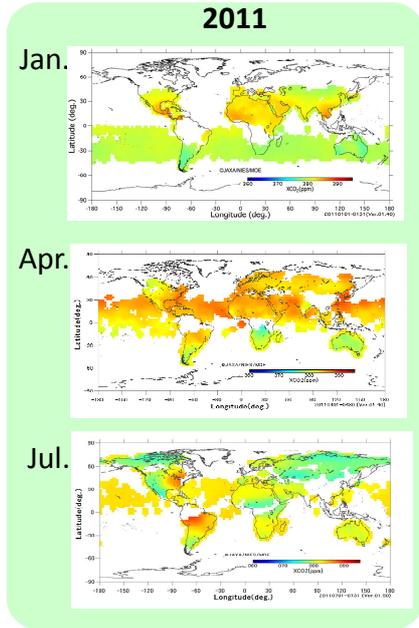
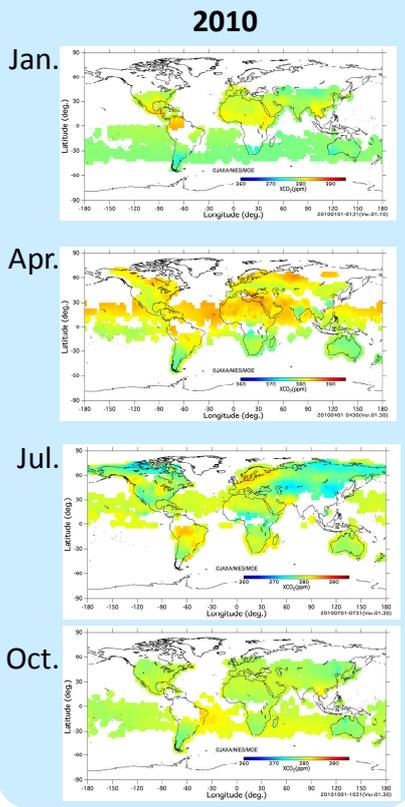
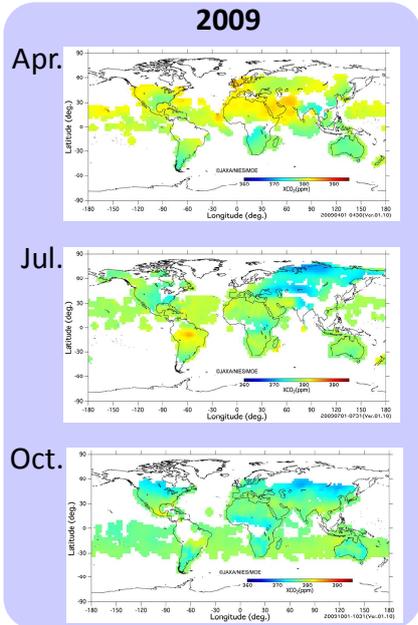


# Greenhouse Gas Monitoring From Space by GOSAT

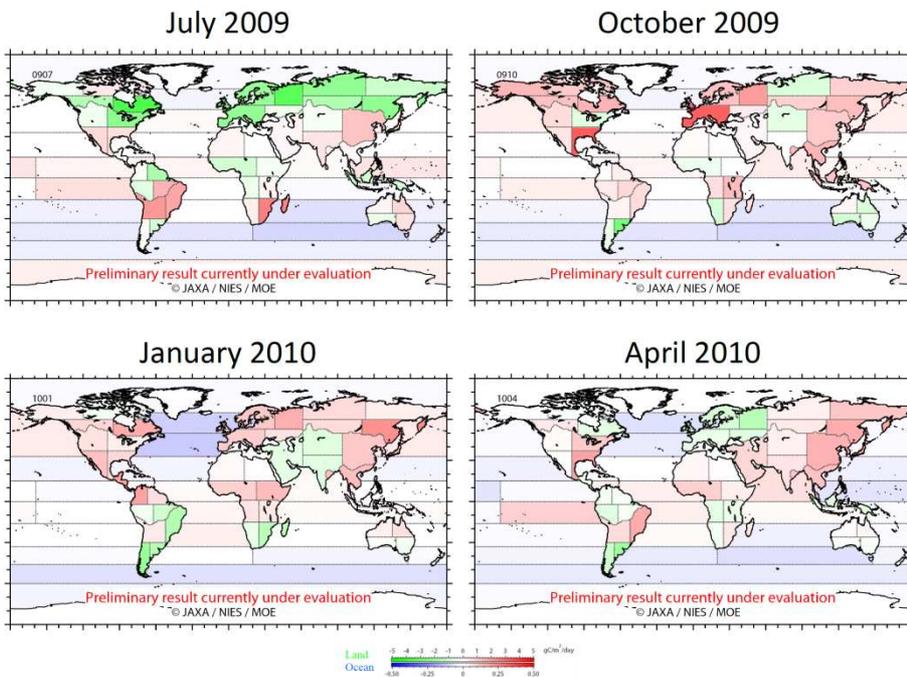
Monthly global map of the CO<sub>2</sub> column-averaged volume mixing ratios in four seasons for three years (April 2009 - July 2011)



(Biases of the GOSAT XCO<sub>2</sub> data about 9 ppm lower than the ground-based validation data are not corrected in these figures.)



## Monthly CO<sub>2</sub> Flux Estimates



64-regional monthly CO<sub>2</sub> fluxes estimated from ground-based network data\* and GOSAT XCO<sub>2</sub> retrievals (currently under evaluation). Results for four months (July 2009, October 2009, January 2010, and April 2010) are presented.

\*GLOBALVIEW-CO2 (2011), Cooperative Atmospheric Data Integration Project - Carbon Dioxide. CD-ROM, NOAA ESRL, Boulder, Colorado (Also available on Internet via anonymous FTP to <ftp.cmdl.noaa.gov>, Path: ccg/co2/GLOBALVIEW).

### GOSAT websites

JAXA GOSAT project

NIES GOSAT Project

Press conference statements

[http://www.jaxa.jp/projects/sat/gosat/index\\_e.html](http://www.jaxa.jp/projects/sat/gosat/index_e.html)

[http://www.gosat.nies.go.jp/index\\_e.html](http://www.gosat.nies.go.jp/index_e.html)

<http://www.gosat.nies.go.jp/eng/related/2011/201111.htm>



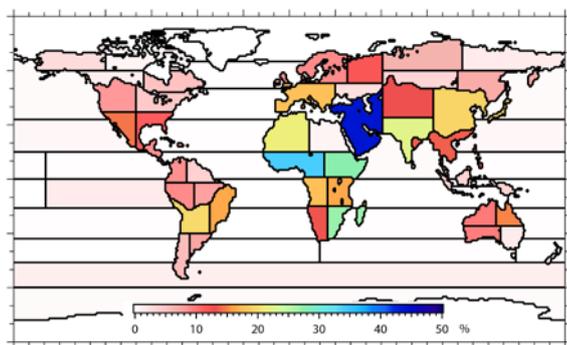
# Estimating Global Monthly Carbon Dioxide Fluxes by Region, Utilizing the Observational Data Obtained by the Greenhouse gases Observing SATellite “IBUKI” (GOSAT)

Ministry of the Environment, Japan  
National Institute for Environmental Studies, Japan  
Japan Aerospace Exploration Agency  
November, 2011

The Ministry of the Environment, Japan, the National Institute for Environmental Studies, and the Japan Aerospace Exploration Agency have been jointly conducting the GOSAT Project for monitoring the global distribution of greenhouse gases. GOSAT was placed in orbit in late January 2009, and it has been taking global soundings of carbon dioxide (CO<sub>2</sub>) and methane for over two years. The CO<sub>2</sub> sounding data have been processed into column-averaged dry air mixing ratios of CO<sub>2</sub> (hereafter denoted as X<sub>CO2</sub>), and the retrieved X<sub>CO2</sub> data are publicly available as the GOSAT FTS SWIR Level 2 data product. To easily grasp the overall characteristics of X<sub>CO2</sub> distributions, the GOSAT FTS SWIR Level 3 data product (gridded X<sub>CO2</sub> concentrations on a monthly basis) has been generated via spatially interpolating and extrapolating the Level 2 X<sub>CO2</sub> data using the Kriging method. The time series of the Level 3 data product over a two-year period is shown in **the upper panel on the back page**. Using the Level 2 X<sub>CO2</sub> data product and the ground-based monitoring network data GLOBALVIEW-CO<sub>2</sub><sup>†</sup>, monthly CO<sub>2</sub> net fluxes (the sum of anthropogenic emissions and the exchanges between the atmosphere, land ecosystems, and the ocean) and their uncertainty were estimated for 64 regions on a sub-continental scale. It was demonstrated that the addition of the GOSAT Level 2 X<sub>CO2</sub> data to the ground-based network data leads to reduction in uncertainty associated with the flux estimates, particularly for regions in South America, Africa, Middle East, and Asia where the sparsity of the ground-based monitoring sites is most evident (see the figure below).

The outcomes of this research were published in the Meteorological Society of Japan’s Scientific Online Letters on the Atmosphere (SOLA) on October 29, 2011<sup>‡</sup>. To be evaluated and verified, these monthly regional flux estimates have been disseminated to affiliated researchers worldwide selected by means of GOSAT Research Announcements. Following the assessment and verification of these results by the researchers, further improved flux data will be made available to the general public.

Among the preliminary results being evaluated by the researchers, the flux estimates for four representative months (July 2009, October 2009, January 2010, and April 2010) are presented in **the lower panel on the back page**. The figures show changes in the net flux distribution with season and location.



The rate of reduction in the uncertainty of monthly surface CO<sub>2</sub> flux estimates, attained via the addition of GOSAT X<sub>CO2</sub> products to the dataset of GLOBALVIEW-CO<sub>2</sub> ground-based observations. The values shown are averages over a one year period between June 2009 and May 2010.

<sup>†</sup> GLOBALVIEW-CO<sub>2</sub> (2011), Cooperative Atmospheric Data Integration Project - Carbon Dioxide. CD-ROM, NOAA ESRL, Boulder, Colorado (Also available on the Internet via anonymous FTP to ftp.cmdl.noaa.gov, Path: ccg/co2/GLOBALVIEW)

<sup>‡</sup> Takagi, H., T. Saeki, T. Oda, M. Saito, V. Valsala, D. Belikov, R. Saito, Y. Yoshida, I. Morino, O. Uchino, R. J. Andres, T. Yokota, and S. Maksyutov, 2011, On the benefit of the GOSAT observations to the estimation of regional CO<sub>2</sub> fluxes, *Scientific Online Letters on the Atmosphere*, **7**, 161-164, doi:10.2151/sola.2011-041. (available online at: [http://www.jstage.jst.go.jp/article/sola/7/0/161/\\_pdf](http://www.jstage.jst.go.jp/article/sola/7/0/161/_pdf))