NIES GOSAT PROJECT NEWSLETTER

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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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DATA PRODUCTS UPDATE

IBUKI's Level 2 Data Products Now Released to the General Users

Text : Hiroshi Watanabe, NIES GOSAT Project Office Manager, Center for Global Environmental Research (CGER), NIES

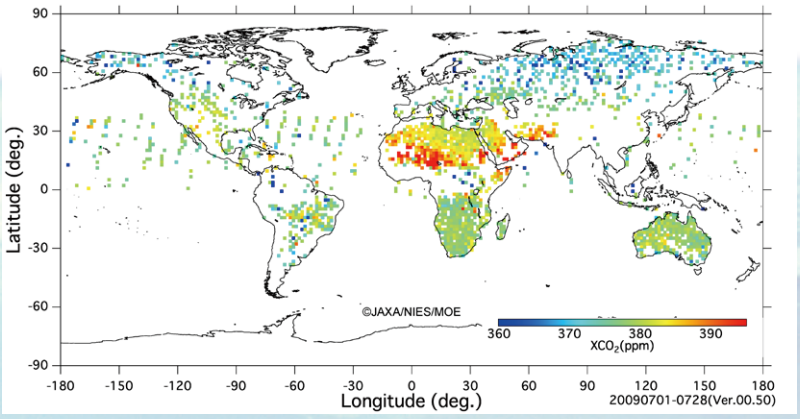
On February 18, 2010, we started to provide the following three IBUKI standard data products to the general users.

- FTS-SWIR Level2 CO_2 column amount (SWIR)
- FTS-SWIR Level2 CH_4 column amount (SWIR)
- CAI Level2 cloud flag

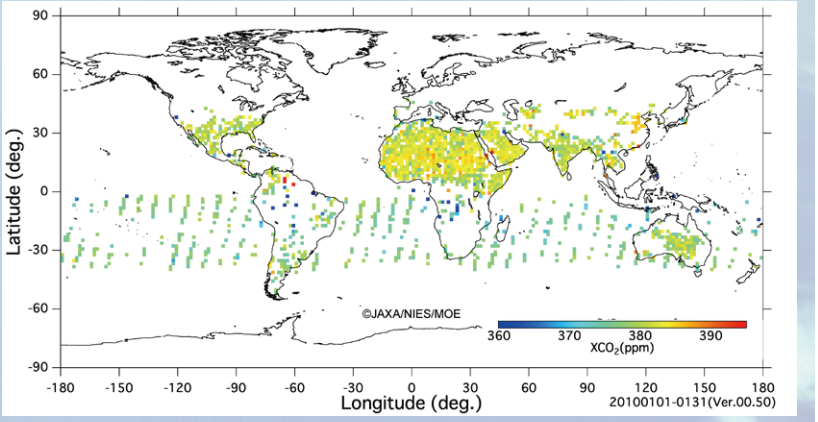
FTS-SWIR Level2 CO_2 column amount (SWIR) and FTS-SWIR Level2 CH_4 column amount (SWIR) are the column abandunces of CO_2 and CH_4 in the atmosphere, each retrieved from the Short Wave Infrared band data acquired by Fourier Transform Spectrometer (TANSO-FTS) onboard IBUKI. Out of all FTS Level1B data - the spectral radiance data of the sun light reflected by the Earth surface (10.5 km in diameter) obtained by TANSO-FTS – only the data that meet certain conditions are used for this retrieval process. One of such conditions is not containing any clouds in their field-of-view, which can be confirmed using the CAI Level2 cloud flag (to be explained later). Simultaneously, each column amount is divided by the total amount of dry air in the column to calculate the column-averaged volume mixing ratios (XCO_2, XCH_4).

IBUKI's observation succeeded in obtaining the data in the regions where there are no ground observation facilities as long as it is conducted under the ckear sky. IBUKI has revealed the variation and distribution of greenhouse gases concentration in those regions.

The global distribution and seasonal variation of the CO_2 and CH_4 concentration observed by IBUKI's data are consistent with the existing knowledge from ground and air-borne observations. IBUKI's data show

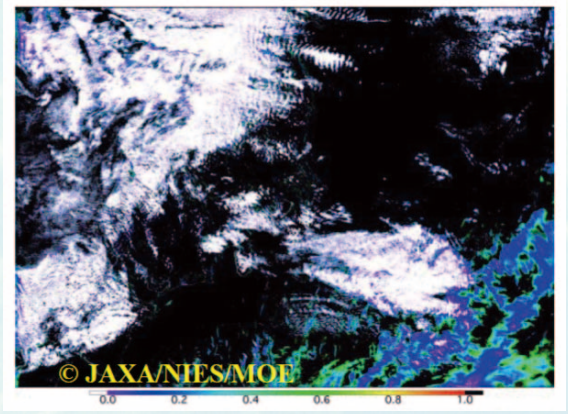


Global map of the CO_2 column-averaged volume mixing ratios in 1.5 deg by 1.5 deg mesh for the month of July, 2009, which was created from the FTS-SWIR Level2 CO_2 column-amount data.



Global map of the CO_2 column-averaged volume mixing ratios in 1.5 deg by 1.5 deg mesh for the month of January, 2010, which was created from the FTS-SWIR Level2 CO_2 column-amount data.

that the seasonal variation of CO_2 is less prominent in the Southern Hemisphere compared to the Northern Hemisphere. It has also shown that in the Northern Hemisphere the concentration of CO_2 is high during the winter and spring while it is low in the summer due to the vegetation activities. Such tendencies can be seen in the monthly global maps of the CO_2 column-averaged volume mixing ratios.



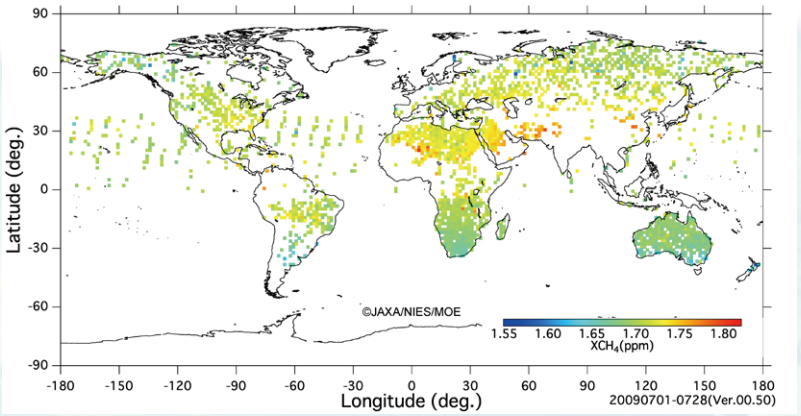
Example of CAI Level 2Cloud Flag

CAI Level 2 cloud flag product contains the clear-sky confidence level information produced from CAI Level 1B's radiance. The cloud flag is the information that shows if an each pixel in CAI image contains any cloud. The clear-sky confidence level demonstrates the confidence level of "clear sky" in each CAI pixel with real number from "0.0" to "1.0." "0.0" indicates cloudy, and "1.0" indicates clear sky.

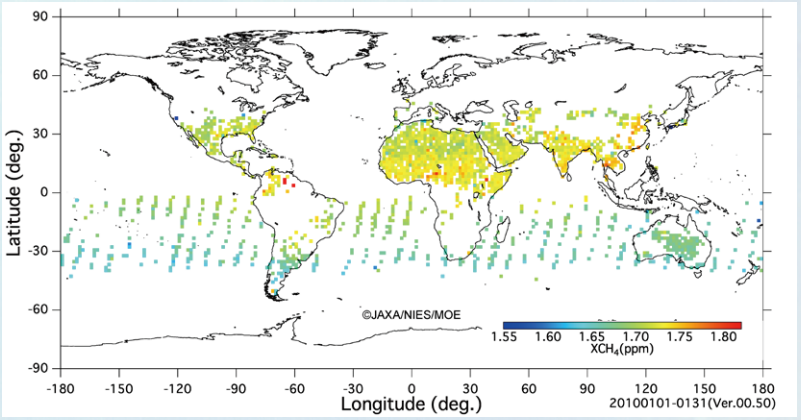
As it is mentioned earlier, FTS-SWIR Level2 CO_2 column amount (SWIR), FTS-SWIR Level2 CH_4 column amount (SWIR), and CAI Level2 cloud flag are released to the public on February 18, 2010. Once you are registered as a general user at the GOSAT User Interface Gateway (GUIG) online, you can search and download these data products of the specific locations and times as the other products in public domain such as FTS L1B (spectral radiance data), CAI L1B and L1B+. Detailed information on the file format and other products can be also found in the same website.

GOSAT User Interface Gateway (GUIG) :
http://data.gosat.nies.go.jp

In the "Gallery" of the GUIG top page, the global maps of monthly average of CO_2 and CH_4 concentration and monthly global map of the Minimum Reflectance calculated from CAI data are available with larger scale to help your understanding on the products.



Global map of the CH_4 column-averaged volume mixing ratios in 1.5 deg by 1.5 deg mesh for the month of July, 2009, which was created from the FTS-SWIR Level2 CH_4 column-amount data.



Global map of the CH_4 column-averaged volume mixing ratios in 1.5 deg by 1.5 deg mesh for the month of January, 2010, which was created from the FTS-SWIR Level2 CH_4 column-amount data.

GOSAT PROJECT IN THE MEDIA

2010/2/16 NHK WORLD「NEWSLINE」featured IBUKI's Level 2 data product release.
(Image : Courtesy of NHK World Website)

GOSAT PROJECT IN THE MEDIA

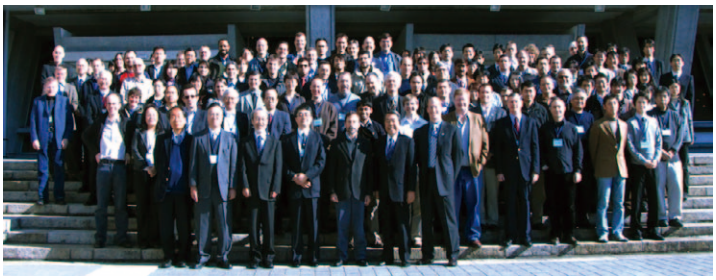
The Yomiuri Shimbun	Feb. 16 (Online)
Mainichi Shimbun	Feb. 17 (Online)
Kyodo News	Feb. 16 (Online)
Jiji Press	Feb. 16 (Online)
The Nihon Keizai Shimbun	Feb. 17
The Tokyo Shimbun	Feb. 17
	etc.

News on IBUKI's Level 2 data product release was featured in various media outlets.

The 6th International Workshop on Greenhouse Gas Measurements from Space Report

Text：Tatsuya Yokota, NIES GOSAT Project Leader, CGER, NIES
IWGGMS-6 Organizer

The researchers around the world working on the satellite observation of the greenhouse gases gathered in Rakuhoku area in Kyoto, Japan, marking one year since the launch of the Greenhouse gases Observing SATellite ("IBUKI", GOSAT). It was for the above-mentioned workshop, the Sixth International Workshop on Greenhouse Gas Measurements from Space (IWGGMS-6). The workshop was held on 26th and 27th of January 2010, and successfully hosted 128 people from 17 countries.



128 researchers attended the IWGGMS-6

The location was Kyoto International Conference Center, by coincidence, in a conference room next to the hall where the Kyoto Protocol was adopted. "IBUKI" is the first satellite in the world whose main purpose is to measure the global distribution of the major greenhouse gases, CO_2 and CH_4. The researchers and their research groups from around the world selected for the GOSAT research announcement had been using the "IBUKI" observation data as well as processed results for their preliminary research. This workshop was held at the timing when they gradually started to obtain results.

At IWGGMS-6, there were 27 oral presentations and 38 poster presentations. On the first day during the morning, the principal investigators (PI)s of the satellite missions around the world made reports on the outline and current status of their missions. The satellites/sensors that were presented are: GOSAT (Japan), Envisat carrying SCIAMACHY (Europe), Aqua carrying AIRS (USA), MetOP carrying IASI (Europe), Aura carrying TES (USA) (in the order of presentation). Then in the afternoon, after the poster sessions, the presentations on "IBUKI"'s sensors as well as its calibration and data processing status were given by Japanese and European groups.

When using the satellite observation data, the information on the data such as following is critical. The current status of calibration, or in other words, how the observation signals are converted into physical amount, how the data are processed, the characteristics of the data, or what they excel and in what they fall short at the moment.

On the second day of the workshop, the reports on validation of the satellite observation data were made in the morning. Then, after the poster session in the afternoon we moved on to the sessions regarding the current status and future prospects of carbon flux (amount of emission/absorption) using the satellite observation data. Above all, Dr. Peter Rayner of the Laboratory for the Science of Climate and the Environment (LSCE) (France) gave a presentation, worthy of note, which compared the error reduction rates of each satellite's sensor in estimating the global carbon flux. SCIAMACHY, AIRS, GOSAT, OCO, A-SCOPE were compared. It was concluded that the existing satellite sensors are contributing to reduce the errors, but a simulation demonstrated that there need to be satellite sensors that are of better performance in the future. This was followed by the reports on the general matters on satellite observation and on the future satellite missions using lidar, and ended with the general discussion. Dr. Gen Inoue, the chief scientist of GOSAT Science Team chaired the general discussion, and the researchers participated in the active discussion. There was an opinion demanding that the workshops on the satellite-borne carbon cycle research should be held regularly, as well as opinions stating the importance of information such as, Normalized Difference Vegetation Index (NDVI) and its time variation obtained from GOSAT's Cloud and Aerosol Imager, the aerosol itself, and the comparison among the satellites with different observation frequency and accuracy which clarifies characteristics and enhances the importance of each mission etc. The live summary notes of the discussion typed by Dr. Charles Miller of Jet Propulsion Laboratory (USA) were projected on the screen at the conference room.

During the workshop.

The host organization/university of the next workshop, IWGGMS-7 is still undecided, but there were some people who were suggesting that it shall be held somewhere in Europe. It was bitterly cold in Kyoto, but we were blessed with fine weather both days. I could say that the experience at the workshop was meaningful for many participants.

GOSAT NEWS

The GOSAT RA PI Meeting offers an opportunity to exchange information and opinions from the Principal Investigators (PI) of GOSAT Project's Research Announcement (RA). In addition to the standard research activities in the GOSAT project, Ministry of the Environment, JAXA, and NIES call for research proposals from the researchers around the world to achieve greater success. Proposals are accepted in the five following fields: calibration, data processing algorithms, and validation fields, and another for the modeling and data application. GOSAT RA Committee Chairperson Dr. Haruhisa Shimoda reports on the 2nd GOSAT RA PI Meeting held late January in Kyoto.

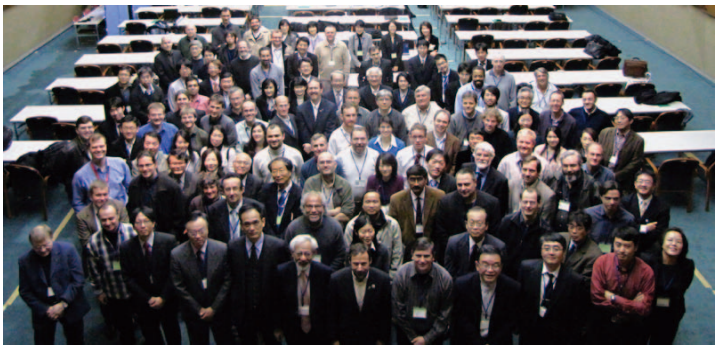


(From Left) Dr. Frederic Chevallier (the Laboratory for the Science of Climate and the Environment) gives a presentation. Attendants at the modeling group session. Professor Sachiko Hayashida (Nara Women's University) participates in a discussion.

The 2nd GOSAT RA PI Meeting Report

Text：Professor Haruhisa Shimoda
Chairperson, GOSAT RA Selection and Evaluation Committee (RA Committee)
Director, Tokai University Space Information Center
Deputy Director, Tokai University Research & Information Center

On January 28th and 29th of this year, the GOSAT team hosted the 2nd GOSAT RA PI Meeting. The number of PIs who were selected at the first RA is 51(52 research topics), and 35(36 research topics) at the second RA, and out of these 86 PI members (88 research topics), only six PIs from the first RA and eight from the second RA were absent. Overall, 133 people including collaborating researchers and GOSAT project team members attended this meeting.



133 reseachers from 18 countries attended the 2nd GOSAT RA PI Meeting.

The meeting started and ended with plenary sessions. In between the plenary sessions, the participants separated into two rooms, one for the sessions on calibration, data processing algorithms, and validation, and another for the modeling and data application.

At the opening plenary session, after the opening remarks and welcome speeches were made, the current status and future prospects of the GOSAT and TANSO were reported. In the closing plenary session, the sessions and working groups mentioned below were summarized, and the action items were reviewed.

There are two noticeable points of this meeting. The first is that the presentations were of high quality in general. The second is that working groups (WG) were established. In the end of data processing algorithm session, a proposal was made that the WGs should be established to encourage more active discussions on the several issues that currently exist. As a result, WGs on the following three issues were formed: aerosol retrieval, Short Wave Infrared Radiometer (SWIR) data product retrieval, and Thermal Infrared Radiometer (TIR) data product retrieval. The first meetings of these WGs were held during the lunch break on the second day.

Professor Teruyuki Nakajima of Center for Climate System Research, University of Tokyo (CCSR) chaired the aerosol WG, Dr. Hartmut Boesch of Leicester University chaired the SWIR WG, and Professor Ryoichi Imasu of CCSR chaired the TIR WG. These WGs will be continued from now on, and good outcome is expected from each WG.



(From Left) Dr. Teruyuki Nakajima (CCSR) , Dr. Hartmut Boesch (Leicester University), Dr. Ryoichi Imasu (CCSR) chaired the newly established working groups. Photo : Nobuyuki Kikuchi

As for the action items, four out of six items that were left open at the first RA PI meeting had been completed before the second meeting, and two items are to be completed in the near future.

We newly proposed ten action items at this meeting. Two have already been accomplished, and four are to be completed shortly. We will continue on the efforts to accomplish the rest as well.

To summarize the entire meeting, each PI is engaged in the active research even though the quality of L2 and L1B data products of TANSO-FTS and TANSO-CAI is still under the process of improvement. The greater success is expected when the data products of higher quality are released in the near future.

GOSAT INTERVIEW

DR. DAVID CRISP

Principal Investigator, Orbiting Carbon Observatory
Senior Research Scientist, Earth and Space Sciences Division,
Jet Propulsion Laboratory, California Institute of Technology

Dr. David Crisp, the principal investigator (PI) of National Aeronautics and Space Administration (NASA)'s Orbiting Carbon Observatory (OCO) mission, sat down for an interview for NIES GOSAT PROJECT NEWSLETTER to talk about his past, his impression on current GOSAT data, and a possibility for the OCO-2 launch. (Interviewer : NIES GOSAT Project Leader Tatsuya Yokota. Kyoto, Japan. Jan. 26, 2010.)

Yokota: Thank you for coming to Kyoto. You are the PI of NASA's OCO mission[1] at Jet Propulsion Laboratory. Firstly, I would like to hear about your birthplace and university days, and how you became involved with the OCO project.

Crisp: I was born in Las Vegas, Nevada. My father was in the U.S. Air Force there. Maybe you know what was happening in Nevada during the 1950s.[2] We moved many times after my father retired from the Air Force, and settled in South Texas. I received my Bachelor's of Science at Texas A&M University. I received my Ph.D. in Geophysical Fluid Dynamics from Princeton University in 1984. There, I was involved in atmospheric physics and studied the thermal balance of the middle atmosphere of Venus. I developed a radiative transfer model that has since been used for studying the atmospheres of Venus, Earth, Mars, Jupiter, and Neptune. At the Jet Propulsion Laboratory (JPL), I started as a member of the technical staff for the Hubble Space Telescope Wide Field Planetary Camera-2 (WFPC-2) project. I contributed to the design of the spectral filters used to make color images, and the development of a computer code that was used to estimate its radiometric performance. Then I led the Science Team's Mars and Neptune observing programs. I was also Principle Investigator of the JPL Micro-Hygrometer. As a member of the Mars Pathfinder Science Advisory Group, I contributed to the design and testing of the meteorological instruments on the Mars Pathfinder Lander.

Yokota: I am surprised that your major was radiative transfer. My major was also atmospheric radiative transfer and information processing. Could you tell us how you became involved with the carbon cycle science and become the OCO PI?

Crisp: As you know, I proposed the OCO project to the NASA's Earth System Science Pathfinder (ESSP) program with my colleagues at JPL, Geoffry Toon, Charles Miller and others. The most critical challenges for the proposal was to address an important Earth Science problem within a very restrictive budget. However, the OCO was selected as one of the best three candidates in the ESSP competition in July of 2002, and then was finally approved for implementation in May of 2005. As you all know, the disaster of OCO launch happened. The fairing of the launch vehicle did not open, and the satellite did not reach orbit. After that the OCO scientists started to use the GOSAT data, and are now working on the proposal for the OCO-2 launch with NASA Headquarters.

Yokota: What is your impression of the present GOSAT data and future expectation?

Crisp: The GOSAT data are very promising. However, this is still a pioneering measurement, and we still need to do some work to fully exploit the information that the data contain. We, at the Atmospheric CO_2 Observations from Space (ACOS)[3], have made a lot of progress over the past year, and believe that we will soon be able to meet the GOSAT measurement accuracy requirements of 1% (4 ppm) on regional scales. After that, we are still hopeful that by working closely with the GOSAT calibration team at JAXA and the retrieval algorithm team at NIES, we will eventually be able to even meet the more demanding OCO requirements of 0.3% accuracy at least over continents.

Yokota: Thank you for your time today. We hope to continue good collaboration between GOSAT members and ACOS members as ever.

1 The Orbiting Carbon Observatory (OCO) was a NASA Earth System Science Pathfinder Project (ESSP) mission designed to make precise, time-dependent global measurements of atmospheric carbon dioxide (CO_2) from an Earth orbiting satellite. On February 24, 2009, OCO failed to reach orbit.

2 In 1950, the U.S. Atomic Energy Commission conducted a series of continental nuclear weapons tests, code named Ranger, in the land owned by the U.S. Air Force in Nevada State. In 1951, the site was established as the Nevada Test Site, a permanent proving ground for nuclear weapons.

3 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 works closely with the GOSAT project to develop and enhance the CO_2 retrieval algorithm for both GOSAT and OCO-2 projects.

GOSAT INTERVIEW

A Series: "IBUKI"'s PI Interviews

GOSAT Project hosted the Second Annual Research Announcement Principal Investigator Meeting (RA PI Meeting) in Kyoto. At this meeting, the PIs of selected RAs, 133 of them from 18 countries around the world, gathered and had intensive discussions.

No.1 Dr. Liping Lei

Chinese Academy of Sciences
Center for Earth Observation
& Digital Earth Sciences

For this issue we are going to introduce one of the PIs from the first RA, Dr. Liping Lei. The interview with Dr. Lei who lived in Japan from 1994 to 2007 was conducted in Japanese. (Interviewer: Yuki Tanaka. Kyoto, Japan. January 26, 2010.)

- I would like to know about your history until you were involved in the current research. Where are you originally from?

I was born in Yunnan Province in China. I went to Beijing attending college. I received my bachelor's degree in geography from Peking University, and majored in remote sensing for my master's degree. After graduating, I worked at Chinese Academy of Sciences for eight years. At the time, Professor Ryuzo Yokoyama of Iwate University (Current honorary professor at Iwate University) in Japan was researching vegetation in China and seeking a Chinese student to work with him. So, I came to Japan as a Japanese government scholarship student in 1994 and got the doctor's degree in 1999.

It is all thanks to my respected Professor Yokoyama why I can write and speak Japanese so much. He was strict. At first, I was thinking of writing my doctoral dissertation in English, but Professor Yokoyama said to me "You came to Japan, so you should write in Japanese." After that, I gradually tried to watch a lot of television drama series and NHK[1] documentaries except my studying. Naturally, I became to like the Japanese culture, and smoothly finished my doctorate paper.

-What was your research at Iwate University?

Originally, I was doing a research on the vegetation monitoring using remote sensing data. I developed a data processing system for the sensor called Advanced Very High Resolution Radiometer (AVHRR) and a software of atmospheric correction. I also did a research on the vegetation in Inner Mongolia grassland.

After receiving my PhD. degree from Iwate University and working as a researcher in the same university, I worked at a Japanese company where I worked on practical application of remote sensing for five years.

In 2007, when my child left home for college, I decided to go back to China. The change of circumstances was a chance for me to restart my research to find "what the remote sensing can do to solve the problems regarding the Chinese environment."

- Could you explain your current research?

I am studying the spatial and temporal variability of CO_2 and CH_4 concentrations in China and their relationships with the land surfaces, for example the land use.

In China, the global warming is a matter of great concern as well. Remote sensing technology is very useful to help us understand the mechanism of global warming. Since GOSAT is a Japanese satellite, I thought it would easy for me to exchange information using my language skill. That is why I applied for the 1st RA.

Currently, I am still working on various projects in China other than GOSAT. For example, I am doing the research how the global warming has affected the variation of snow and glacier in Qinghai-Tibet Plateau in a government-funded project.

I am happy that the Chinese economy has been growing in recent years, so research funding has been increasing as well. This has enabled more ground observations and field works for us.

- What is your impression on "IBUKI"'s data?

I used Level 2 data products that were released last October and checked which areas in China have high or low concentration, and investigated the rationality of data. The spatial distribution of CO_2 derived from IBUKI's data seems reasonable. The concentration is high in areas where anthropogenic emission is high – such as where many people live or where there are many factories.

Now although there are not many GOSAT observation points available still, the investigated result of CH_4 is also shown reasonable to some extent.

The satellite observation and data processing algorithms are very complex, so there is always some level of error. The task for us researchers is how to find and reduce these errors. One solution is to find where the uncertain data is firstly, and then to investigate the reason for the errors at those points. When the values derived from the satellite were compared to the ground observation, it is inevitable that there is an absolute gap. However, I think you can find a relative variation when comparing the data acquired on the same point at the different time.

Since the satellite observation can acquire the mass of data for the large region continuously, I believe that GOSAT will present us many meaningful investigating results with the increase of GOSAT observating data.

- What is your plan for the future?

China is putting an importance on coping with global warming including reduction and other environmental issues. I'll make the further analysis for GOSAT data combined with the field works. As a scientist, through the GOSAT RA research, I wish that my studying results should contribute to the government's policy making towards energy saving and CO_2 reduction.

1 NHK is a public broadcaster in Japan.

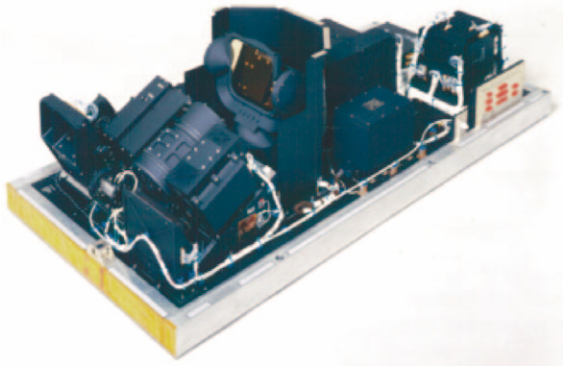
GOSAT PEOPLE

NIES GOSAT Project Leader
Text : **TATSUYA YOKOTA**
Chief, Satellite Remote Sensing Research Section,
Climate Change Research Program Core Research Project 2 Leader
Center for Global Environmental Research (CGER), NIES

GOSAT is the third satellite I have been concerned with. I was involved in two other satellite projects at National Institute of Environmental Studies (NIES) before the GOSAT project.

First: ILAS Project – Polar Ozone Layer Monitoring Sensor

My first satellite project was on the Improved Limb Atmospheric Spectrometer (ILAS), the first ozone layer monitoring sensor of Japan. Since "ozone depletion in the stratosphere" was the biggest global environmental issue in the world twenty years ago, the Environment Agency of Japan (former Ministry of the Environment (MOE)) and NIES developed a satellite sensor to observe the minor gas constituents in polar ozone layer where the ozone hole was appearing. I was involved in this project from the preliminary investigating stage in 1989. I was dispatched as a visitor researcher at NASA Langley Research Center (LaRC) in the United States from November 1990 for one year. I stayed in the HALOE group and studied the basics of data retrieval methods to estimate the vertical profile of concentrations of ozone and other related gases for the ILAS project. I remember many flying fighters took off for the Gulf War from the U.S. Air Force base adjacent to the NASA LaRC at that time. After coming back to Japan, I developed a data processing algorithm for the ILAS by modifying the methods that I learned there. ILAS was successfully launched aboard Advanced Earth Observing Satellite (ADEOS, "MIDORI") in August 1996, but ADEOS ceased its operation due to a mechanical trouble in the satellite's solar paddle in the end of June, 1997.

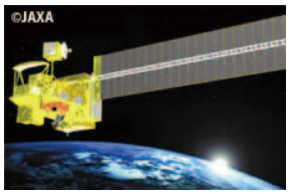


The exterior view of ILAS sensor. Photo : From the ILAS pamphlet (initial results).
http://db.cger.nies.go.jp/ilas/DHF/Pamphlet/p.1_2.pdf

Successor ILAS-II on the Satellite MIDORI-II

The next project was the Improved Limb Atmospheric Spectrometer-II (ILAS-II). In this project, I upgraded the data processing algorithm and developed the ILAS-II Data Handling Facility (DHF) as a Research Program Manager of CGER. On the year of launch, I was promoted to the Chief of the Information Processing and Analysis Section in the Social and Environmental System Division at NIES, and became in charge of managing the ILAS-II DHF and of the data processing algorithm research. The ILAS-II was successfully launched on the Advanced Earth Observing Satellite-II (ADEOS-II, "MIDORI-II") in December, 2002, but the satellite operation once again stopped due to a electrical trouble in the satellite's solar paddle in October, 2003.

"MIDORI II" carried the successor ILAS-II, but had to end its operation due to the solar-paddle failure. Photo : From the ILAS-II homepage.
http://db.cger.nies.go.jp/ilas2/en/index.html



GOSAT Data Processing Algorithm Development and Becoming the Project Leader

GOSAT project is a joint project among MOE, Japan Aerospace Exploration Agency (JAXA), and NIES. These three parties initiated the project in 2002, and a virtual team was organized in CGER, NIES in April, 2004. The team leader was Dr. Gen Inoue, then Director of CGER, and six staff members including me, and several contract researchers joined this virtual team. At first, I was in charge of developing the data retrieval algorithm along with the late Dr. Tadao Aoki, Yukio Yoshida, Nawo Eguchi, and Yoshifumi Ota. I will leave the details on the algorithm development and its contribution to the project for the other researchers for other articles of this newsletter. After two years, in April 2006, as the Second Five-year Plan started at NIES, GOSAT team was established as an official organization both as a research group and a project at CGER. Since then I am assigned the project leader. "IBUKI" is a satellite that aims to obtain scientifically effective observation data of greenhouse gases. It was not proved if it is possible to obtain analyses usable enough from the satellite

observation data. For this reason, we made computer simulation for developing the data retrieval method and conducted field experiments before the satellite launch to make sure if the developed method was reasonable and effective.

"IBUKI" Keeps on in Its Operation

Shortly before the launch, GOSAT was nicknamed "IBUKI". "IBUKI" was launched from the JAXA Tanegashima Space Center in January 2009. Since then, it has been keeping in operation for more than one year until now. In the three parties' GOSAT project, NIES has taken several roles on various researches and tasks for several years before the launch until now: development and improvement of the data processing algorithms, development and operation of the DHF system, evaluation and validation of "IBUKI" data products, development of transport and inverse models to estimate carbon flux by using "IBUKI" data and ground monitoring station data, issuing research announcements, releasing the data products to researchers and the general public, and distributing information. These tasks were achieved and maintained by the efforts of more than 20 researchers, engineers, and assistant staffs involved in the NIES GOSAT project, as well as the contractors who support the project.

Third Time is a Charm

Both ILAS and ILAS-II, whose projects I was involved in, operated only for eight months even though they were planned to operate for three years. "IBUKI" has just turned one year last month. We were able to start releasing the data products to the general public, as we should keep our efforts to improve the products to be more precise and satisfactory. I am very glad that "IBUKI" has become my third time charm. "IBUKI" is aimed to operate for more than five years. I hope "IBUKI" will obtain observational data continuously for long period of time, and I am determined to make the best effort to produce good results and useful data for research works with other members in the project. I hope with all my heart that researchers around the world would yield many scientific results by using the "IBUKI" data in near future.

IMAGE OF THE MONTH

Diffusion of River Water Seen in CAI Image

Coastal Regions of Pacific Ocean, Japan

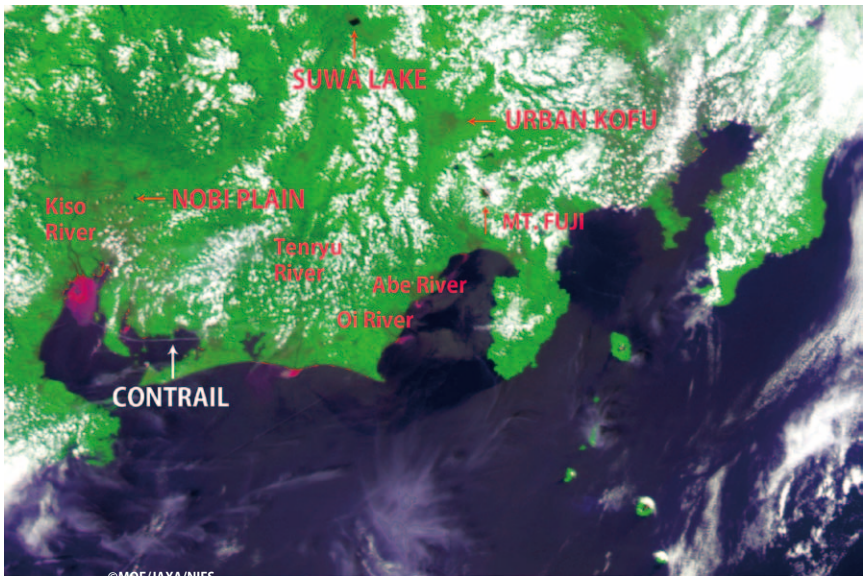
Text：Tsuneo Matsunaga

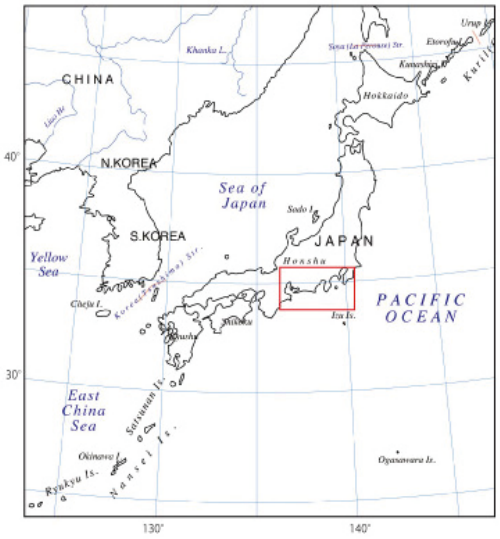
Chief, Office for Global Environmental Database, CGER, NIES

This month, "The Image of the Month" features a CAI L1B+ image (August 3, 2009) of the coastal region of Pacific Ocean from Kanto and Chubu area in Japan. The image was introduced by Dr. Yuji Sakuno of Graduate School of Engineering at Hiroshima University, the PI of GOSAT RA study, "Aerosol distribution estimation using GOSAT CAI data in coastal environments for red tide bloom detection."

In the land area you can see some small clouds scattered, but the urban area of Kofu, Suwa Lake, and Northern Nobi Plain are shown clearly. You can see there are some red parts on the sea surface around the mouths of Kiso River in Ise Gulf, of Tenryu River coming from Suwa Lake, of Oi, Abe, and Fuji rivers in Suruga Gulf. They can be considered as the signs of river water that is more turbid than seawater diffused into the ocean. Two days before "IBUKI"'s observation there was 83 mm rainfall in Kanie town in Aichi Prefecture, 55mm in Iwata city and 62mm in Shizuoka city in Shizuoka Prefecture. The soil and sand carried into the rivers due to this rain seem to be the reason why those parts in the ocean appear red in this CAI image.

Additionally, there is a thin white line from the Central Japan International Airport to Toyokawa City, and this seems to be a contrail of airplane flying over the area.





CAI Level 1B+ data product of the coastal region of Pacific Ocean, Japan (August 3, 2009) *Blue=Band 1 Green = Band 3, Red=Band 2

AHA! OF THE MONTH

Keeling Curve

Text, figure：— Hiroshi Takagi
Specialist, CGER, NIES

The result of the pioneering CO_2 observation work that laid the foundations for later researches in man-made greenhouse gases, including the GOSAT Project, is referred to as the "Keeling Curve" (shown in the figure). This long-term effort began in late 1950s near the summit of Mt. Mauna Loa, Hawaii, where the present-day Mauna Loa Observatory is located. The observatory, now operated by the U.S. National Oceanic and Atmospheric Administration, rises 3,397 meters (11,135 feet) above the sea level. This is a prime location for monitoring long-term trend of CO_2 levels since the location does not see direct influences of large-scale human activities and plant respirations.

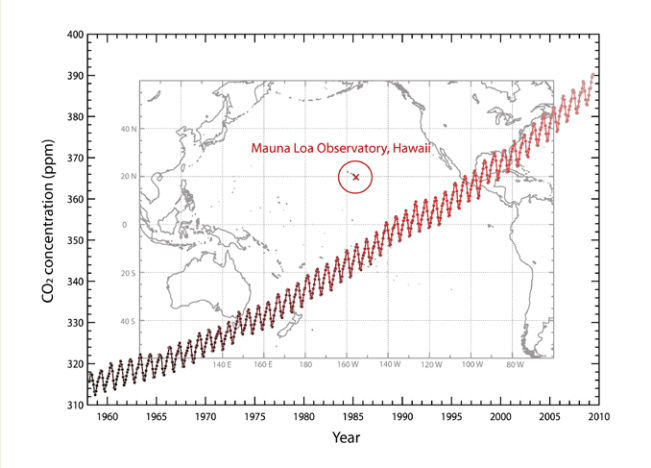


Figure: The Keeling Curve-the concentration of carbon dioxide measured at Mauna Loa Observatory, Hawaii (19.5° N, 155.6° W) over the period between 1958 and 2009. The figure was produced with the data provided by the Scripps Institution of Oceanography, USA.

In 1958, Dr. Charles Keeling, a postdoctoral research fellow at that time, began taking measurements of CO_2 at that location. Until early 1960s, the trend in atmospheric CO_2 levels was not clearly understood. His findings shed light on the unknown by showing that the atmospheric CO_2 concentrations were rapidly increasing. The CO_2 level at the start of his observation work was around 315 ppm, but it has risen, over the course of fifty years, to the level of 390 ppm (see figure).

We hope that our effort in monitoring CO_2 with GOSAT would lead to more accurate understanding of the current CO_2 trend and preventing further progression of global warming.

CALENDAR

2010/03/01

Presenting a research at the 17th Remote Sensing Forum held by the Society of Instrument and Control Engineers at Tokyo Metropolitan University, Akihabara Satellite Campus (Akihabara Dai Bldg., 12F).

2010/04/17

Lecturing and exhibiting a booth at NIES Open House held as a part of Science and Technology Week in Tsukuba city.

ANNOUNCEMENT

GOSAT PROJECT NEWSLETTER is accepting submissions from our readers.
We appreciate your opinion pieces;
"I want to read articles on ..."
"I'd like to know what ... means."
"... was really interesting. ...could have been better if ..."
etc.
We also appreciate contributions from people involved in GOSAT Project;
"I'd love people to know about ..."
"My research (work) is on ...,
and I am passionate about it!" etc.
Please feel free to contact : gosat_newsletter@nies.go.jp.
Thank you for supporting our newsletter.

-Yuki Tanaka, editor

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