Mission Objectives and Current Status of GOSAT (IBUKI)

Japan Aerospace Exploration Agency

Yasushi Horikawa

Background of the Launch of the GOSAT project

1997 Adoption of the Kyoto Protocol

1999 study initiation of GCOM-A1
- research of atmospheric chemistry
- solar occultation

2002 Ratification of Kyoto Protocol
- continuation and acceleration of the development of the systematic observation,
- escalation in societal concern with the global environment and global warming

2003 changed to GOSAT
- contribution to the applicative environmental administration
- nadir observation

2004
IGOS report released
- the necessity of the global observation of CO2 and CH4 column density in all seasons with an accuracy of the 1ppm

→expectation of the observation from space

CSTP : Council for Science and Technology Policy
- decrease the estimation error of the GHG flux by half
- continuation of the observation of the CO2 from space

2005 beginning of the development of GOSAT

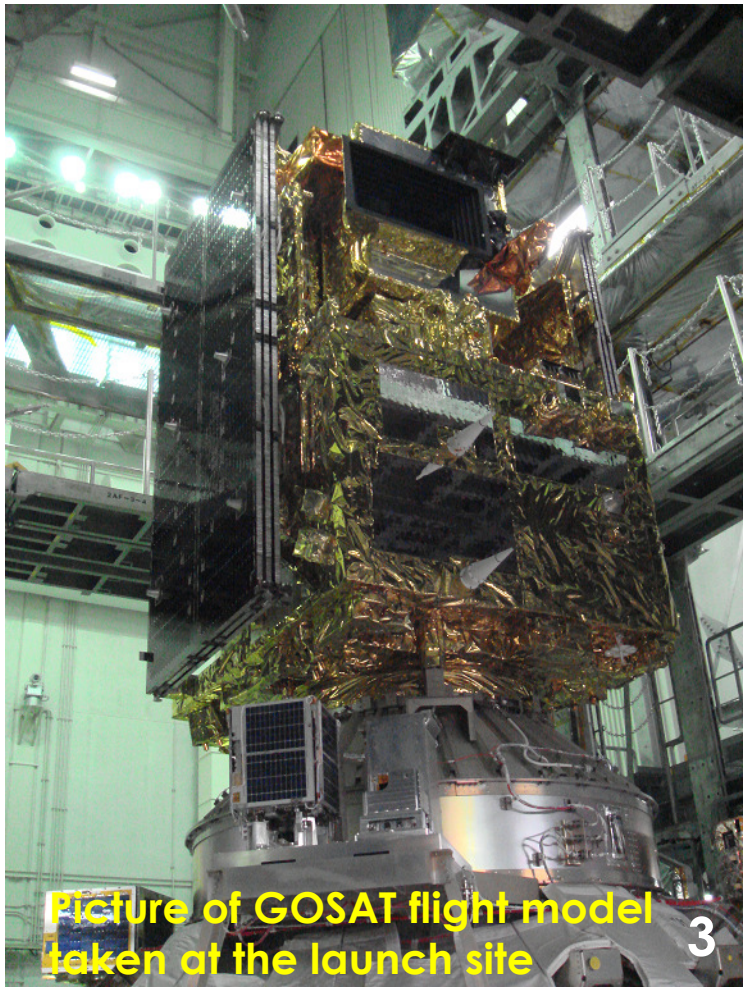
Mission Objectives and Targets

GOSAT *(Greenhouse gases Observing SATellite)*

*Nickname = "**IBUKI**" ("Breath" in Japanese)*

(1) To observe CO_2 and CH_4 column density
- with relative accuracy of
  1% for CO_2(4ppmv) and
  2% for CH_4(34ppbv)
- at 1000km spatial scale
  in 3 months average
- during the Kyoto Protocol's first commitment period (2008 to 2012).

(2) To reduce sub-continental scale CO_2 annual flux estimation errors by half
-0.54GtC/yr → 0.27GtC/yr

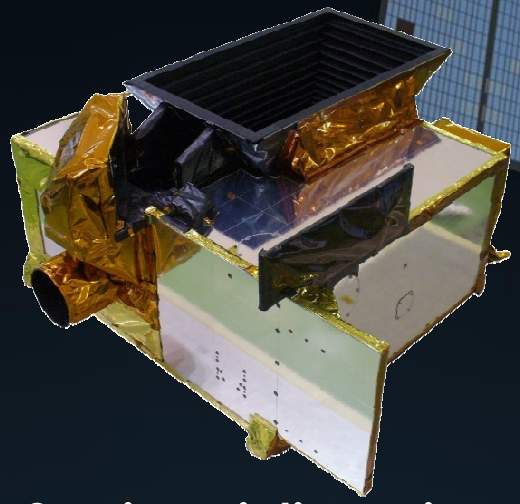


Picture of GOSAT flight model taken at the launch site

GOSAT mission instruments

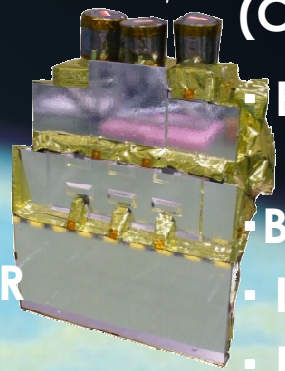
TANSO=Thermal And Near infrared Sensor for carbon Observation

TANSO-FTS
(Fourier Transform Spectrometer)



- 2 axis-pointing mirrors (fully redundant) for ground pointing, calibration and IMC
- Cross Track (+/- 35deg) Along Track (+/- 20 deg)
- IFOV : 10.5 km
- scan speed : 4 sec./interferogram
- observation wavelength region : NIR, SWIR and TIR
- Spectral Resolution : 0.2 cm-1

TANSO-CAI
(Cloud and Aerosol Imager)

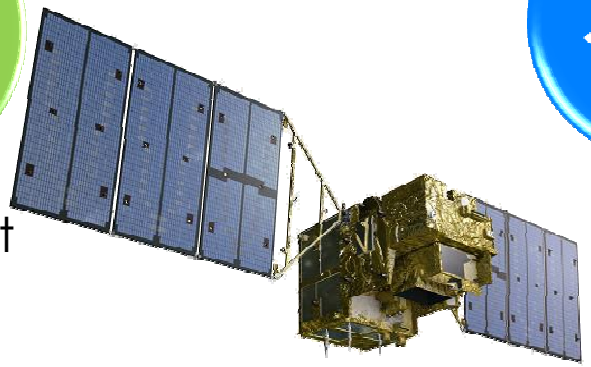


- Bands : 4 (UV, VIS, NIR and SWIR)
- Band width : 20 nm (90 nm)
- IFOV : 500 m (1500 m)
- FOV : 1000 km (750 km)

Organization

National Institute for Environmental Studies

- Algorithms development
- Data processing (L2 or higher)
- Data use for science
- Validation
- Data distribution



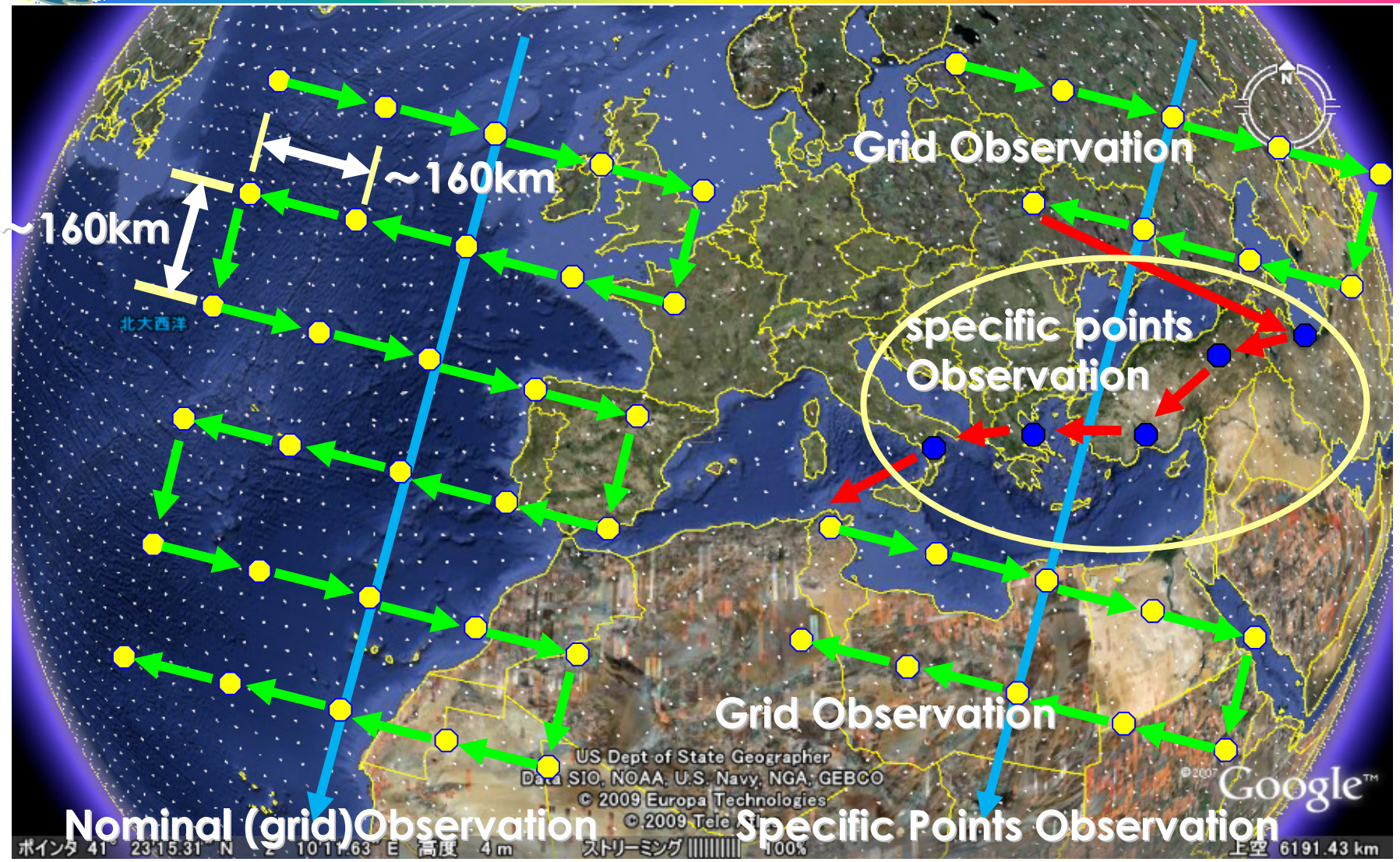
Japan Aerospace Exploration Agency

- Sensor development
- Satellite development
- Launch
- Satellite operation
- Data acquisition
- Data processing (L1)
- Calibration
- Data distribution

Ministry of Environment

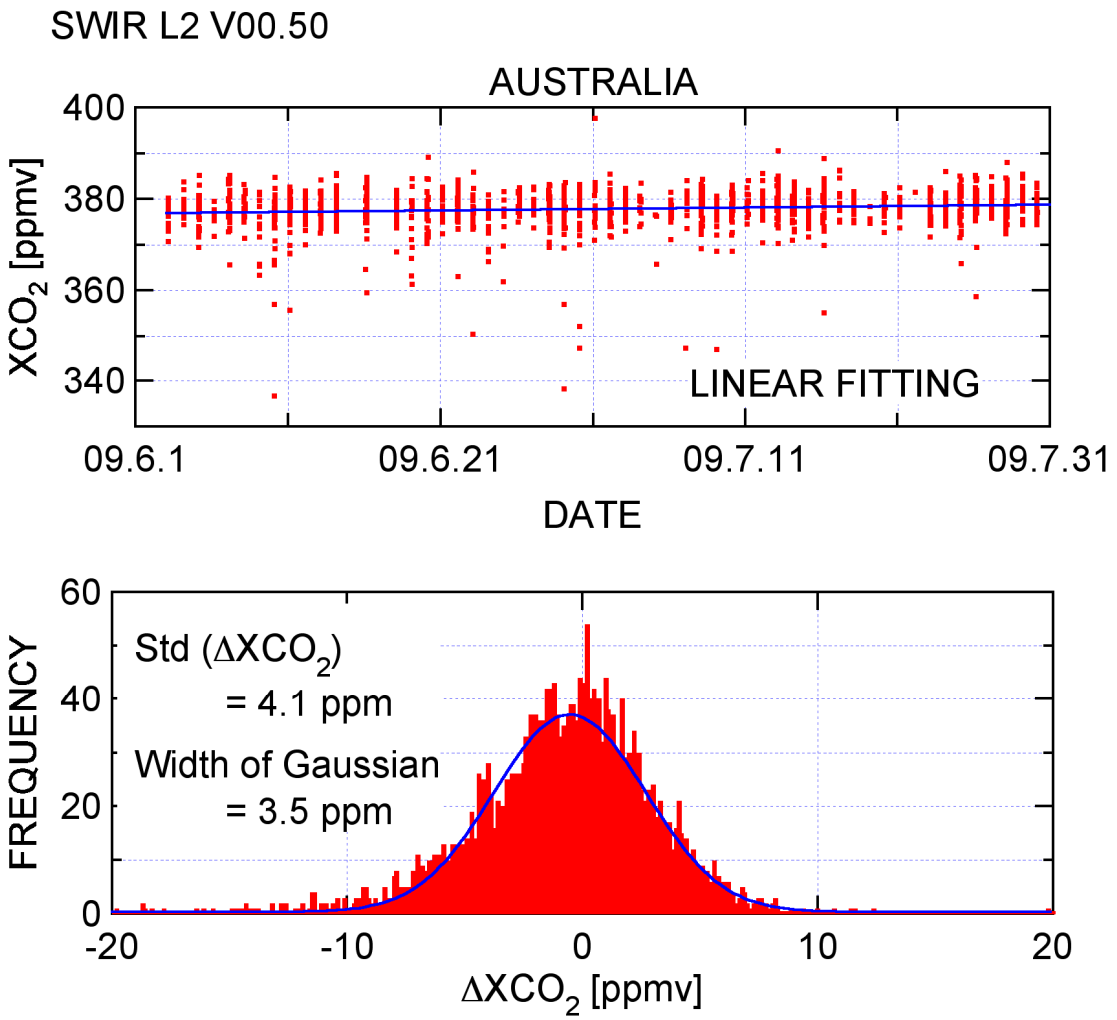
- Sensor development
- Administration

Observation Pattern




Initial function check
Initial Cal. and Val.
Nominal operation
Extra Operation

Observation Accuracy

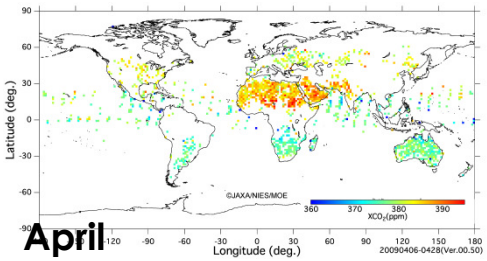


The relative accuracy of the observation data : about **1 %**

100 to 300 samples
- in the area of 1000km*1000km and
- in 2 months

about **0.06 to 0.1 %** relative accuracy

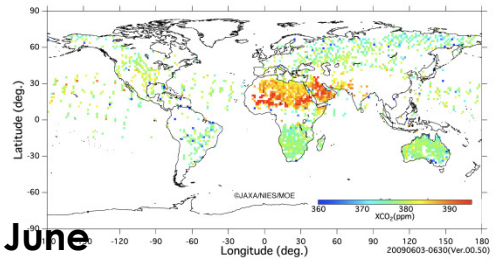
Observation Results
CO_2 column averaged dry air mole fraction



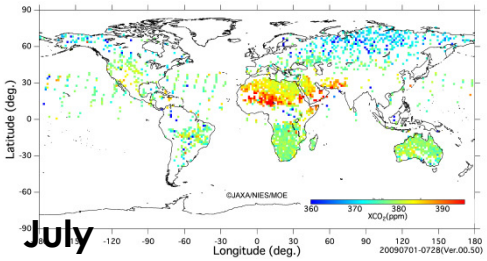
April

not observed

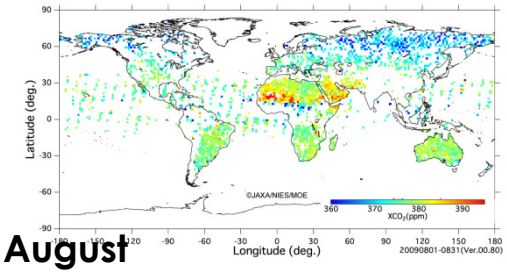
May



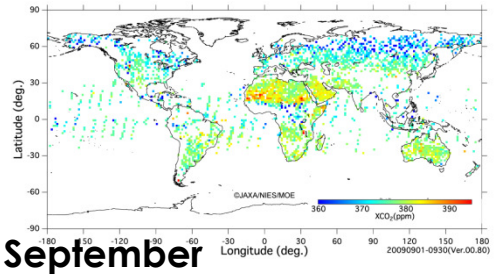
June



July



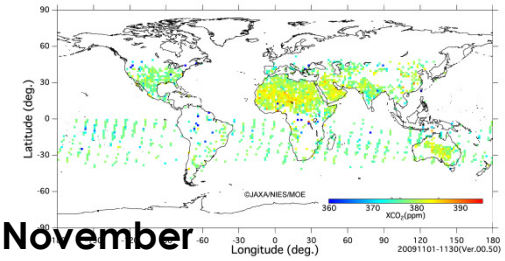
August



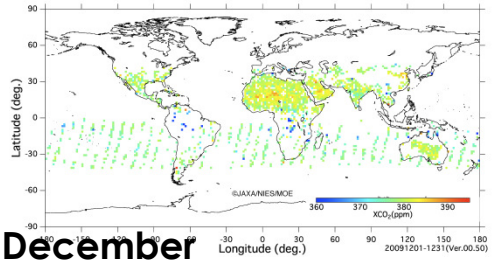
September

Under Processing

October



November



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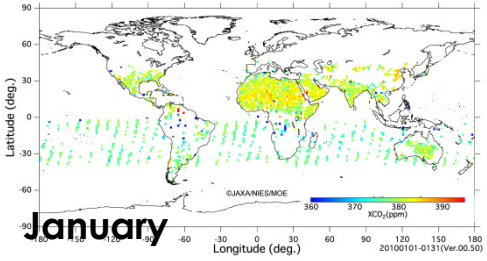
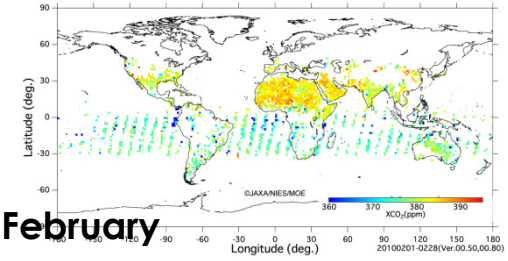
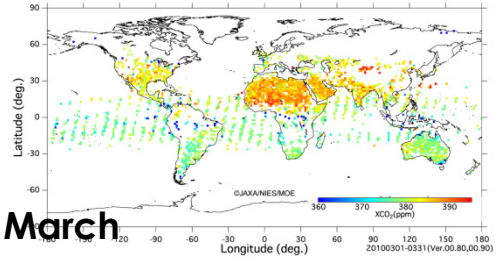


January

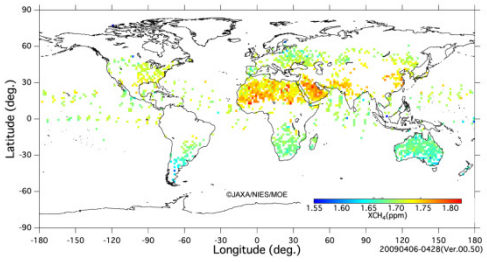


February



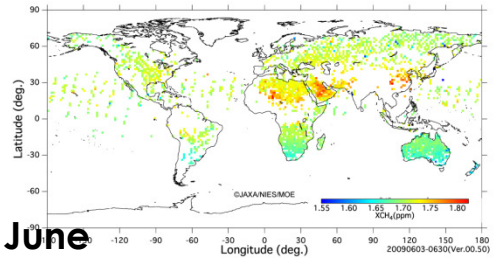
March

Observation Results
CH4 column averaged dry air mole fraction



May

not observed



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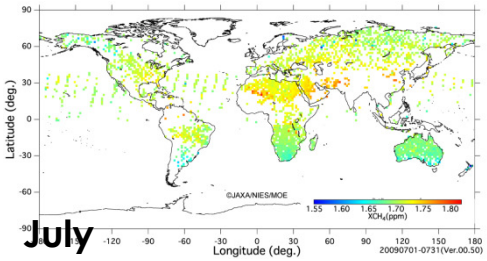

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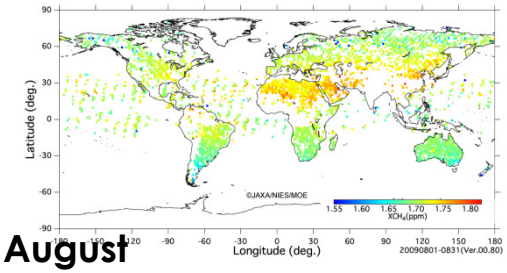
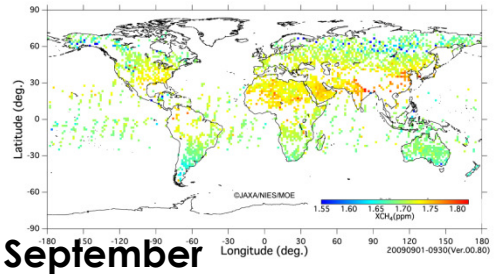


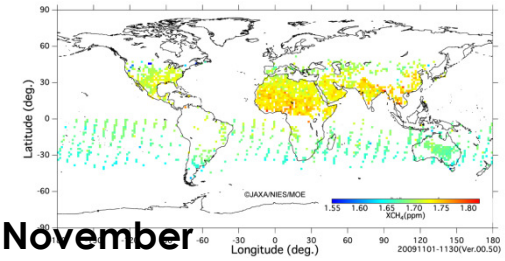
August



September

Under Processing

October



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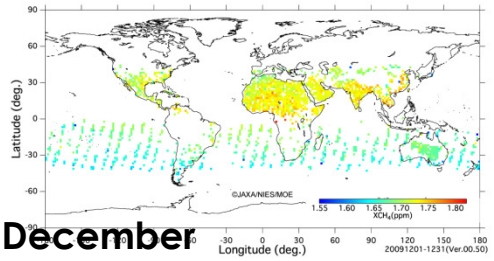
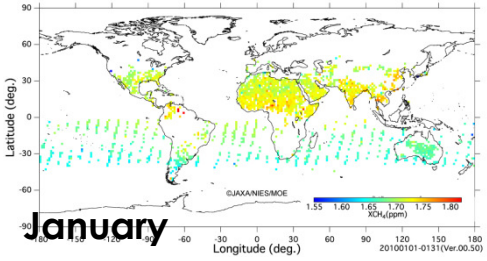
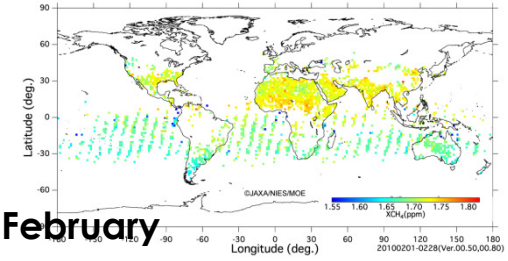


December



January



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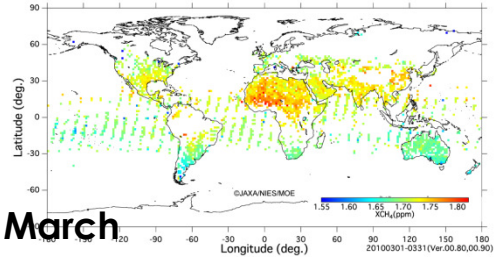
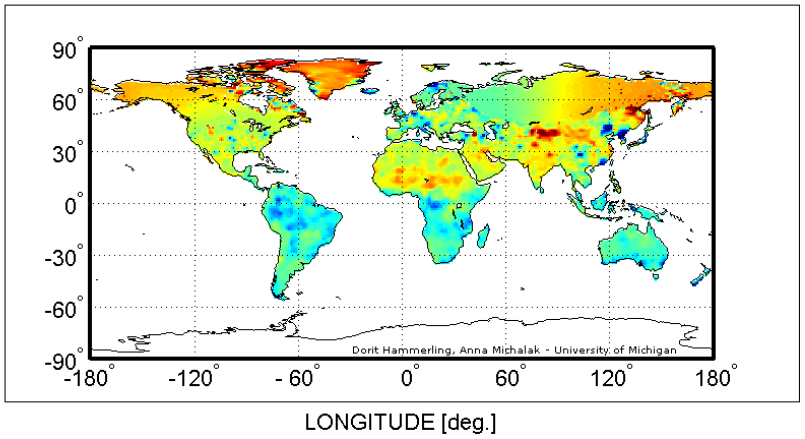


March

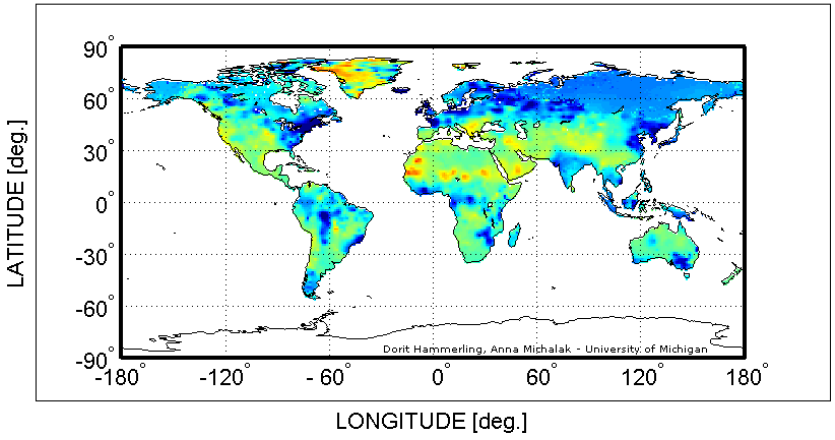
Collaboration with ACOS team

CO_2 column averaged dry air mole fraction

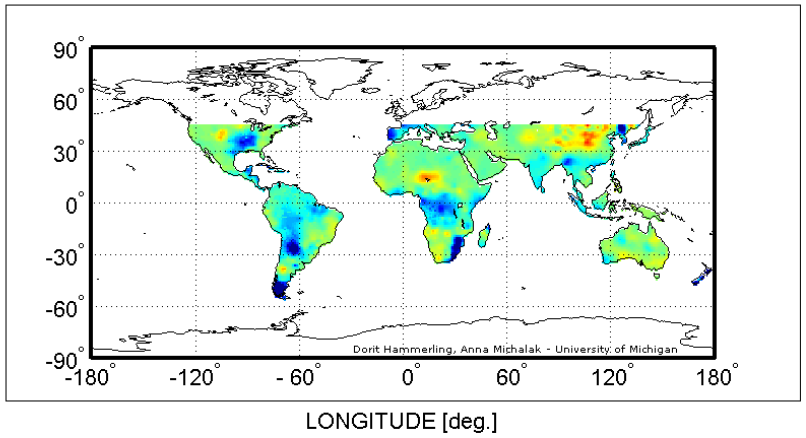
2009/04/20 - 2009/04/28



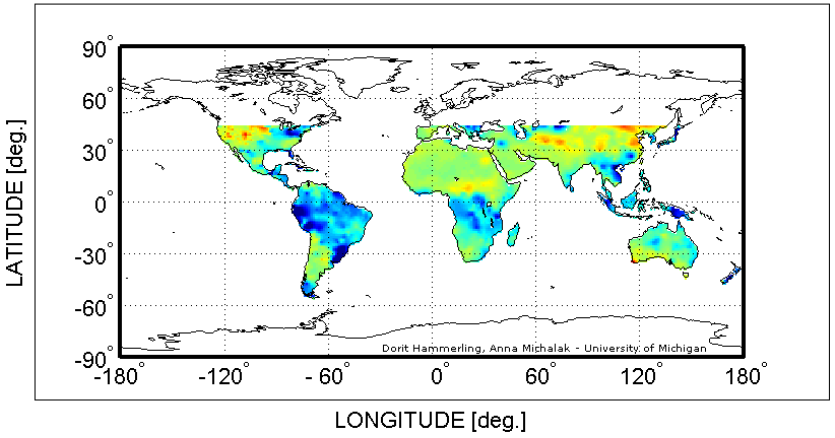
2009/07/24 - 2009/07/26

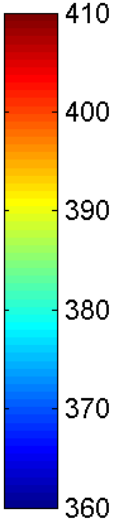


2009/11/15 - 2009/11/17



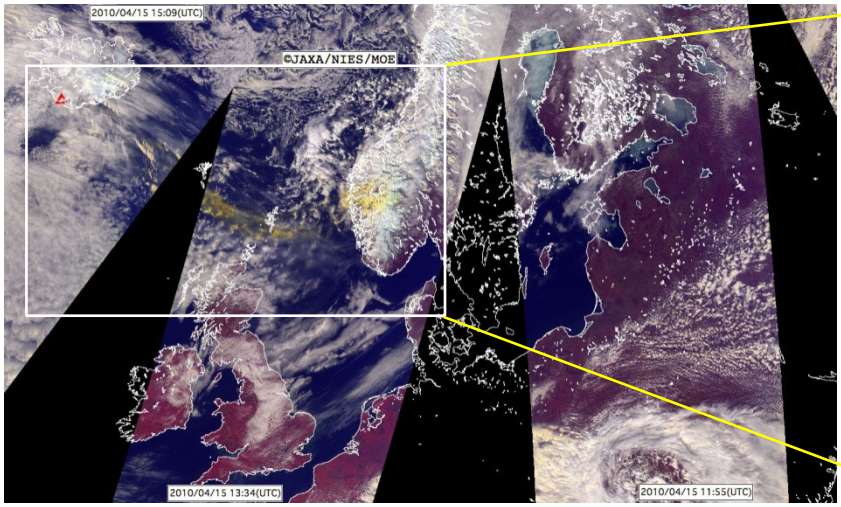
2010/01/14 - 2010/01/16



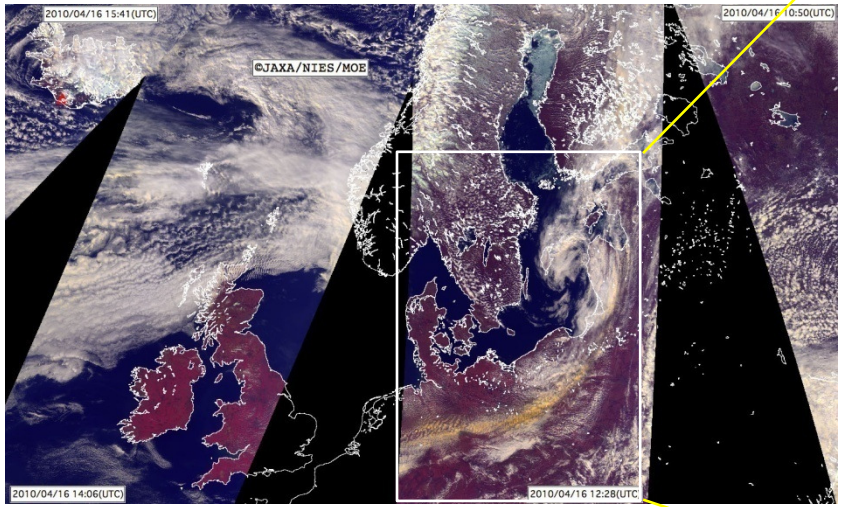


Processed by Dorit Hammerling
Anna Michalak (University of Michigan)

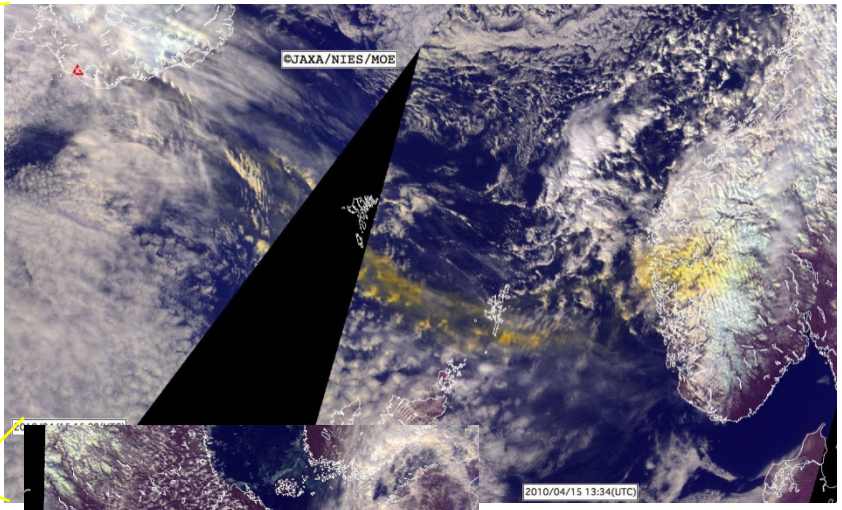
Observation of volcanic eruptions in Iceland and their spreading ash plume

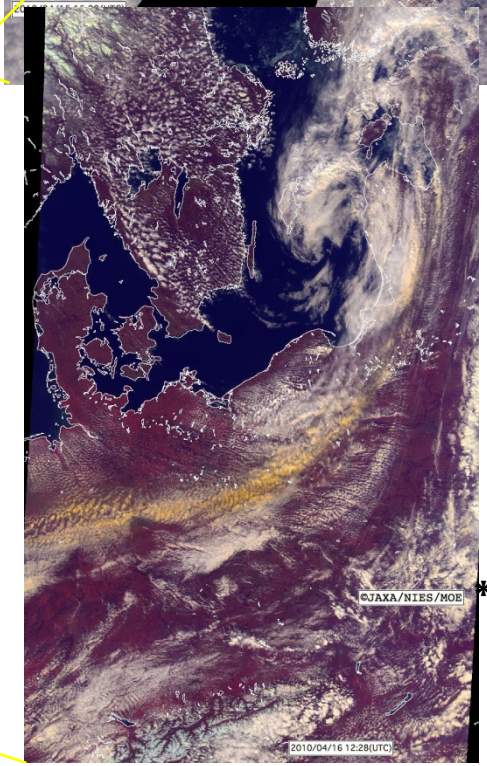


15 April, 2010



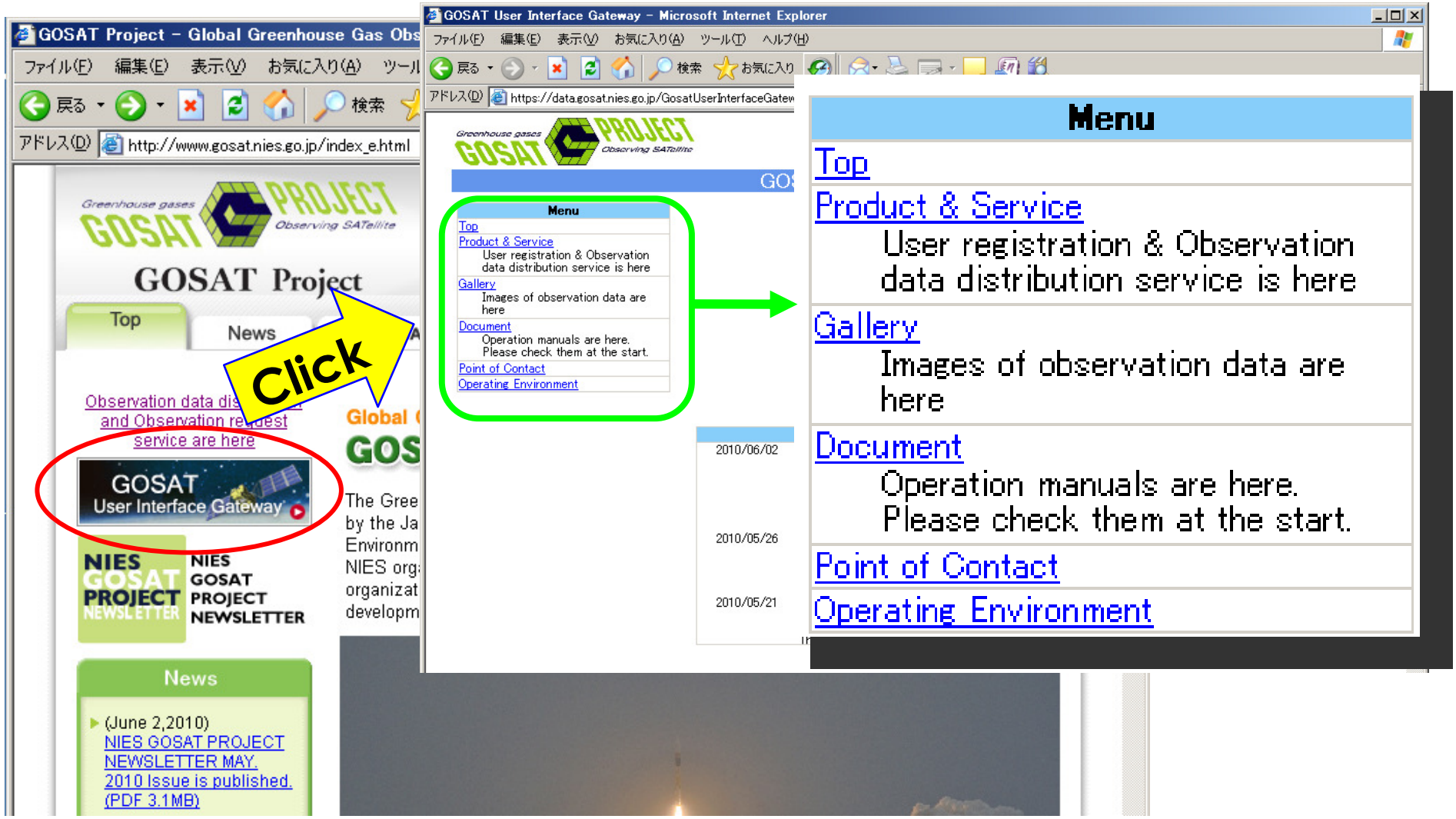
16 April, 2010





* Not actual colors

Data Distribution
- How to get the GOSAT data -



http://www.gosat.nies.go.jp/index_e.html

Data Output Plan of this year

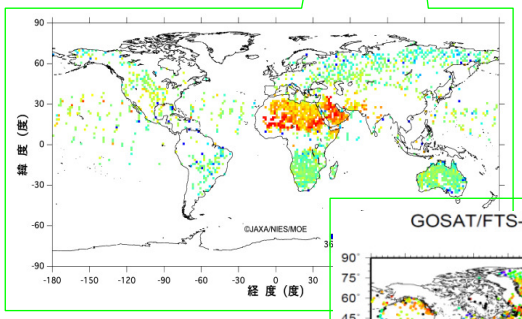
	2	3	4	5	6	7	8	9	10	11	12
GOSAT data output plan	▲				▲	▲	▲	▲	▲	▲	▲
								▲			▲
					▲						
							▲				

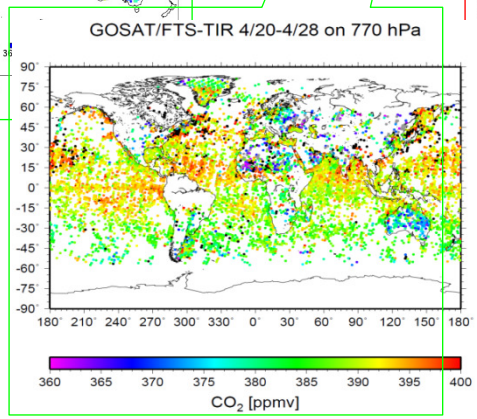
CO_2, CH_4 Column density data (monthly average data)

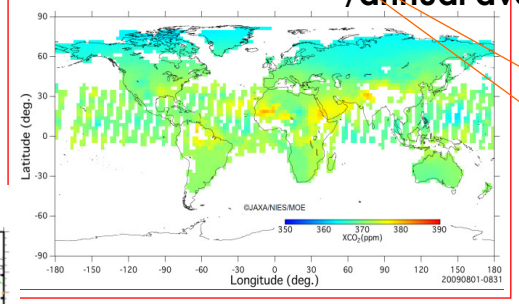
CO_2, CH_4 Column density seasonal change data (1000km square/3 months average)

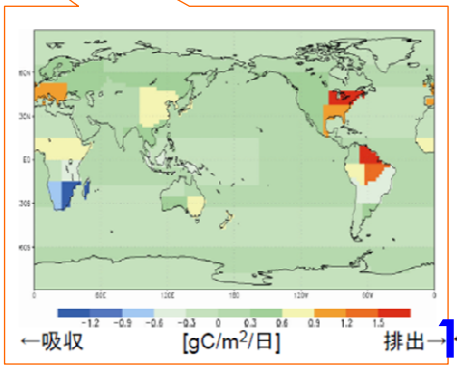
CO_2 net flux (sub-continental scale /annual average)

proposal of the application of the CO2 and CH4 concentration data from space









Conclusion

- Up to now, a year's worth of data has been accumulated.
- The initial calibration and validation were completed and a 1 % relative accuracy of one observation data was achieved for CO2 and 2 % for CH4.
- GOSAT data have several ppm biases and the method to reduce this bias is under research.
- When there are other particles, such as the sand over the desert, the result of the retrieval large. We are now considering a method to eliminate the influence of these particles.
- From now on, the monthly data will be compared with the data of the same month of the previous years.
- We would like see the satellite data utilized for the management of the Earth environment.