT, "IBUKI") project from the NIES GOSAT Project Office.
http://www.gosat.nies.go.jp/

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NEWS Level 3 CAI Global Reflectance Distribution (Clear-sky) Released to General Users

- Nobuyuki Kikuchi, Specialist, NIES GOSAT Project Office

The NIES GOSAT Project has released a new product, the Level 3 CAI global reflectance distribution (clear-sky) on June 23, 2011. The Level 3 CAI global reflectance distribution data product is processed by collecting the image data with minimum reflectance from the Cloud and Aerosol Imager (TANSO-CAI)'s Level 1B data for 30 days. The product shows the surface of the globe clear of clouds in most areas. The Level 3 CAI product is produced every three days (one recurrence) because "IBUKI" observes the whole globe in three days.

The image shown below is the Level 3 CAI global reflectance distribution data product processed from the CAI radiance data acquired between March 7, 2011 and April 5, 2011. The surface in the tropics where it is usually covered in the clouds is visible. There can be spotted traces of snow in the high latitude area and the Himalayas in the northern hemisphere. In the southern hemisphere, Antarctica is visible in the higher latitude area. Since the areas where the solar altitude is less than 20 degrees are eliminated, the data seem broken in the edges in the high latitude areas in both hemispheres. Over the ocean, there are tilted vertical bright streaks aligned near the equator. They are the mirror reflection of sunlight on the sea surface called sun-glint. They appear along the inclined orbit path of "IBUKI."

The Level 3 CAI global reflectance distribution data product contains reflectance data of ground and ocean separately. Along the coastlines, the data pixels are detected as both the ground and ocean. The values of such areas are calculated by dividing the sums by two.

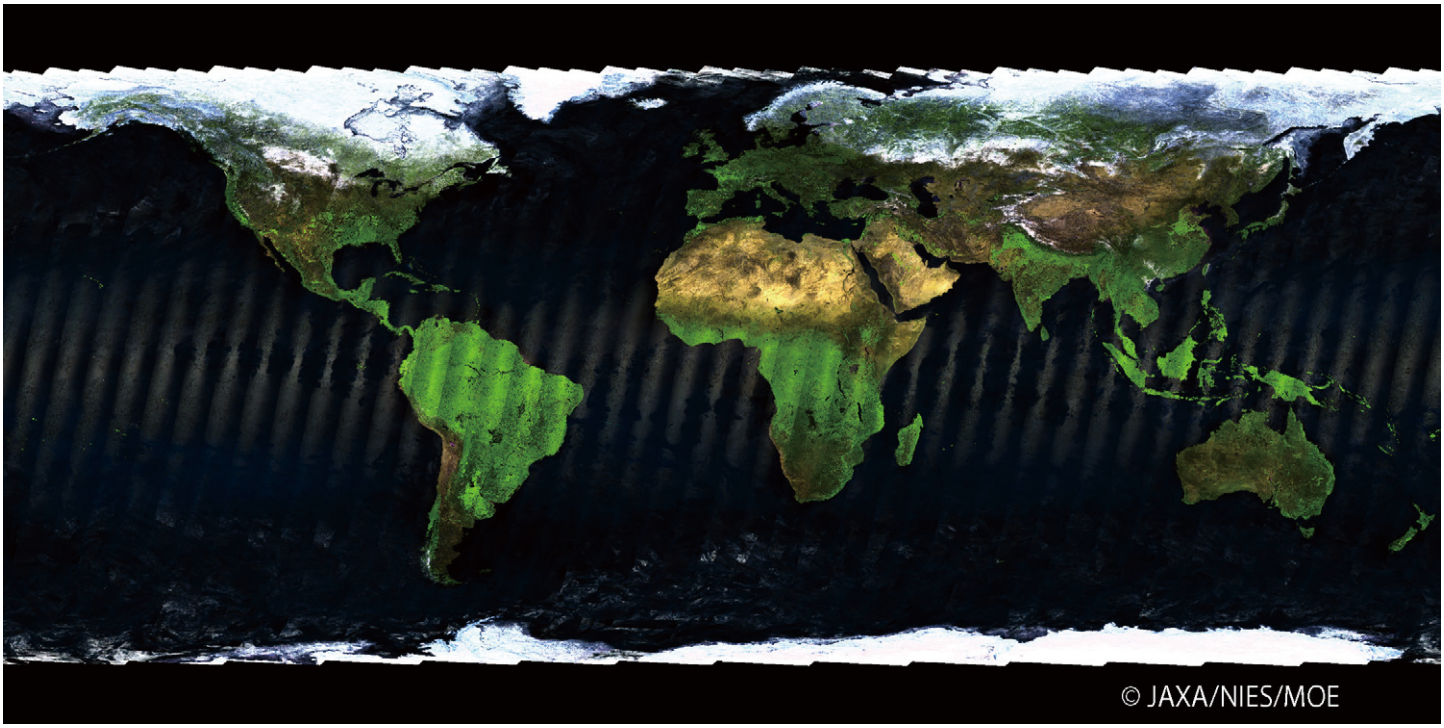


Photo 1. Shuji Kawakami of JAXA (right), Makoto Inoue of NIES (left) and the baby carriage are hard at work in the desert. (As opposed to the 40 ° C sunbaked desert in the front, the mountains in the back are snow-capped.) Photographed by Akihiko Kuze.

NEWS

Annual Railroad Valley Vicarious Calibration Campaign

- Akihiko Kuze, Satellite Applications and Promotion Center, Japan Aerospace Exploration Agency

The third vicarious calibration campaign for GOSAT was carried out from June 18 to June 26, 2011 in collaboration with the American ACOS team[*1] in Railroad Valley (RRV), Nev., USA.

The goals of this campaign are 1) to evaluate the sensitivity degradation of the sensors installed on GOSAT, Fourier Transform Spectrometer (TANSO-FTS) and Cloud and Aerosol Imager (TANSO-CAI) in long-term orbit, and 2) to make an in-depth measurement of the physical quantities necessary for radiative transfer calculations and to improve its accuracy. The measurement of atmospheric constituents by differential optical absorption observation is theoretically possible even with sensitivity degradation of instruments. However, in a mission like GOSAT, which has to talk about 1% precision, the accuracy of absolute sensitivity is also significant. I will let the research papers explain the analysis results, and here I would like to introduce you to the beauty of RRV.

This campaign was started with a modest hope to get results in the long run. However, in reality, we have been making progress every year. Our challenge for the first year was to make a vicarious calibration campaign possible with such a large instantaneous field of view as TANSO-FTS's 10 km. We overcame this challenge by calibrating the radiance and bidirectional reflectance distribution function (BRDF), using TANSO-CAI and MODIS[*2] that have higher spatial resolutions. However, now it left us with new issues; pointing of TANSO-FTS has offset, and two hours of walking in the desert carrying a PC and a heavy spectrometer on one's shoulder was too much work for us middle aged members. So, for the second year, we stared at the CAM imagery for the preceding few months to estimate the offset errors, and made adjustments to the planned values of pointing angles. Also, NASA's Jet Propulsion Laboratory brought a sturdy twin-baby carriage customized for desert, which reduced the physical work of measurer and improved the accuracy of the ground radiance measurement. By the third year, we have grown greedy and included the observations for Thermal Infrared calibration (both day and night time), the measurement of spectral radiance by airplanes, and in-situ measurement of CO_2/CH_4. The U.S. team in particular has strengthened its system each year. For this year, groups from the JPL, NASA Ames Research Center, Colorado State University, and the University of Wisconsin participated in the campaign. During the campaign, there was a series of observations with three airplanes: a high-altitude aircraft, ER-2 carrying three sensors, an unmanned aircraft system, SIERRA[*3] that measures vertical profile, and an ex-battle plane Alpha

*1 Atmospheric CO_2 Observations from Space (ACOS) is a group formed around the OCO Science Team, including the research members from NASA's JPL, Caltech, and Colorado State University. Using "IBUKI"'s data, ACOS team has collaborated with the GOSAT project to develop and enhance the CO_2 retrieval algorithm for both GOSAT and OCO-2 projects.

*2 Moderate Resolution Imaging Spectroradiometer (MODIS) is an optical sensor instrument developed by NASA that has 36 channels from visible to infrared on board Terra (launched on 1999) and Aqua satellite (launched on 2002) of NASA Earth Observing System (EOS).

*3 Sensor Integrated Environmental Remote Research Aircraft (SIERRA)

Photo 2. The team has grown to 26 members this year. (The master of desert,' Dr. Mark Helmlinger is in the center of back row wearing a white t-shirt. The author is in the center of front row wearing a long sleeve white shirt.) Photograph courtesy of the author.

Jet that can make spiral flights. It was an exciting "air show." We collected an ample stock of measurement items that the radiative transfer maniacs would drool over: the ground radiance, BRDF (TANSO-FTS, TANSO-CAI), optical thickness of aerosols, CO_2/CH_4's ground-surface, vertical, and in-plane profiles, radio sonde's vertical profiles of water vapor, temperature, and air pressure.

I also find it exciting that all RRV members including a 20 year-old student and a veteran almost 50 years their senior spend time together in the desert. We take turns in preparing meals. It is regretful that the GOSAT team made little improvements to the menu since last year, and we could only serve boil-in-the-bag curry, chirashi sushi (bowl of sushi rice topped with variety of ingredients), and frozen konjac fruit jelly. Next time, I hope to bring the extraordinary world of Japanese cuisine to RRV (with limited time and fire). The magic of RRV is that after spending long hours together, we run out of small talks and become close enough to complain and whine, which in fact generates a productive discussion on data processing for the next day. The JPL reserved us a camper with a toilet, shower, and refrigerator, but the closest gas station is more than 100 km away and refueling was not an easy task. Turning on the engine also interferes with the CO_2 observation. So, how to live with renewable energy, which is a timely issue, is another challenge we work on. We held out till the end of campaign with the solar energy and its cloudy-day and nighttime complement, wind energy, but we had to bring water everyday from hotel room in a near-by town.

Although the desert is far from any town, there is an unexpected diurnal variation of CO_2 and CH_4 concentrations. It has been suspected that there is an emission source in the vicinity. This year, astrobiologists and volcano specialists participated in the campaign to take some soil sample for mass spectrometry. There is even a natural hot-spring oasis near-by, and this place for me is the world's heritage. In case when it is actually named as a World Heritage site and I start my second career as its guide, I need to explore further into the mystery of RRV. Praying for the long life of GOSAT and 'the master of desert,' Mark Helmlinger (Sensors & Instruments Department, Northrop Grumman Aerospace Systems), I left my beloved RRV this year.

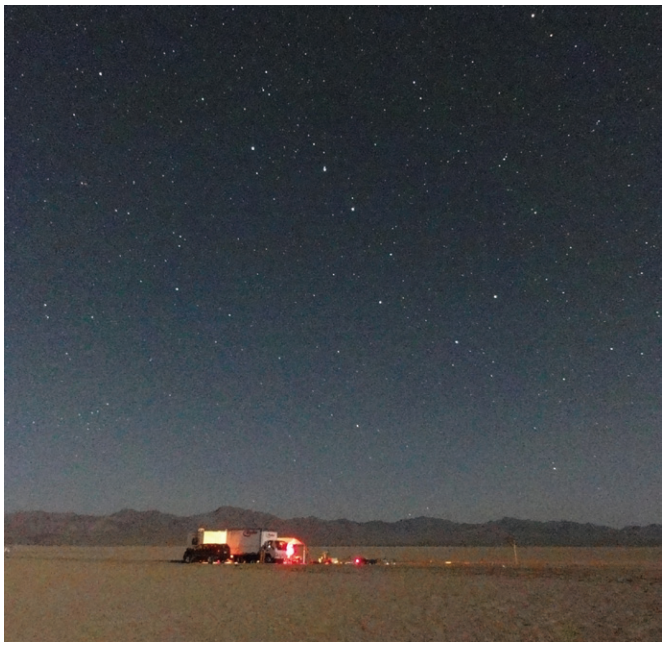


Photo 3. The base camp and sky full of stars (the Plow is visible). Photographed by JAXA Masataka Naito.

NEWS

Report : NIES Open Symposium 2011

- Nobuyuki Kikuchi, Specialist,
NIES GOSAT Project Office
- Isamu Morino, Senior Researcher,
- Makoto Inoue, Research Associate,
Center for Global Environmental Research, NIES

NIES Open Symposium 2011. Photographed by Nobuyuki Kikuchi on June 25, 2011 at the Silk Hall in Kyoto, Japan..

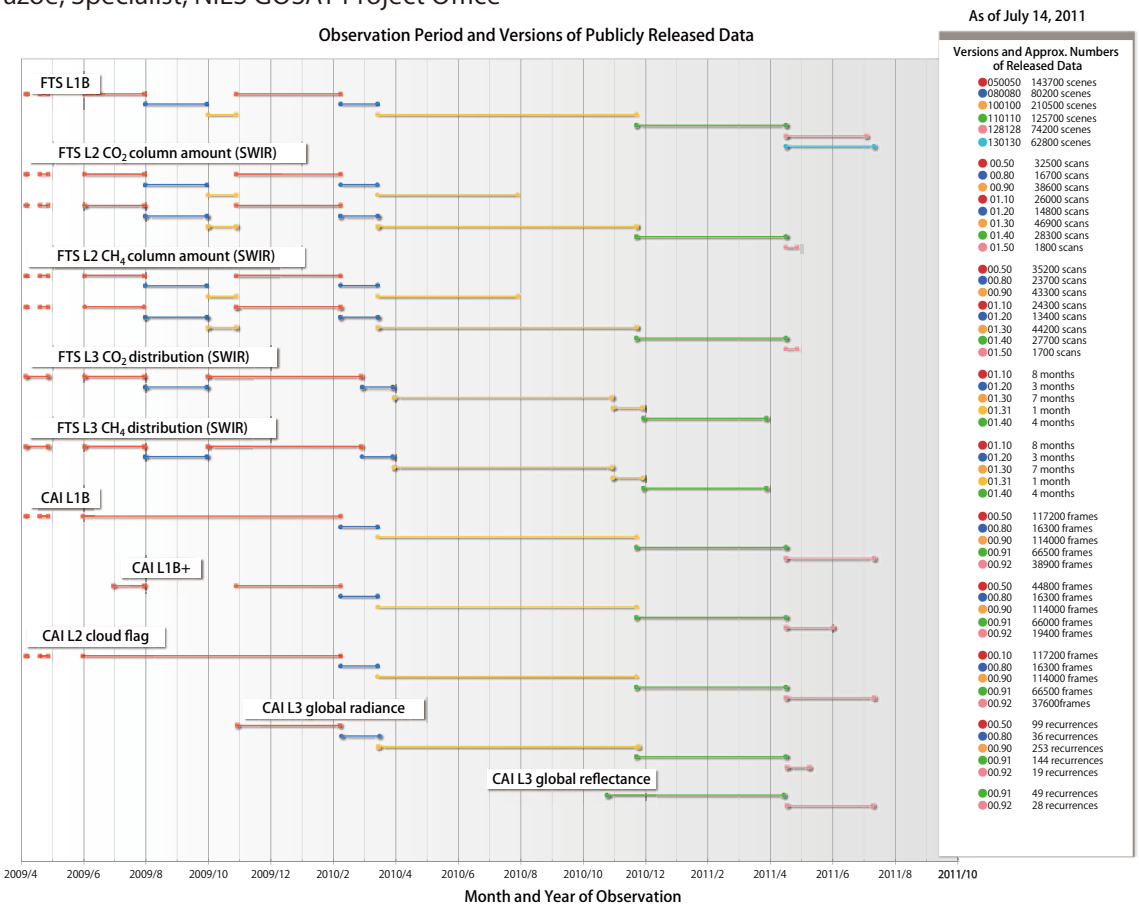
The National Institute for Environmental Studies (NIES) hosted two open symposia, on June 18, 2011 at the Yomiuri Hall in Tokyo, and on June 25, 2011 at the Silk Hall in Kyoto, Japan. As many as 546 people visited the symposium in Tokyo and 224 people visited the symposium in Kyoto. NIES GOSAT Project gave a poster presentation at these symposia. We showed the seasonal variation of CO_2 and CH_4 using the spatial and latitudinal distribution maps of CO_2 and CH_4. We also showed a CO_2 emission and absorption map that we are preparing for distribution. I would like to introduce some of the questions from the visitors. 1) Does CO_2 stay in the bottom because it is heavier than the air? 2) Why is there a lot of CO_2 emission in August in the Amazon? 3) If the greenhouse gases absorb the infrared, why does it now make the temperature go down? Do they not also absorb the sunlight and less light reaches the ground? These are all very difficult questions but we gave the following explanations: 1) In the lower layer called troposphere, the air is always being stirred, so it does not mean CO_2 concentration is higher just because it is near the bottom of atmosphere. However, when the photosynthesis of vegetation is active, the concentration can become lower as it gets closer to the surface. 2) It is because of the dry season and the photosynthesis of vegetation is limited. This causes emission from the vegetation to surpass its absorption. 3) The infrared of sunlight is in the wavelength range between 0.7 μm and 4μm, and the infrared that releases the Earth's heat out to the space is between 3 μm and 100 μm. CO_2 absorbs the infrared of wavelength between 12 μm and 18 μm, so it interferes only with the infrared that goes out to the space, but not with the infrared between 0.7 μm and 4μm that reaches from the sun.

We hope to let the outcome of "IBUKI" research known to more people whenever there is an opportunity. We are happy to answer your questions.

DATA PRODUCTS UPDATE

DATA PROCESSING STATUS UPDATE FROM GOSAT PROJECT OFFICE

- Fumie Kawazoe, Specialist, NIES GOSAT Project Office



Continued from last month, we have been processing and releasing the V130.130 and V128.128 for the FTS L1B, V00.92 for the CAI L1B, L1B+, L2 cloud flag, and L3 global radiance data products. We have been processing the V01.50 for the FTS L2 CO_2 and CH_4 column amounts (SWIR) data product after April 19, 2011, and started to release this version this month. Also, we have just released a new product, CAI L3 global reflectance distribution (clear-sky). The version numbers are V00.91 and V00.92. The data products are processed using the data acquired after October 26, 2010. For more detailed information on this new data product, please refer to the "Product Format Descriptions" and "Important Notes at Releasing" - V00.91/V00.92 (L3 reflectance distribution) under "ATBD, Product Format Descriptions, Product Description, Results of Validation" on the GOSAT User Interface Gateway (https://data.gosat.nies.go.jp). Please also have a look at the article, "CAI L3 Global Reflectance Distribution (clear-sky) Released to General Users" on the page 1 of this issue.

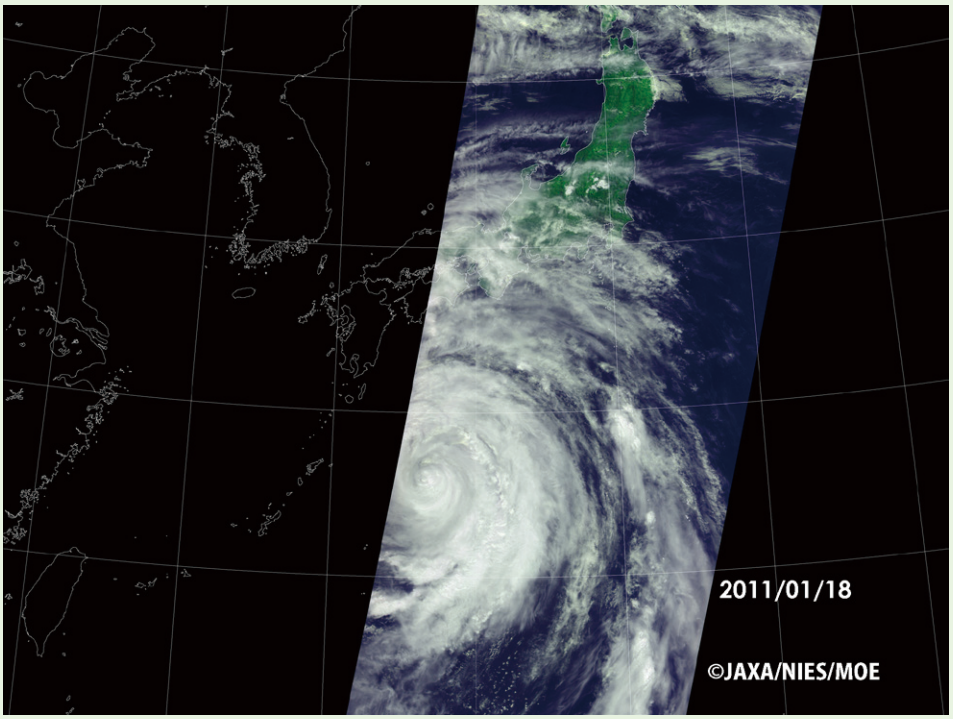
The number of registered users is 1073 as of July 14, 2011.

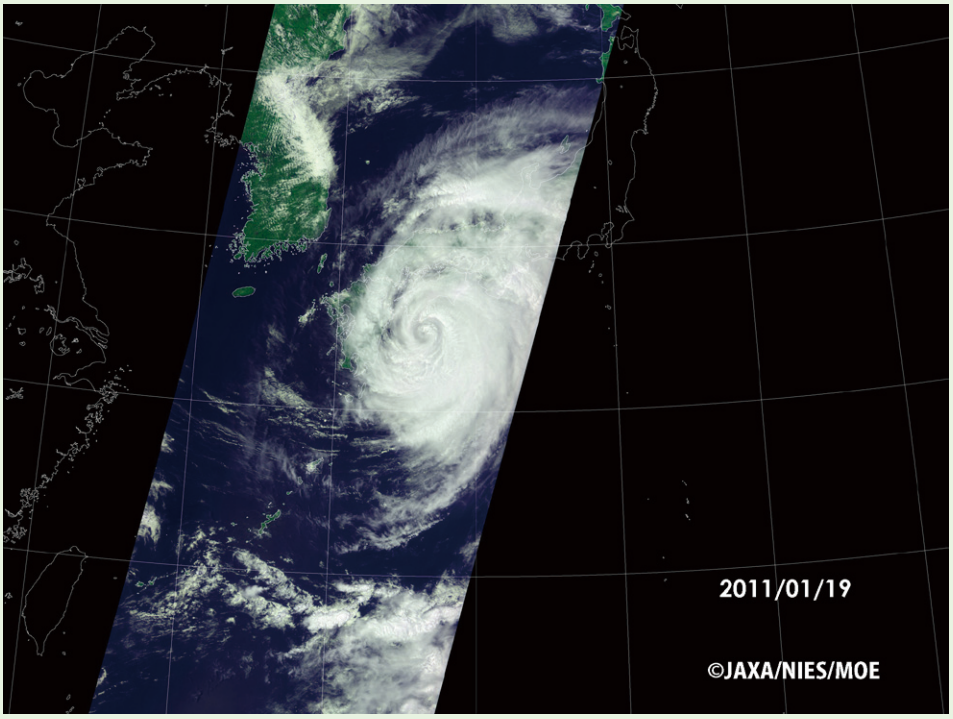
NEWS

On the Energy Saving Action at the NIES GOSAT Project and the Effect on the Data Product Distribution.

- Hiroshi Watanabe, NIES GOSAT Project Office Manager

(article as of July 19) Due to the earthquake on March 11, 2011 and the subsequent nuclear power plant accident in Fukushima, the power supply shortage during this summer is expected in Japan, especially in the service area of the Tokyo Electric Power Company. In response to the situation, the National Institute for Environmental Studies (NIES) decided to reduce the electricity consumption to 20% of 5600 kW, the contracted electricity service. The NIES GOSAT Project has made a careful consideration as to how to reduce the power usage in order to cooperate in NIES' energy saving action while making the effect on the data user's inconvenience minimal. In addition to the NIES' efforts to make cuts in the daily life electricity consumption (including the air-conditioning), and shutdown of the NIES' supercomputer (NIES S/C) (relatively high capacity, shared among multiple groups at NIES) in July, the NIES GOSAT Project is planning to stop the GOSAT Data Handling Facility (GOSAT DHF) that consumes electricity about 10% of NIES S/C from August 12 to August 18. For this reason, the data distribution service, GOSAT User Interface Gateway will be unavailable during above-mentioned dates. Due to the shutdown of NIES S/C, the data processing of CO_2 and CH_4 Level 2 data products has been stopped until the end of July. We are working to restart data processing in the last week of July with a back up plan, but even after the restart, it is likely that data distribution will be delayed due to the shutdown of GOSAT DHF. We deeply apologize for the inconvenience, and appreciate your understanding and consideration for the power supply plight after the earthquake.





IMAGES OF THE MONTH

TYPHOON MA-ON - JAPAN

"IBUKI" captured a powerful typhoon, Ma-on, moving from the southern sea of Shikoku Island to Kyusyu Island in Japan. The images are made from the data acquired by an imaging sensor installed on "IBUKI," the Cloud and Aerosol Imager (TANSO-CAI) on (top) July 18, 2011 at around 03:56 (UTC) and (bottom) July 19, 2011 at around 04:28 (UTC).

ANNOUNCEMENT

NIES GOSAT PROJECT NEWSLETTER welcomes letters from our readers. We appreciate your opinions, such as "I want to read articles on ...,""... was really interesting." etc. We also appreciate opinions or contributions from people involved in the GOSAT Project. Please feel free to contact : gosat_newsletter@nies.go.jp. Thank you for supporting the newsletter.

CALENDAR

2011/08/29 - 2011/09/02
Participating in the 22nd Colloquim on High-resolution Molecular Spectroscopy held in Dijon, France.

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