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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CONTENTS

NEWS

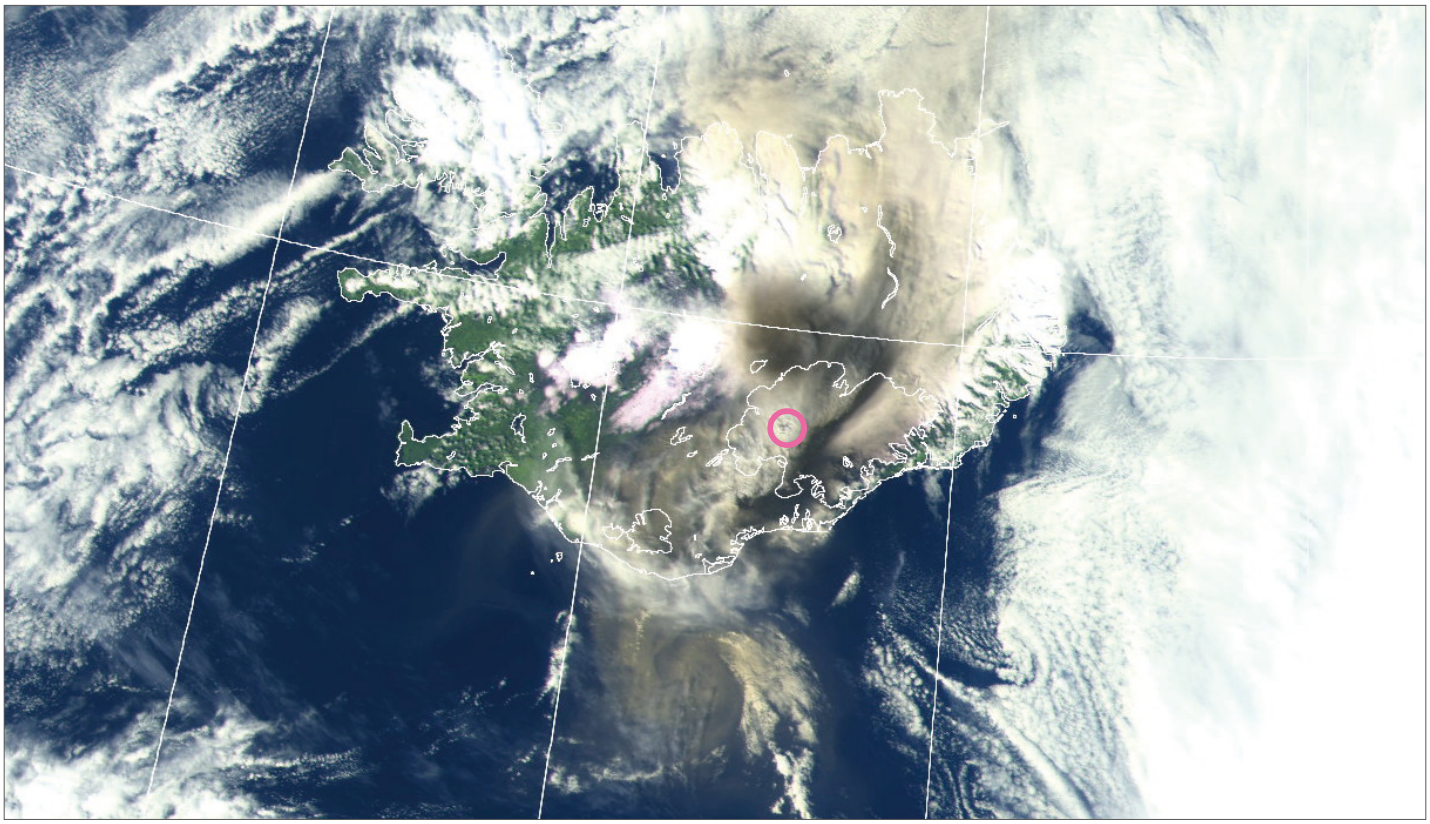
ANOTHER VOLCANO ERUPTS IN ICELAND

- Nobuyuki Kikuchi, Specialist, NIES GOSAT Project Office

The plume of erupting Grimsvotn volcano in Iceland was observed by the Cloud and Aerosol Imager of the Greenhouse gases Observing SATellite (GOSAT) "IBUKI."

The Grimsvotn volcano started its eruption on May 21, 2011, and the image was captured on May 22, 2011, at 15:09 (UTC) (on May 23, 2011 at 0:09 (JST)) when "IBUKI" flew over Iceland. The plume (in yellow and black) can be seen drifting northwards and southwards when the image was captured. The red circle indicates the location of the volcano.

In Iceland, Eyjafjallajokull volcano erupted last year on April 14 as reported in NIES GOSAT PROJECT NEWSLETTER, April 2010 (Issue#4).



The image shows Iceland observed by the Cloud and Aerosol Imager (CAI) of "IBUKI" at 15:09 on May 22, 2011 (UTC) (00:09 on May 23, 2011 (JST)). (Blue = Band 1, Green = Band 3, Red = Band 2) The plume is shown as yellow and black, and the red circle indicates the location of the Grimsvotn volcano.

NEWS

A Fine Picture of Fossil Fuel CO_2 Emissions

- Tomohiro Oda, Research Associate, Biogeochemical Cycle Modeling and Analysis Section, CGER, NIES

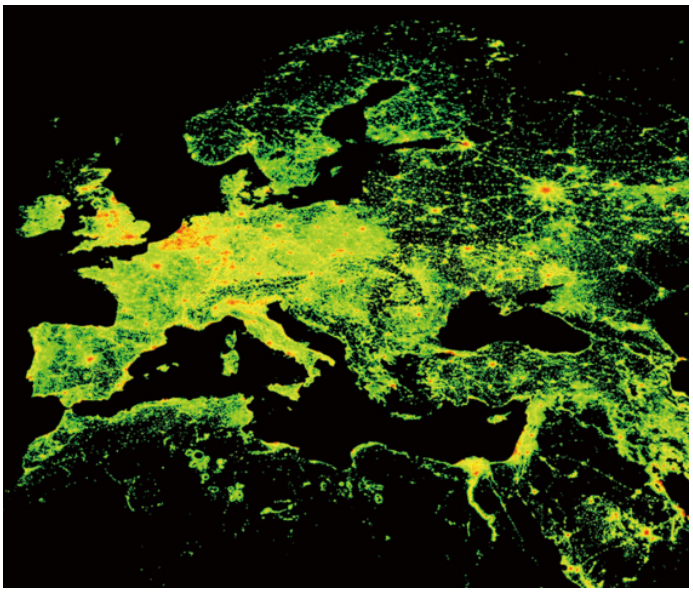


Figure 1 Emission map over Europe, Northern Africa and a part of Middle East.

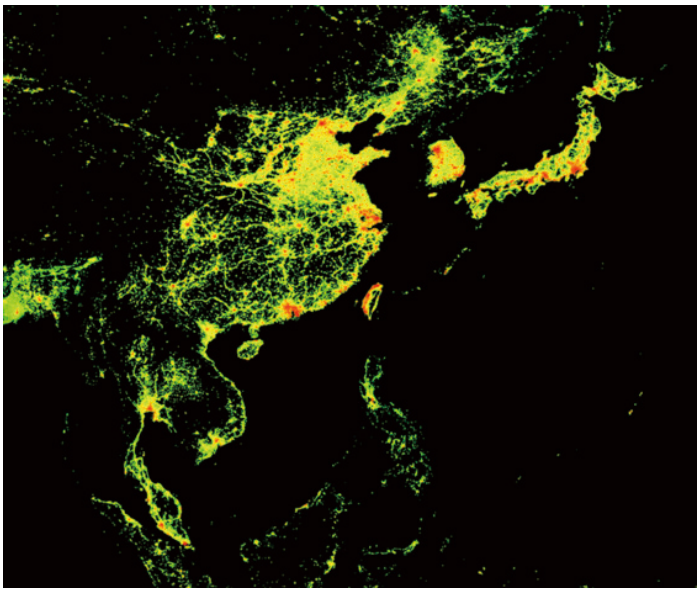


Figure 2 Emission map over East Asia

Carbon dioxide (CO_2) circulates through different processes around the world including man-made CO_2 emissions, photosynthesis and respiration by plants and atmosphere-oceanic CO_2 exchange. We at the GOSAT project have developed computer models that simulate key aspects of global CO_2 cycle, which will be used to draw a global picture of regional sources and sinks. Here we introduce one of those models; the "ODIAC" (Open-source Data Inventory for Anthropogenic CO_2)[*1] model which gives a very fine picture of CO_2 emissions due to fossil fuel burning.

CO_2 emissions due to human activity are a major source in the global carbon cycle. Human activity emits 29 billion tons of CO_2 per year (as of 2008)[*2] by burning fossil fuels such as coal, oil and natural gas. The amount of CO_2 used per country is usually calculated by known fossil fuel consumption over a year-long period. Global and national total CO_2 emissions can be derived by applying conversion factors to the total amount of consumed fuels.

Though it sounds simple to develop a dataset of fossil fuel CO_2 usage, one large remaining concern is that the CO_2 emission location is unknown, though we can derive good national numbers. Conventionally the distribution was estimated using distribution of population, thus emissions were distributed to proportional to population density on an emission map. This is a good approximation. For example, CO_2 emissions would be much higher say, at Tokyo (where human activity is intense), compared to the middle of Sahara desert (less populated). However, if we want to draw a fine resolution picture, such an assumption is not appropriate. If we use population data, we cannot tell where people live within a town, nor locations of important CO_2 sources such as power plants and heavy traffic that are not always related to human residence.

In the ODIAC model, national total emissions for a country were considered as the sum of power plant emissions and other emissions. Then, power plant emissions were mapped using geographical coordinate (latitude and longitude) available in power plant records and remaining emissions were distributed using satellite-observed nightlight distribution. Nightlight data is available at 1 km (30 arc second) resolution globally and as such, is very useful to pinpoint exact location of human settlements.

This distribution methodology is simple, but powerful. Figure 1 shows the emission distribution over Europe, Northern Africa, and a part of Middle East. Bright regions indicate where intense sources are located. European countries are indicated as sources as well as some coastal regions in Africa, and human settlements along the Nair are also clearly depicted. In addition, we can see lights that could tell us emissions from major traffic roads (see around Moscow, for instance). How about East Asia? (see Figure 2) As expected, populated cities such as Beijing, Shanghai, Hong-Kong, Tokyo are very bright. Over China we can see clear contrast of developed coastal regions and less-developed inner regions. Such knowledge is included and taken into account in the analysis of regional sources and sinks by using ODIAC inventory.

The ODIAC model produces very fine, vibrant pictures. But, please do remember, this tells you how we emit CO_2 on this Earth.

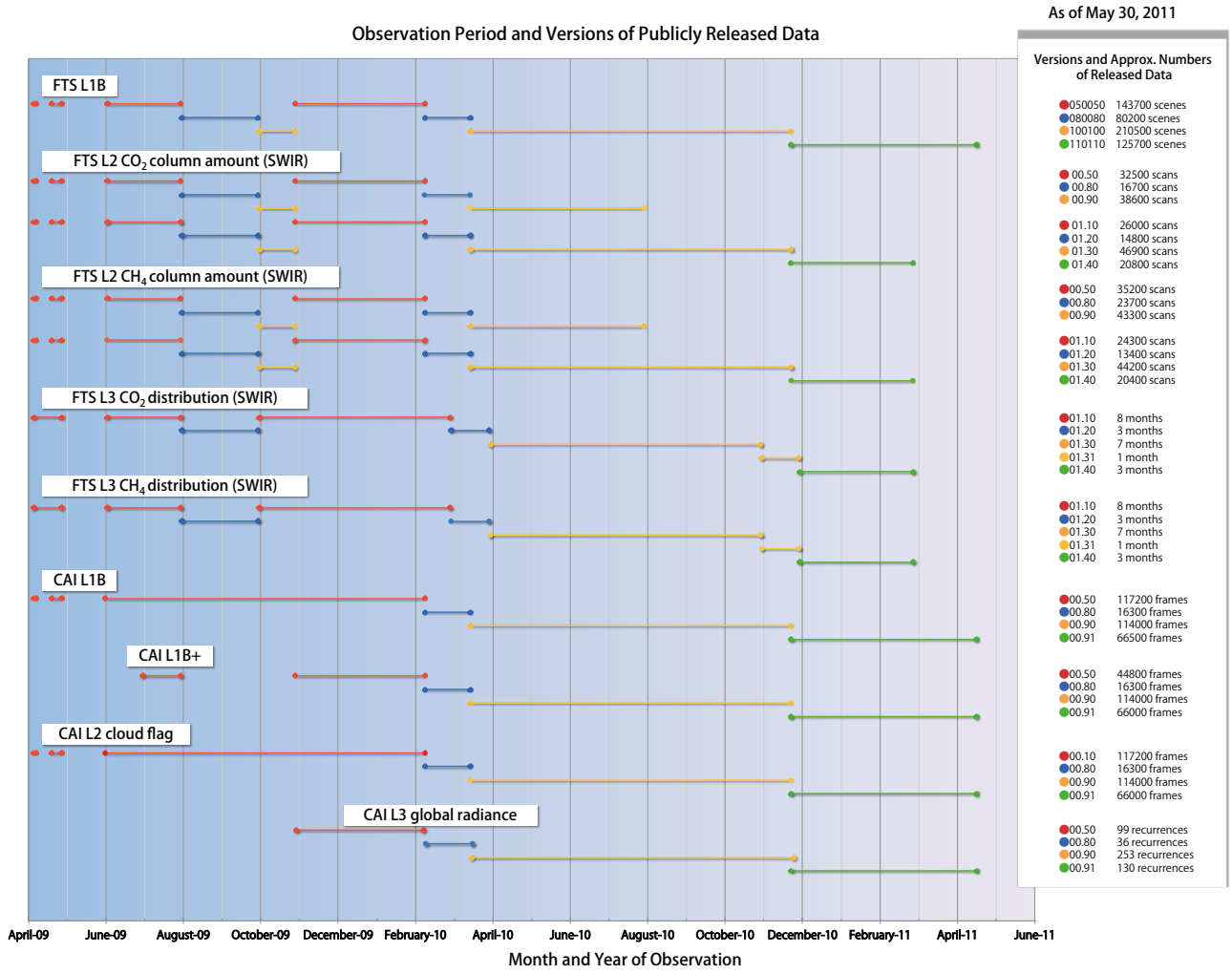
*1 Oda, T. and Maksyutov, S.: A very high-resolution (1 km × 1 km) global fossil fuel CO_2 emission inventory derived using a point source database and satellite observations of nighttime lights, Atmos. Chem. Phys., 11, 543-556, doi:10.5194/acp-11-543-2011, 2011.
http://www.atmos-chem-phys.net/11/543/2011/acp-11-543-2011.html

*2 International Energy Agency (IEA) CO_2 Emissions from Combustion 2010 EDITION

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 April and early May 2011.

Continued from last month, we processed and released the V110110 of the FTS L1B data products, the V00.91 of the CAI L1B, L1B+, L2 cloud flag and L3 global radiance data products, and the V01.40 of the FTS L2 CO_2 and CH_4 column amount (SWIR) data products, and FTS L3 global CO_2 and CH_4 distribution (SWIR) data products. At 18:15 on April 19, 2011 (UTC), we have started processing upgraded versions, V128128 for the FTS L1B, V00.92 for the CAI L1B, L1B+, L2 cloud flag, and L3 global radiance data products, and V01.50 for FTS L2 CO_2 and CH_4 column amount (SWIR) and FTS L3 global CO_2 and CH_4 distribution (SWIR) data products. The changes of the new versions will be listed in the "Difference of the Standard Product by Version" on the GOSAT User Interface Gateway. Please be reminded due to the processing delay, not all the upgraded products are released and available yet.

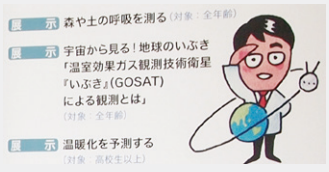
The number of registered users is 1049 as of May 20, 2011.

Answers to IBUKI QUIZ on ISSUE#15

Q1
Which of the following items is not observed by "IBUKI"?
3) temperatures of world's major cities

Q2
About how much is the CO_2 concentration "IBUKI" has been observing now? 3) 390ppm

Q3
What item weighs about the same as "IBUKI"?
1) large passenger car. (approx.1.75t)



Q4
Who is the model of this image on an ad board at the NIES Summer Openhouse?
1) NIES GOSAT Project Leader Tatsuya Yokota (see P1 of Issue #8)

Q5
Which of the following techniques does "IBUKI" employ to measure the CO_2 and CH_4 in the earth's atmosphere?
2) nadir-looking method

AHA! OF THE MONTH

GOSAT DATA IMAGES IN GUIG GALLERY

- Nobuyuki Kikuchi, Specialist, NIES GOSAT Project Office

The GOSAT User Interface Gateway (GUIG) is a website for distributing the Greenhouse gases Observing SATellite (GOSAT), "IBUKI"'s data products such as observational data and analysis data. On GUIG, we have the Gallery section to exhibit maps and images created from the GOSAT data products. You are able to find global maps of CO_2 and CH_4 concentrations as well as to search and download satellite images of the Earth's surface acquired by the Cloud and Aerosol Imager (CAI) on "IBUKI."

Gallery provides the monthly global maps of FTS SWIR Level 2 and Level 3 data products of CO_2 and CH_4, as well as the FTS SWIR L3 (XCO_2) animation videos. These items show how the distributions of CO_2 and CH_4 concentration change month by month.

The CAI images are distributed per frame. It is possible to search for CAI images of specific time and location. For more details on how to use "CAI L1B+ Browse," please refer to the article, "CAI L1B+ Browse Images Now Released – How to Search and Display Images" on the NIES GOSAT PROJECT NEWSLETTER June 2011 (ISSUE#6).

If you are interested in the GOSAT data products, you are able to login to GUIG as a "guest user." Please click on "Product & Service" - "User Authentication"- "Guest user login" in GUIG. As a guest user, you have access to do almost everything what a registered general users can do, including to search for data products and to read technical documents; however, you cannot download data products. If you wish to download and use data products, please register as a general user. You can start the registration process by going to "Product & Service" - "User Authentication" - "For Registration: here" in GUIG.

ANNOUNCEMENT

NIES GOSAT PROJECT NEWSLETTER welcomes letters from our readers.
We appreciate your opinions,
"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. - Yuki Tanaka, editor

CALENDAR

2011/06/11

Opening of the "TSUNAGARI" project at Miraikan, the National Museum of Emerging Science and Innovation in Tokyo, Japan. The GOSAT data products will be exhibited on their Geo-Cosmos and Geo-Scope.
Miraikan URL (http://www.miraikan.jst.go.jp/en/)

PUBLISHED PAPERS

Field of Research : Carbon balance estimation, atmospheric transport models
Name of Journal : Geoscientific Model Development (Volume 4, Number 2, pages 317-324)
Title : Simulation of variability in atmospheric carbon dioxide using a global coupled Eulerian – Lagrangian transport model
Authors : Y. Koyama, S. Maksyutov, H. Mukai, K. Thoning, and P. Tans

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