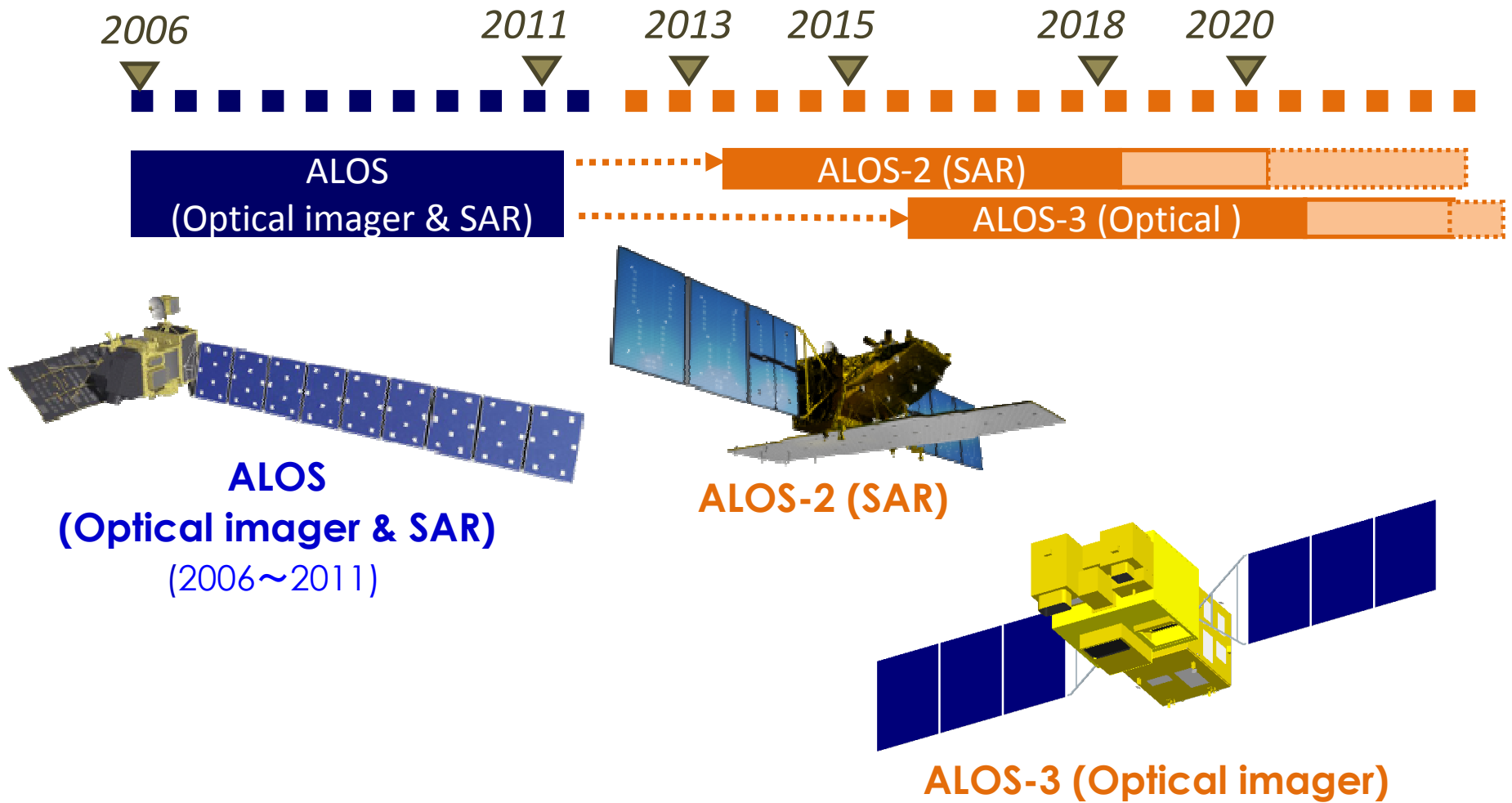


Japanese Satellite Challenge to the Global issues

Takaaki IWASA
Ministry of Education, Culture, Sports,
Science and Technology, Japan (MEXT)

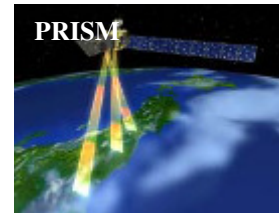
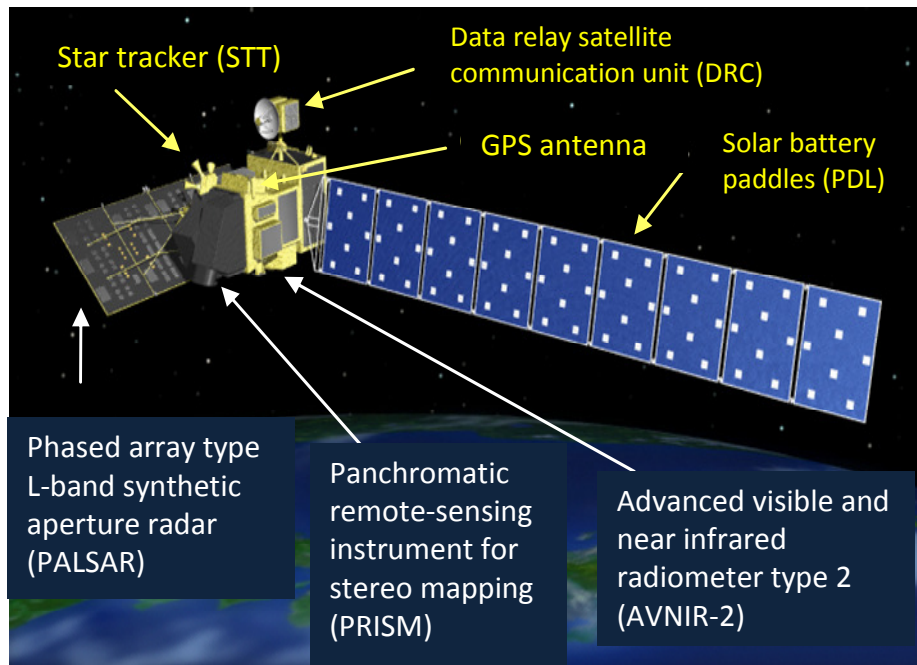
Midori SASAKI
Ministry of the Environment, Japan (MOE)

ALOS program



ALOS "DAICHI"

Advanced Land Observing Satellite



- Monochrome
- Resolution: 2.5m
- Swatch: 35 to 70km
- Recurrent cycle: 46 days



- Color
- Resolution: 10m
- Swatch: 70 km



- Monochrome
- Resolution: 10 to 100m
- Swatch: 70 to 350km

Objectives:

To achieve further advancement in land observation technologies to date, and to contribute to the creation of maps, observation of regions, facilitate understanding of disaster situations, resource exploration, and other aims.

(Main specifications)

Mass	Approx. 4,000kg
Power generated	Approx. 7kW
Design lifespan	More than 3 years, target of 5 years
Orbit	Sun-synchronous sub-recurrent orbit (Approx. height of 700km)

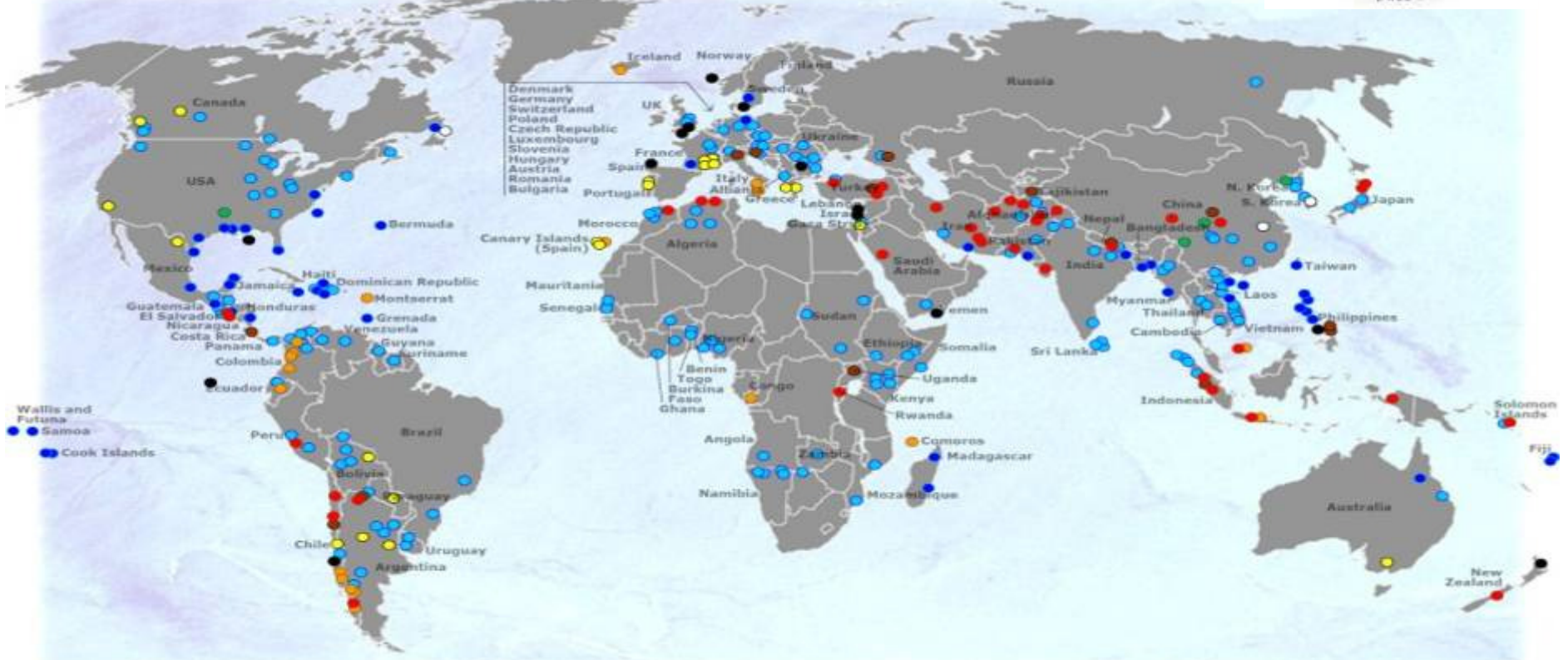
Jan 2006	Launched from a H-IIA No.8 rocket
Oct 2006	Operation commenced in earnest
May 2011	Operation concluded

The International Charter

- Providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters



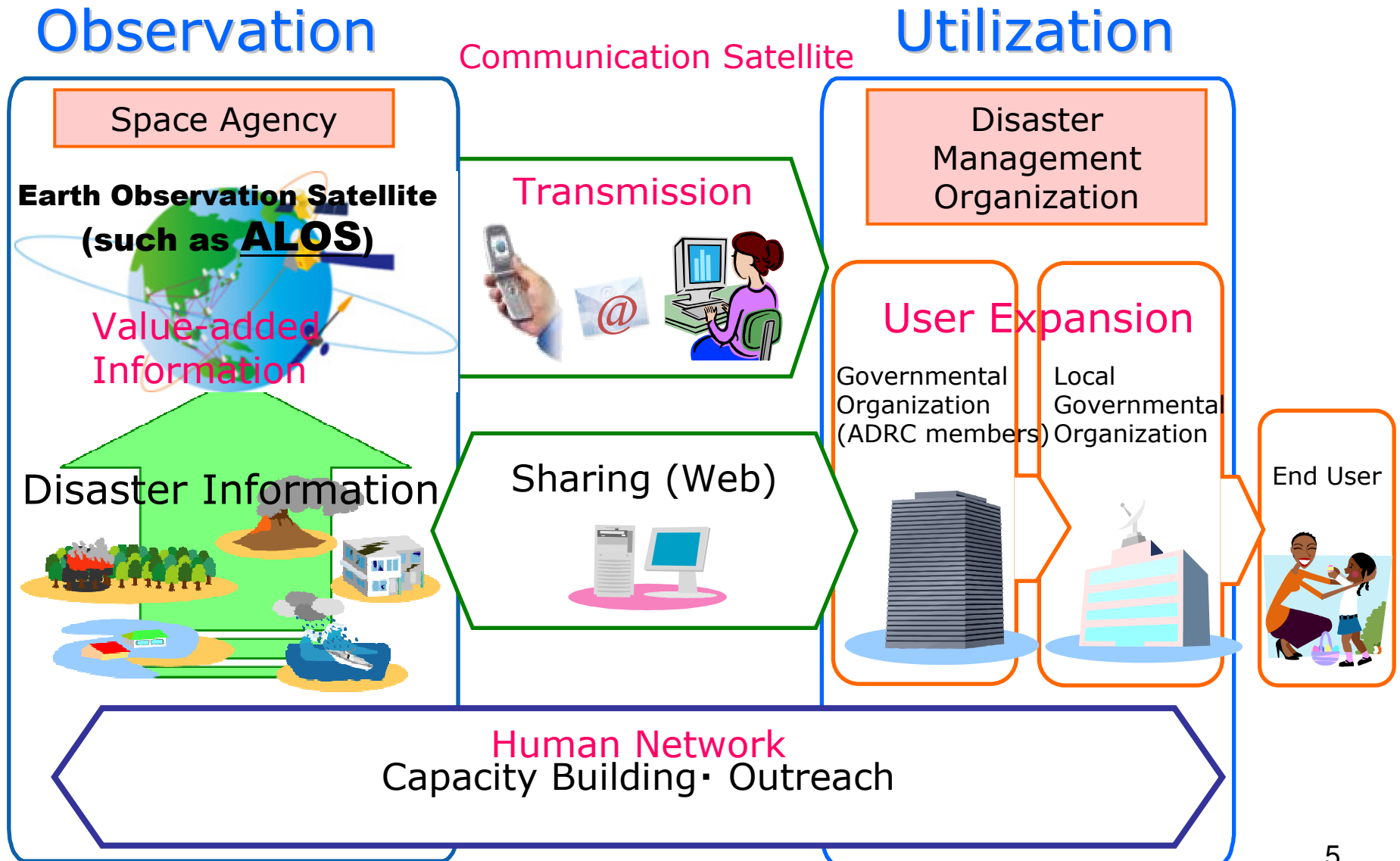
No. of activity cases: 322, and data distribution partners (2000 to 2011)



Legend: ● Earthquake ● Landslide ● Volcano ● Storm/hurricane
● Flood/ocean wave ○ Ice/snow hazard ● Fire ● Oil spill ● Other

Sentinel Asia

Collaboration between space agencies and disaster management agencies

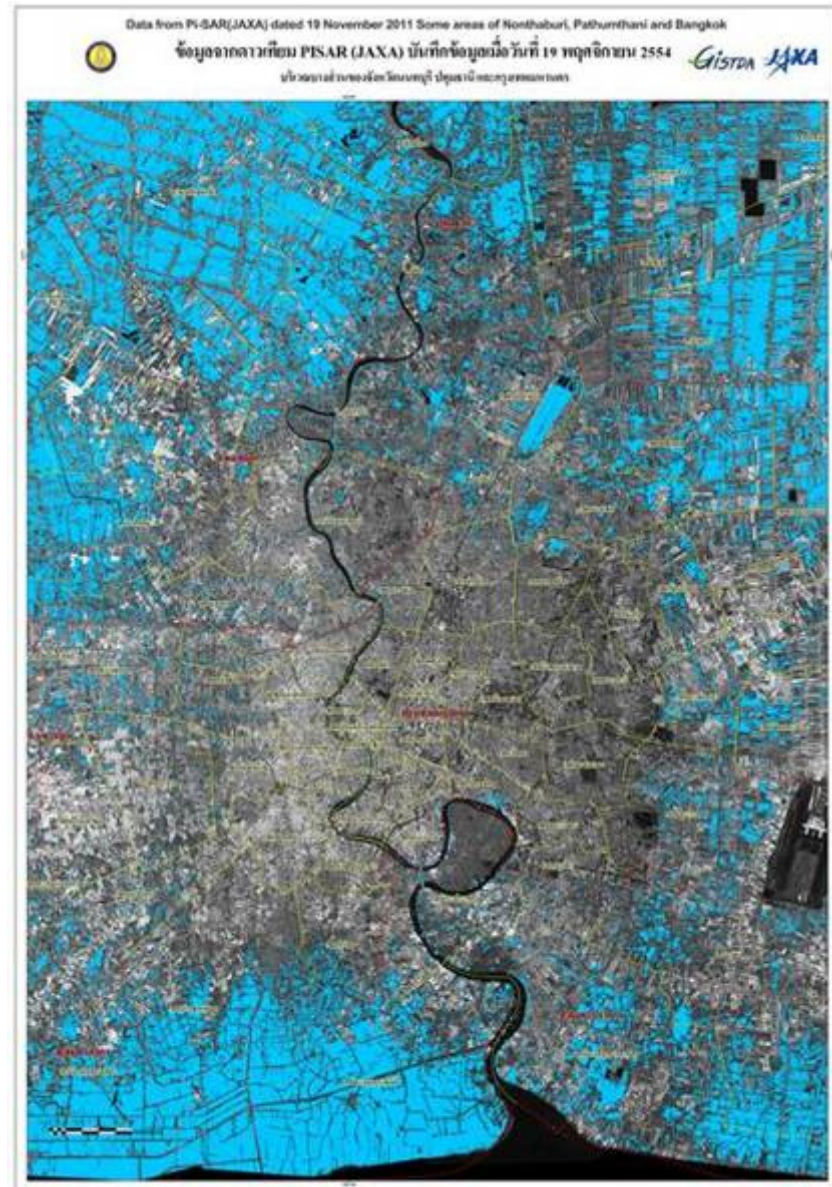


Bilateral Cooperation (Thailand)

Flood Countermeasures

Maps of flood zone on 19 Nov. 2011
Some areas of Nonthaburi, Pathumthani and Bangkok.

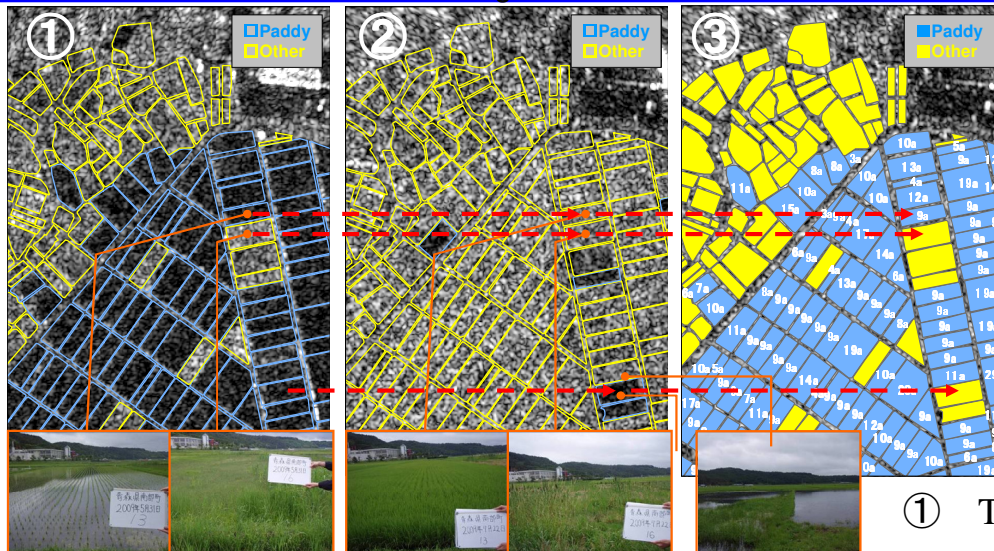
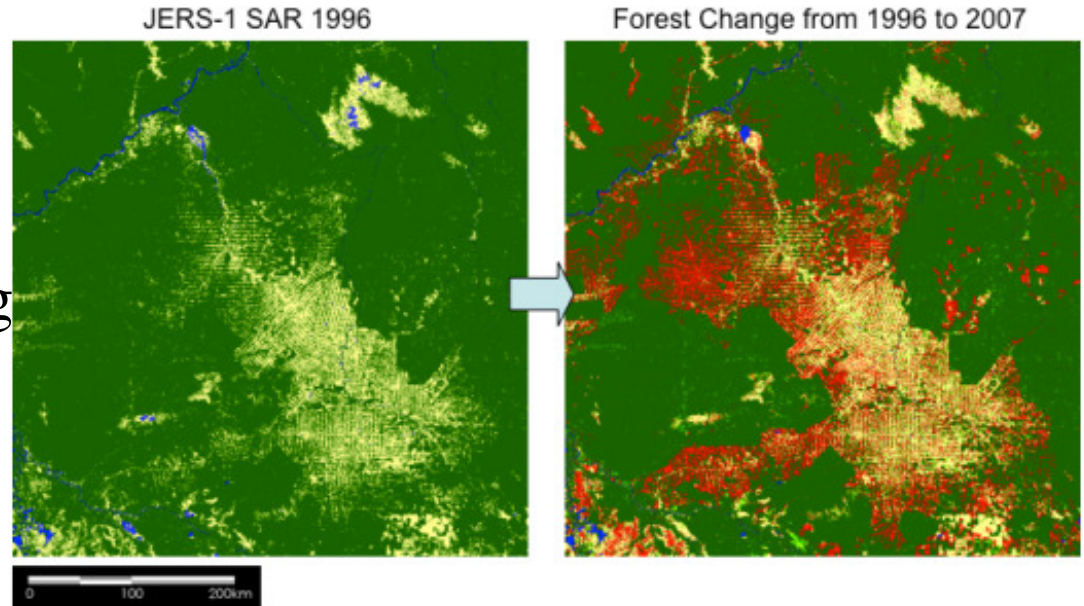
Analyzed by GISTDA
obtained by Pi-SAR (JAXA)
(The areas denoted in blue
represent the estimated flood areas)



Contribution to the issues of climate change and food security



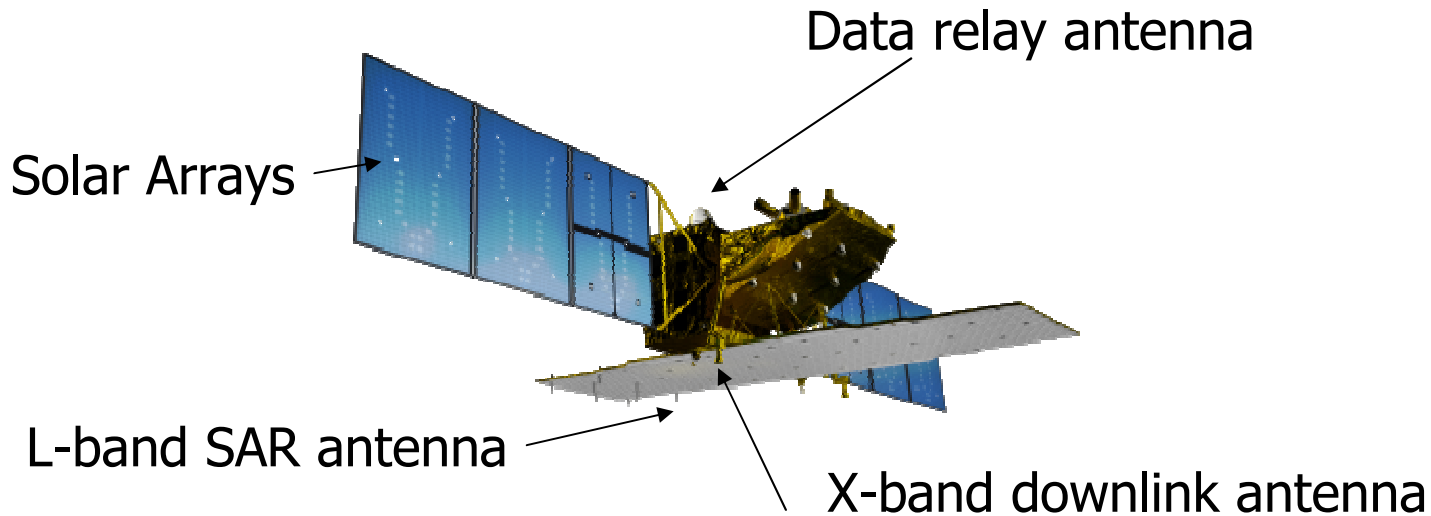
- Forest monitoring:
 - Monitoring of illegal logging



- Rice crop:
 - Precise monitoring of major rice crop cultivated area and estimation of major rice crop yield including in the rainy season.

① Transplanting season ② Growing season

Improvement in ALOS-2 (1)

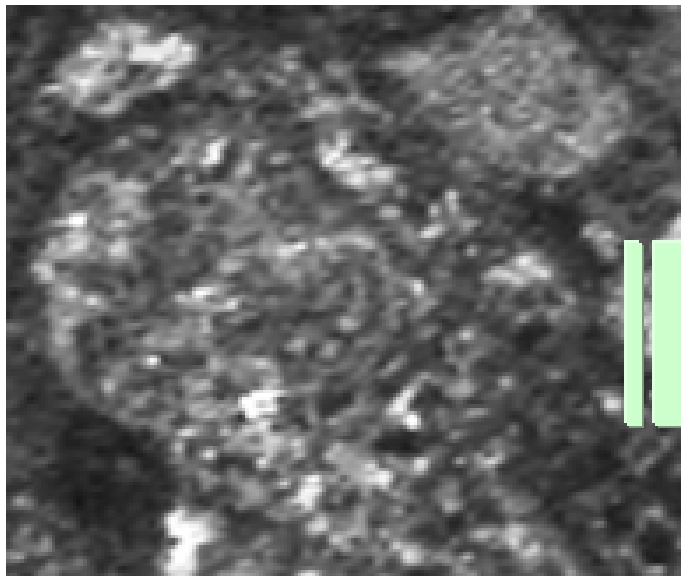


	ALOS	ALOS-2
Recurrent cycle	46 days	14 days
Observable area	approx. 870km (Right looking)	approx. 2320km (Left & Right looking)
Spatial Resolution	10m (Stripmap)	1-3m(Spotlight), 3m/6m/10m(Strip map)
Downlink	138Mbps (X-band) & Data Relay Satellite	800Mbps (X-band) & Data Relay Satellite

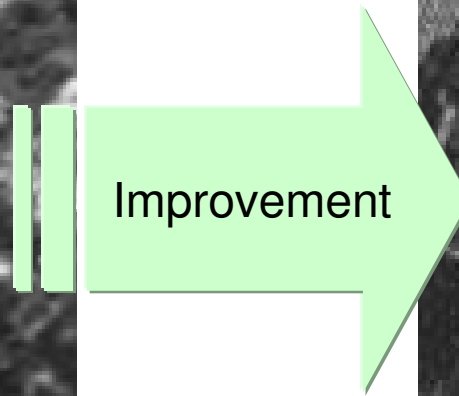
➔ **High Frequency**

➔ **High Resolution**

Improvement in ALOS-2 (2)

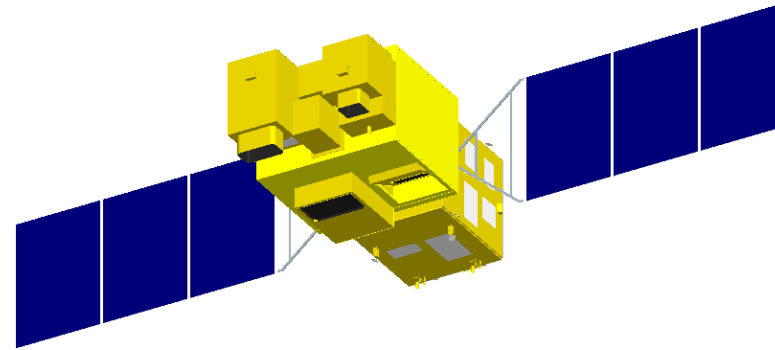


“Daichi” radar image (C)JAXA/METI



ALOS-2 radar image (simulation)

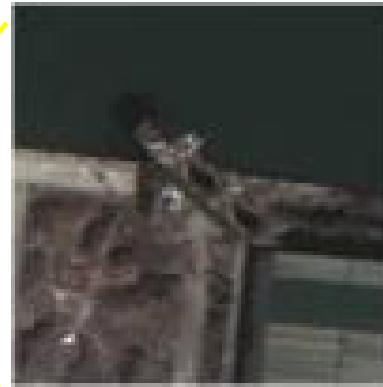
Improvement in ALOS-3



	ALOS	ALOS-3
Frequency (at arbitrary location)	about once every two days	once a day
Observable area	approx. 35km /70km	approx. 50km
Spatial Resolution	2.5m	0.8m
Downlink	240Mbps (Ka-band) 120Mbps (X-band)	800Mbps (X and Ka-band)

ALOS-3 Simulated Image (1)

ALOS-3 simulation image
(resolution 0.8m)



Tanker run aground
(Left: ALOS-3, Right: Daichi)

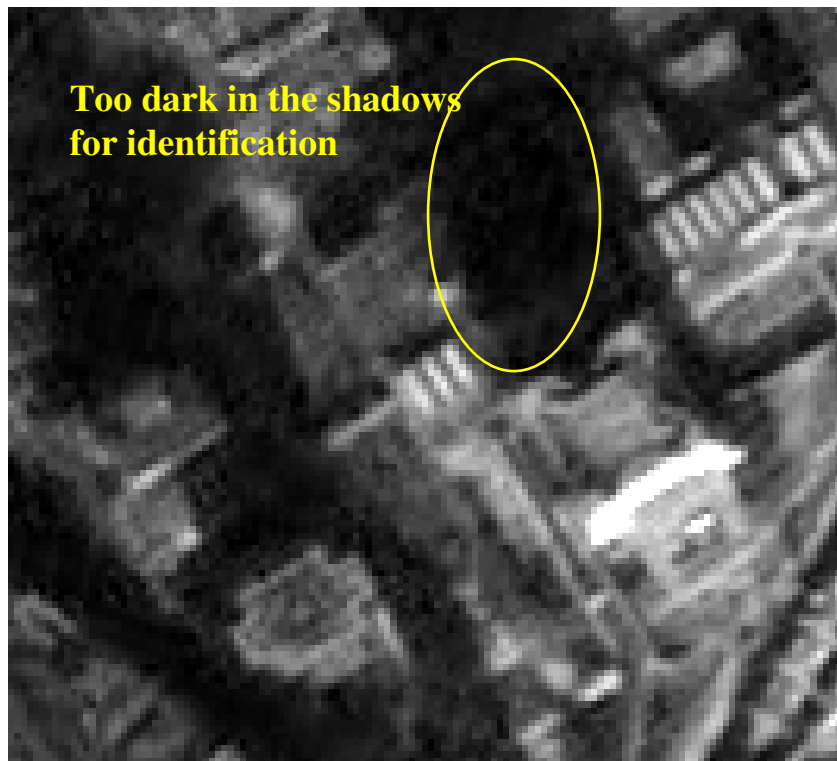


Scattered cars, etc. as a result of the
tsunami (Left: ALOS-3, Right: Daichi)

ALOS-3 Simulated Image (2)

Panchromatic image

(Yokohama, Japan)



ALOS (GSD 2.5m)

(Jan 19, 2009 © JAXA)



ALOS-3 (GSD 0.8m)

(Simulated image using airborne image
(ADS-40, Dec. 2007 ©Pasco)

Japanese Satellite Challenge to the Global issues

- Update of the GOSAT project -



Greenhouse gases
GOSAT PROJECT
Observing SATellite



Midori Sasaki
Ministry of the Environment
COPUOS
June 8, 2012

GOSAT project is a joint effort of JAXA, NIES, and MOE of Japan.

Brief history of space-based GHG monitoring (CO₂ and CH₄)

- **SCIAMACHY on Envisat (ESA): 2002 – 2012 (10 yrs)**
- **AIRS on Aqua (NASA) : 2002 – (more than 10 yrs)**
- **TES on Aura (NASA): 2004 – (almost 8 yrs)**
- **IASI on MetOp-A (EUMETSAT): 2007 – (5 yrs)**
- **TANSO on GOSAT (JAXA, NIES, MOE):**
 - 2009 – (more than 3 yrs)
 - The first satellite dedicated to monitor GHGs
 - Many researchers in the world are using GOSAT data
 - To retrieve concentrations of CO₂ & CH₄ more accurately
 - To reduce uncertainty in estimates of CO₂ fluxes

Objectives of the GOSAT Project

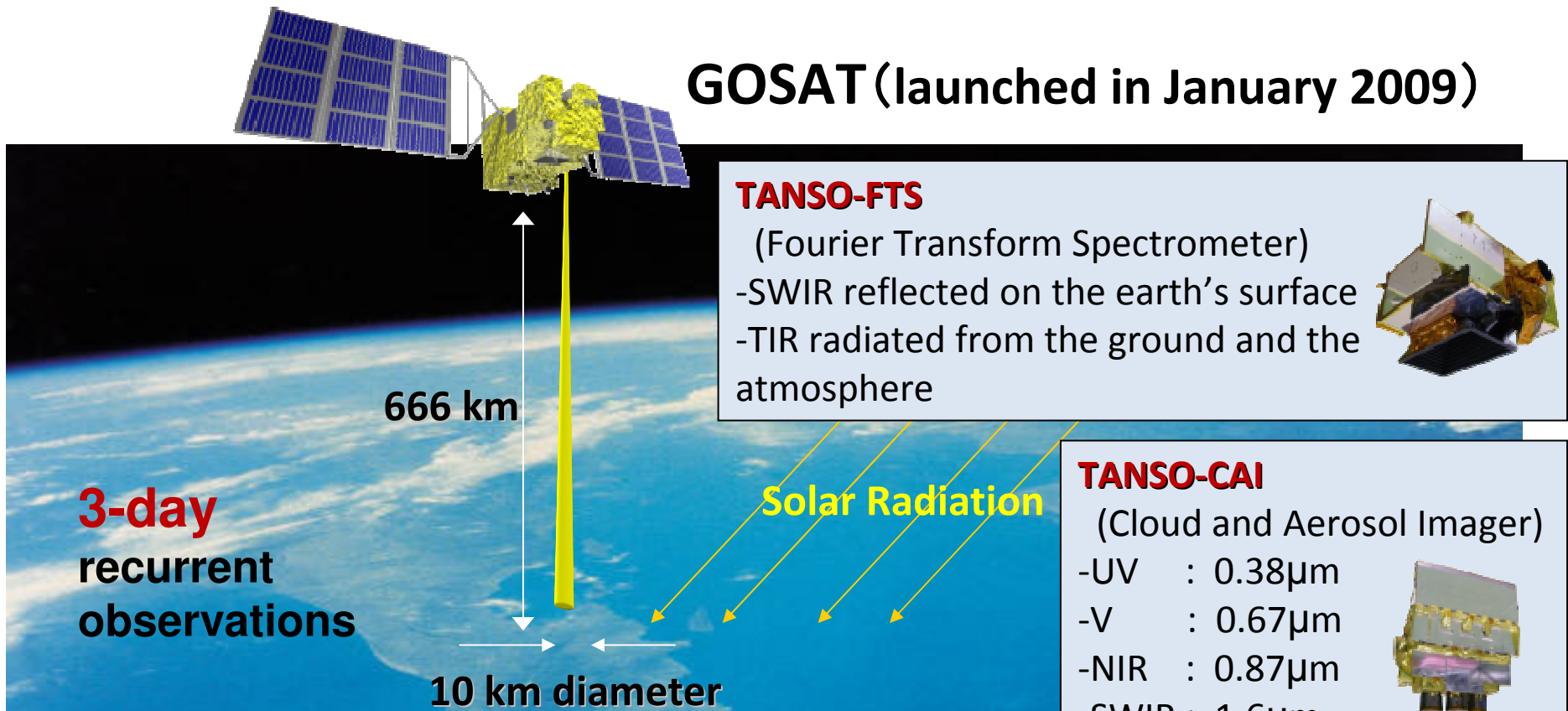
1. To obtain the global distributions of GHG concentrations (CO_2 and CH_4) and their temporal variations
 - To visualize changing GHG global distributions
 - To fill out the blanks in the network of ground monitoring stations
2. To improve accuracy of the carbon flux (sources and sinks) estimation on a sub-continental scale
3. To develop technologies for future GHG observing satellites.



GOSAT project is a joint effort of JAXA, NIES, and MOE of Japan.

GOSAT observation, Sensors, and Products

GOSAT (launched in January 2009)



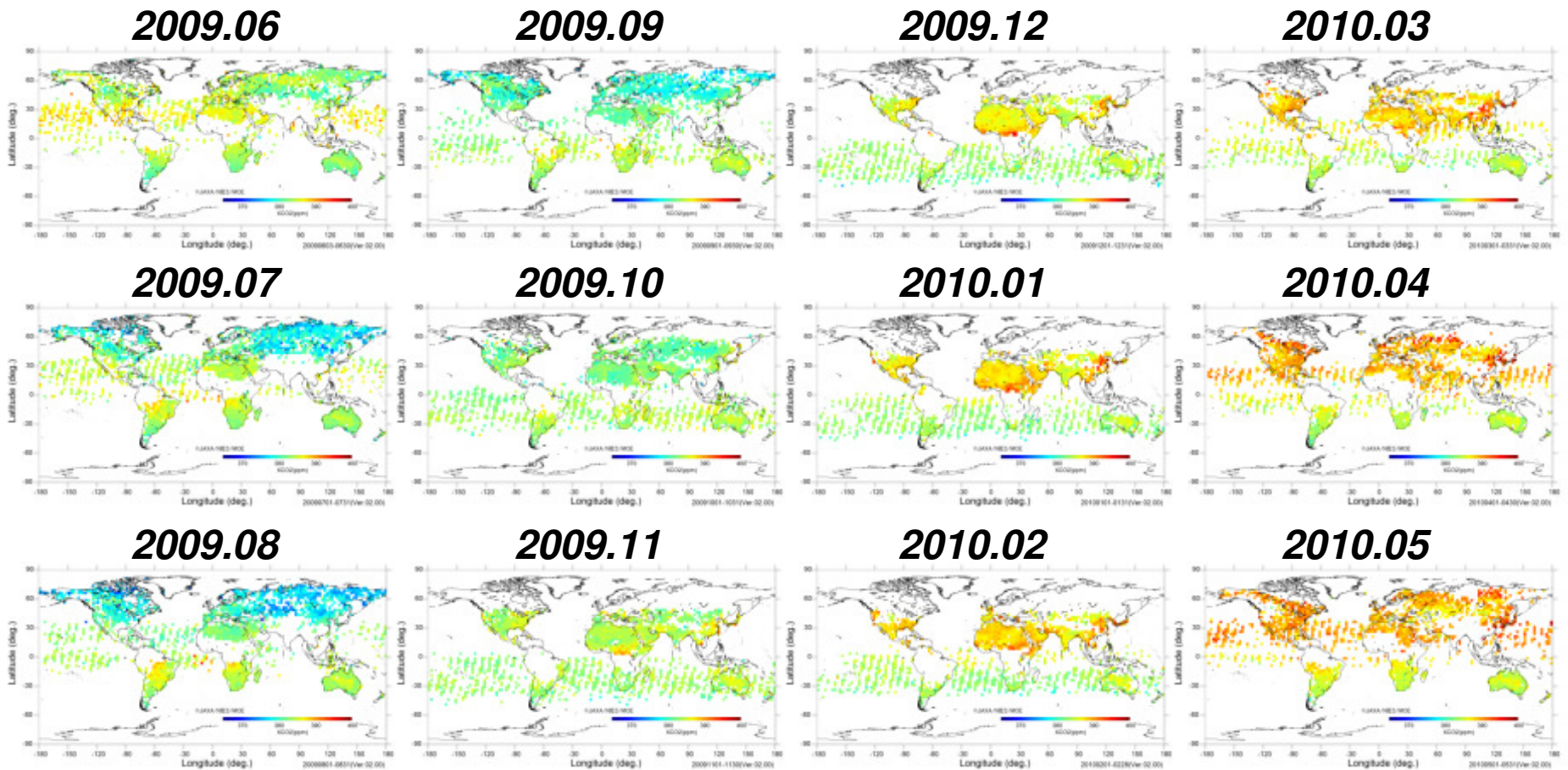
Outcomes (Data Products)

- "First Light" images and spectra obtained on 9 Feb 2009
- First Level 1 products (radiance and spectral) released in Oct 2009
- First Level 2 XCO₂ and XCH₄ products released in Feb 2010
- Level 4A product (sources and sinks) product to be released in 2012

Fact 1: GOSAT has observed globally. [2.5 deg. grid monthly means of XCO₂]

(TANSO-FTS SWIR Level 2 Ver.02.00)

Ex.) June 2009 – May 2010 (12 months)

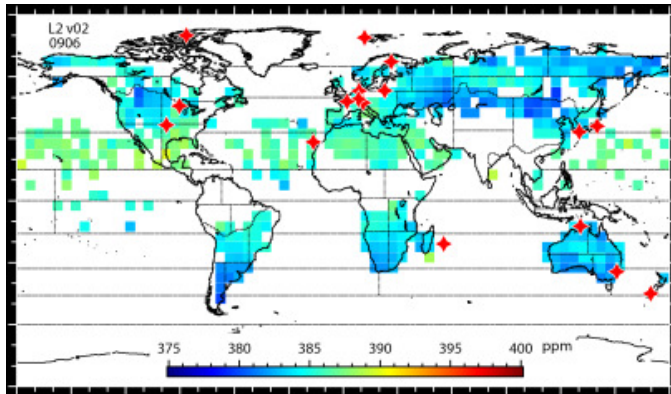


XCO₂ 2365 370 380 390 400 (ppm)

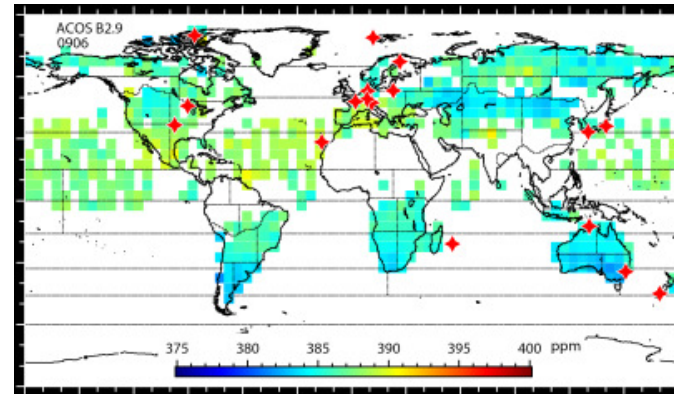
Fact 2: Institutes and universities in the world have retrieved column CO₂ (XCO₂) using different algorithms.

(Data for April 2010)

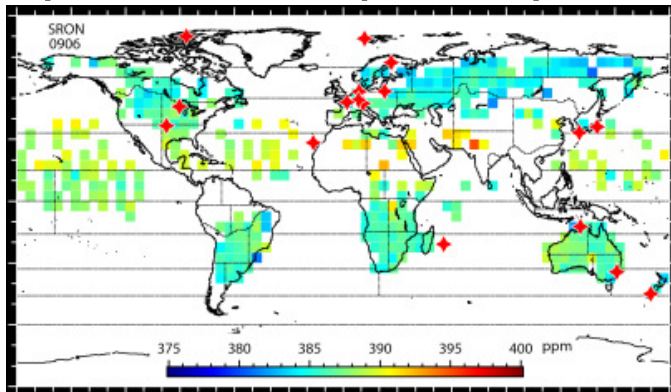
NIES (Japan)



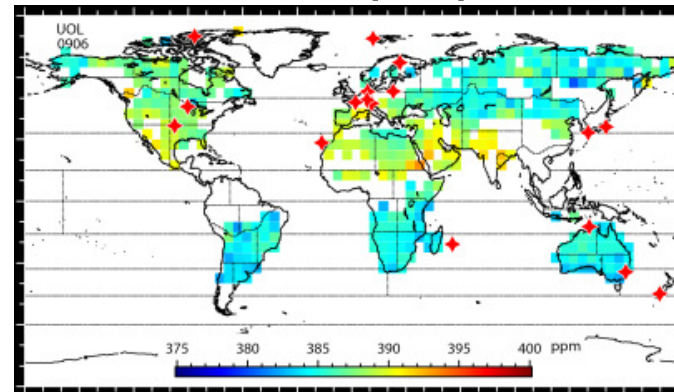
ACOS (USA)



SRON (Netherlands) / KIT (Germany)



UoL (UK)

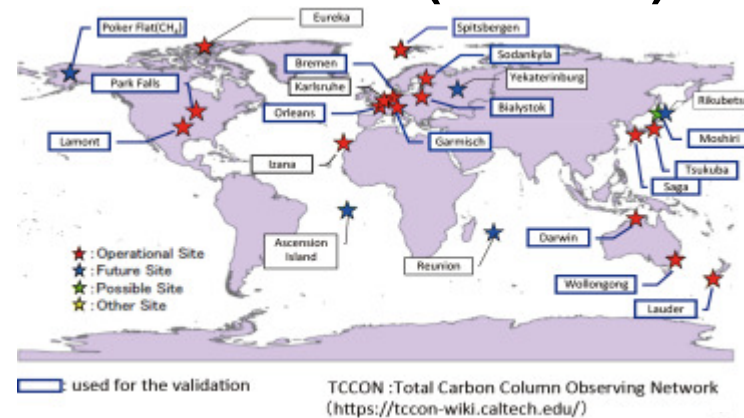


(+ : TCCON validation sites)

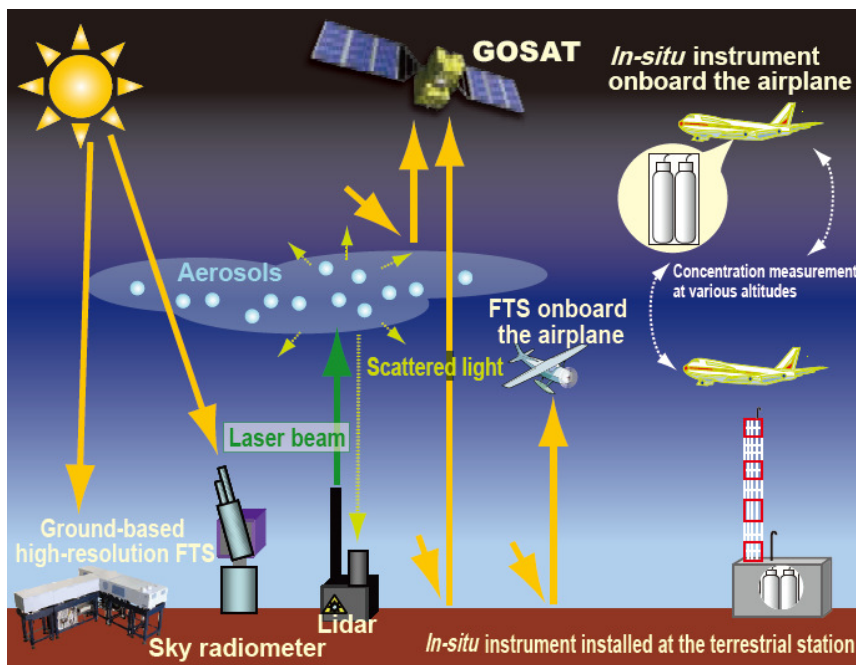
(by H. Takagi (NIES))

Fact 3: Several teams in the world have validated the retrieved XCO₂ with data obtained by ground-based FTSs and aircraft.

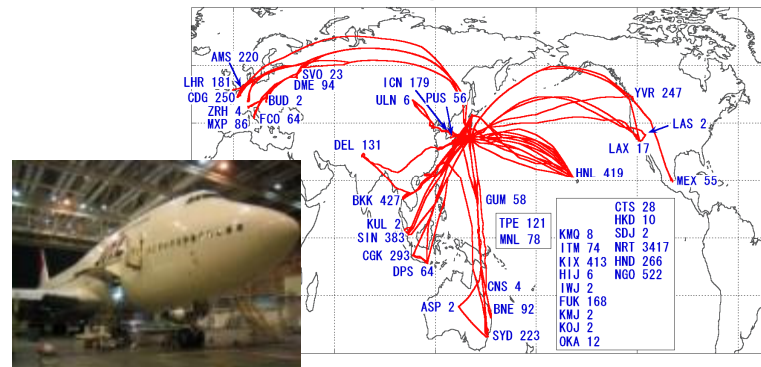
Data from ground-based FTS network (TCCON)



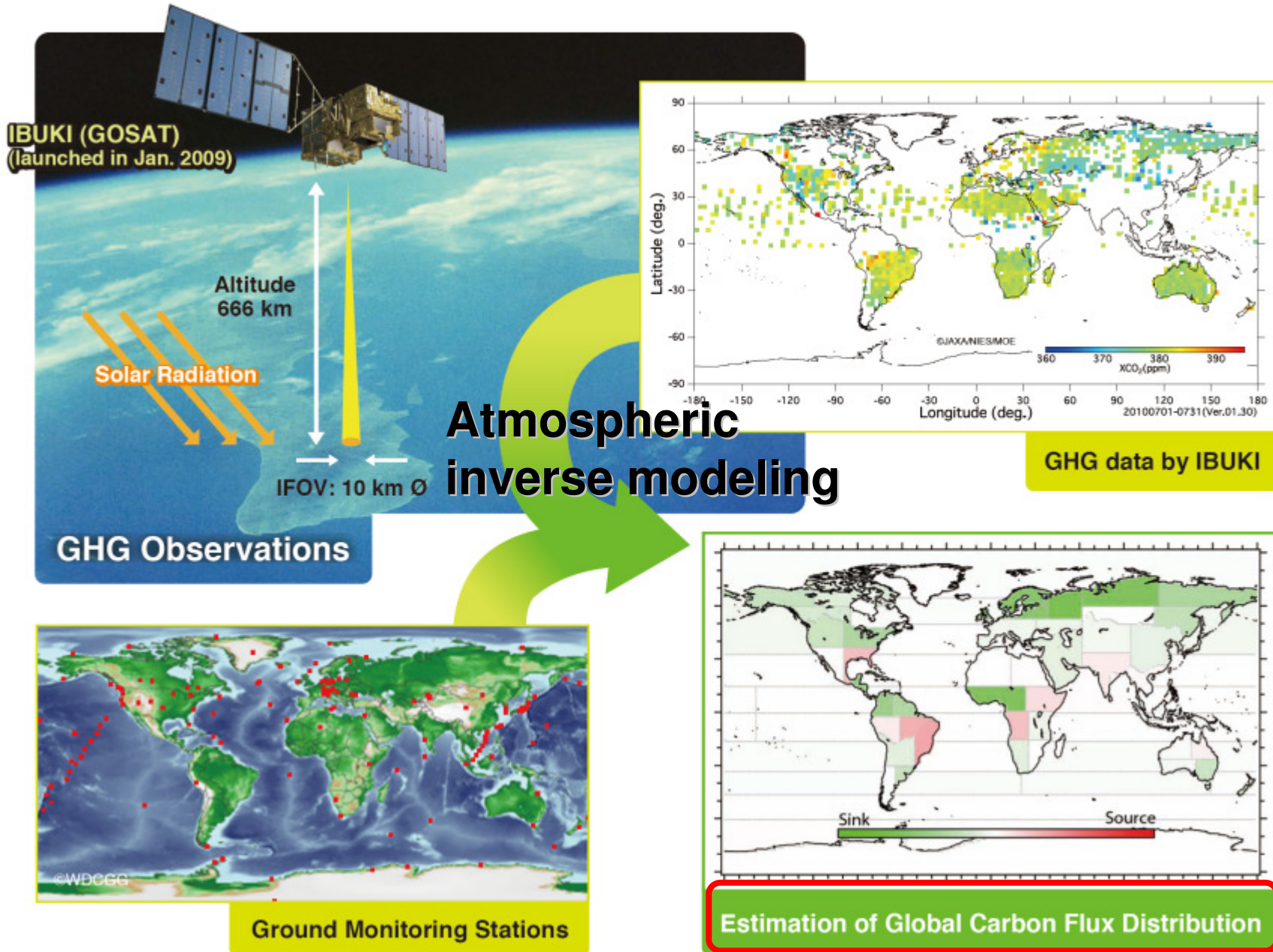
Data validation scheme



Data from aircraft measurement (CONTRAIL Project)

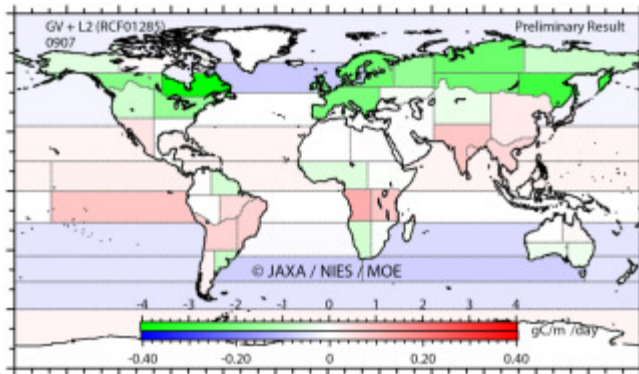


Contribution of satellite data to carbon flux estimation

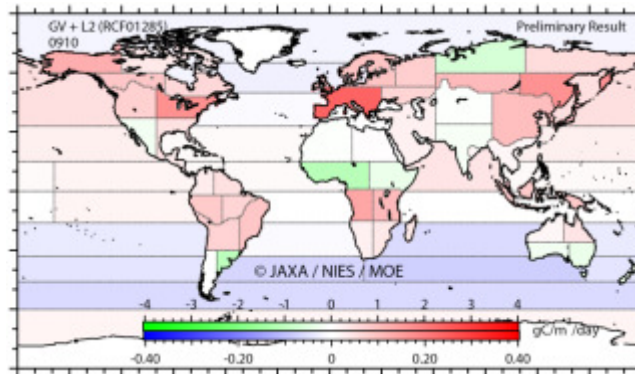


Plan 1: Monthly CO₂ Flux Estimates (Level 4A product)

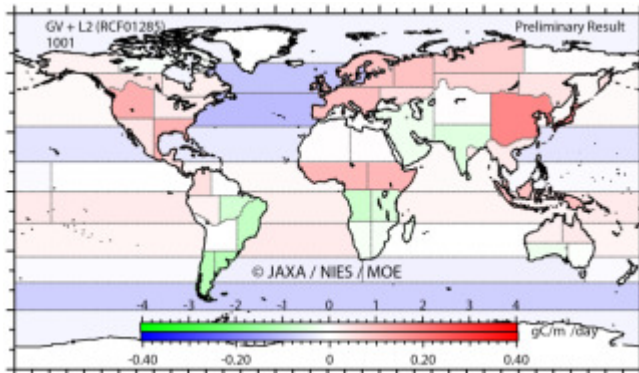
July 2009



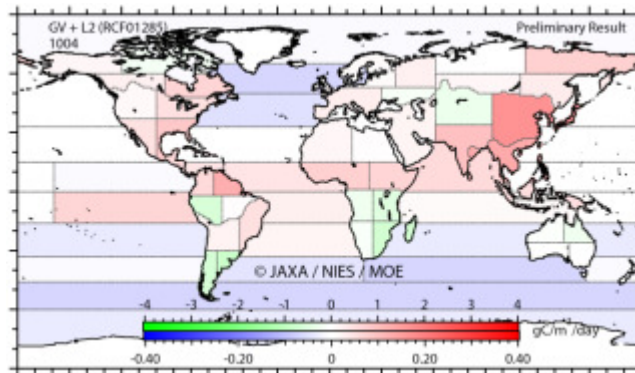
October 2009



January 2010



April 2010



64-regional monthly CO₂ fluxes estimated from ground-based network data* and GOSAT XCO₂ retrievals. Results for four months (July 2009, October 2009, January 2010, and April 2010) are presented here.

*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](ftp://ccg/co2/GLOBALVIEW)).

(Data between June 2009 and May 2010 will be released in 2012)

(by S. Maksyutov & H. Takagi (NIES))

GOSAT websites

JAXA GOSAT project

NIES GOSAT Project

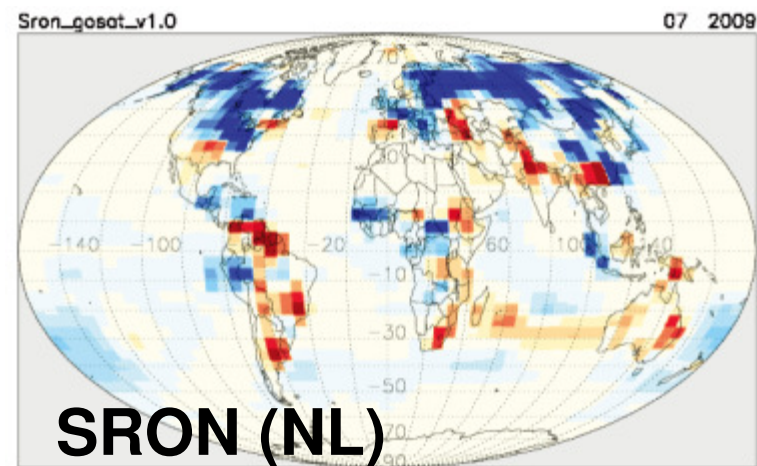
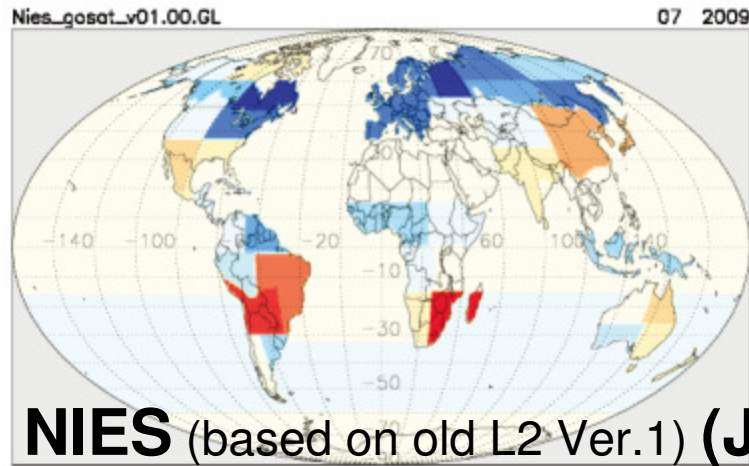
http://www.jaxa.jp/projects/sat/gosat/index_e.html

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

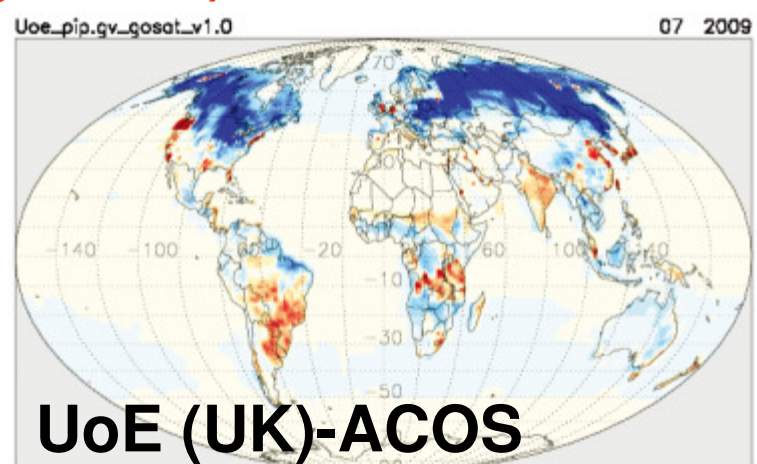
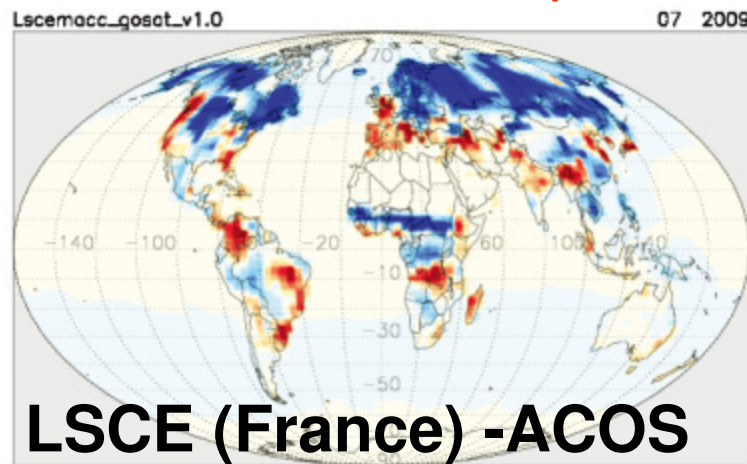


Plan 2: GOSAT-based CO₂ flux Inter-comparison campaign is underway by TransCom participants.

(July 2009) (courtesy of S. Houweling (SRON))



(Preliminary results)



Perspective on future GOSAT missions and international cooperation

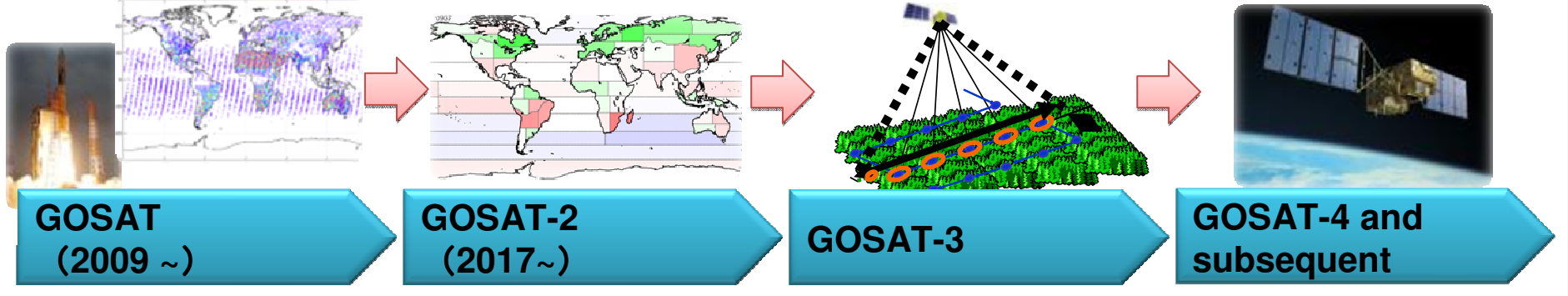
Goals of the GOSAT project

- Filling out blank areas
- Reducing GHG uncertainty

- Improving accuracy of GHG concentration and carbon flux

Contributing to Global MRV system

Long-term space-based monitoring of GHG



Possible contribution of GOSAT series

- Elucidating global carbon cycle through precise observation of CO₂ and CH₄

⇒ **Improvement in climate change prediction**

- Early detection of major changes in climate system

⇒ **Identifying changes in global environment**

- Monitoring of GHG reduction (mitigation efforts) (Incl. REDD+ activities)

⇒ **Contribution to climate policy making**

Cooperation in global observation

GOSAT-2~
(Japan)

- Establishing a platform for cooperation in data inter-comparison and verification, etc.

⇒ **Improvement in data reliability and accessibility**

CarbonSat
(ESA)

OCO-2
(NASA)

Invitation to the GOSAT seminar at Rio+20

THURSDAY, 21 JUNE 2012

11:30-13:00

*Venue: Multipurpose space in the Japan Pavilion
in the Parque dos Atletas (Athlete Park)*

Co-organized by

**Japan Aerospace Exploration Agency (JAXA),
National Institute of Environmental Studies (NIES), and
Ministry of the Environment, Japan (MoE-J)**

