Atmosphere monitoring from Space

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Present condition of Global Warming

Present condition of Global Warming

- What is the cause of Global Warming ?

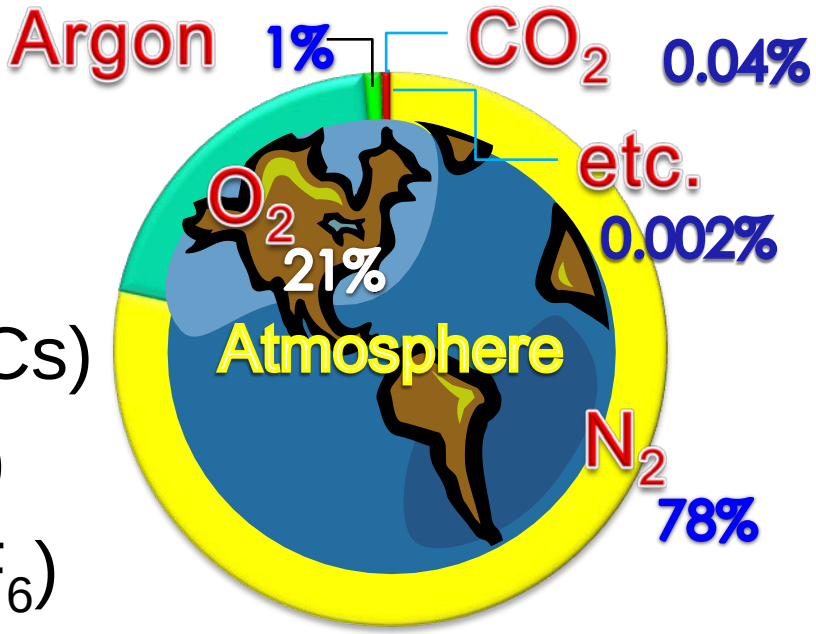
  IPCC Fourth Assessment Report (AR4) said,

  "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations."

Present condition of Global Warming

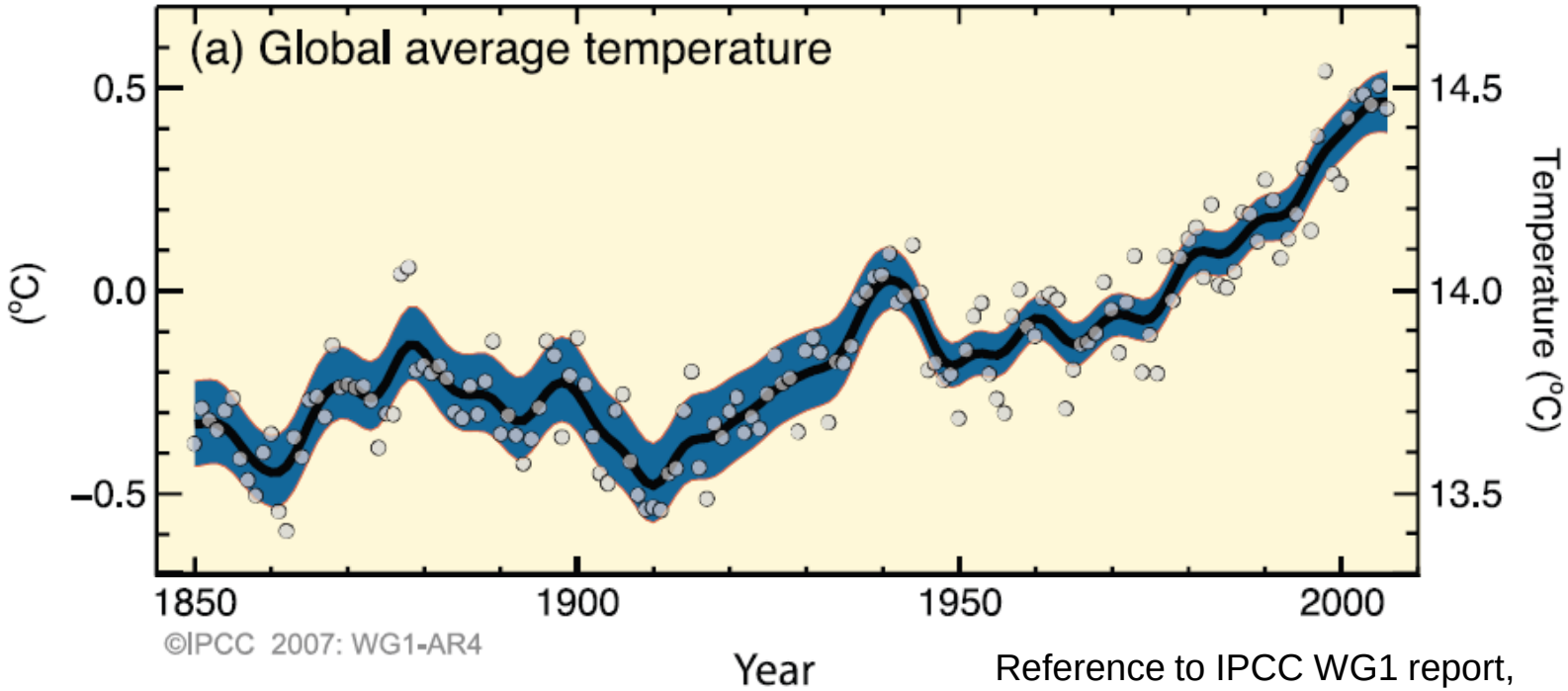
- What are the Greenhouse Gases ?
  - Carbon dioxide (CO_2)
  - Methane (CH_4)
  - Nitrous oxide (N_2O)
  - Hydrofluorocarbons (HFCs)
  - Perfluorocarbons (PFCs)
  - Sulphur hexafluoride (SF_6)

(written in the Kyoto Protocol)



Present condition of Global Warming

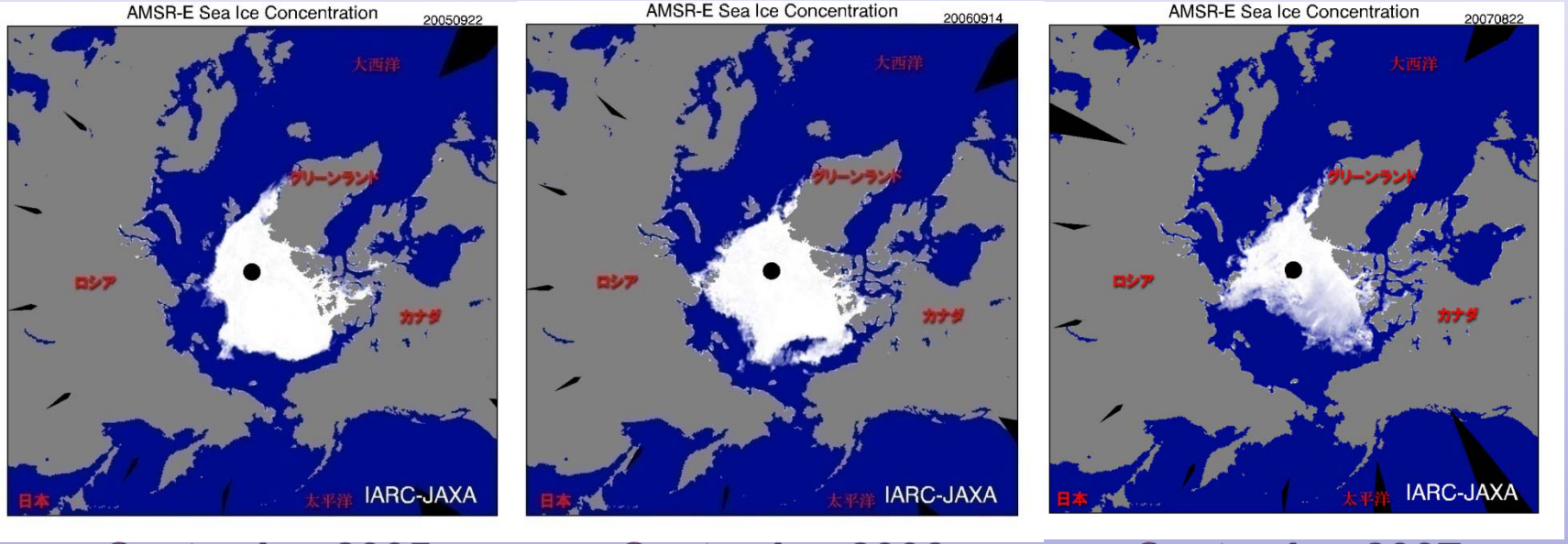
Greenhouse gases affect the climate, such as increasing of temperature, melting of ocean ice, and so on.



Reference to IPCC WG1 report, Summary for Policymakers

Present condition of Global Warming

Arctic Ice monitoring from Satellite

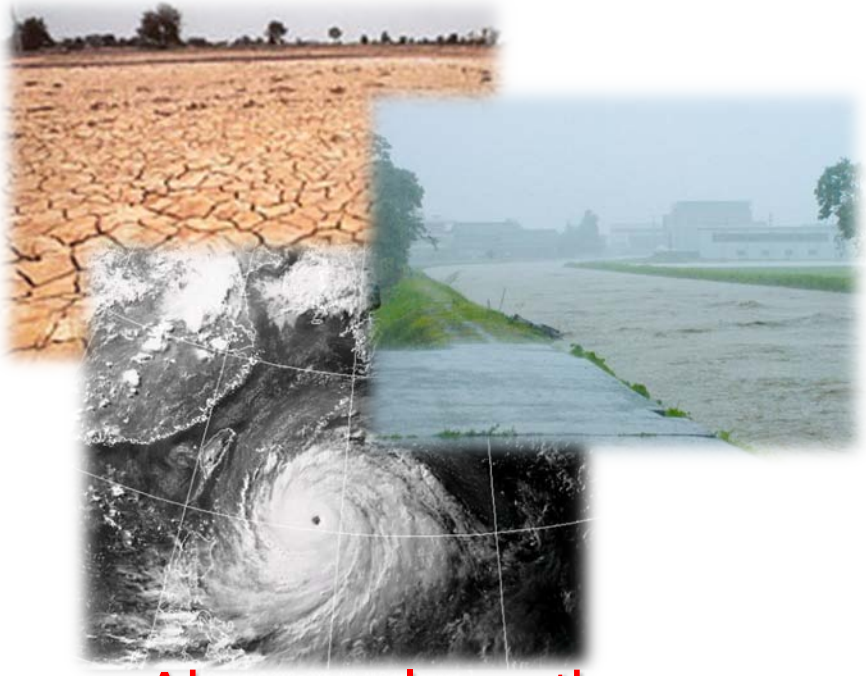


September 2005 September 2006 September 2007

Observation data of microwave radiometer (AMSR-E) on Aqua

Present condition of Global Warming

If the Greenhouse gases increase and the Global warming is in progress .....



Abnormal weather

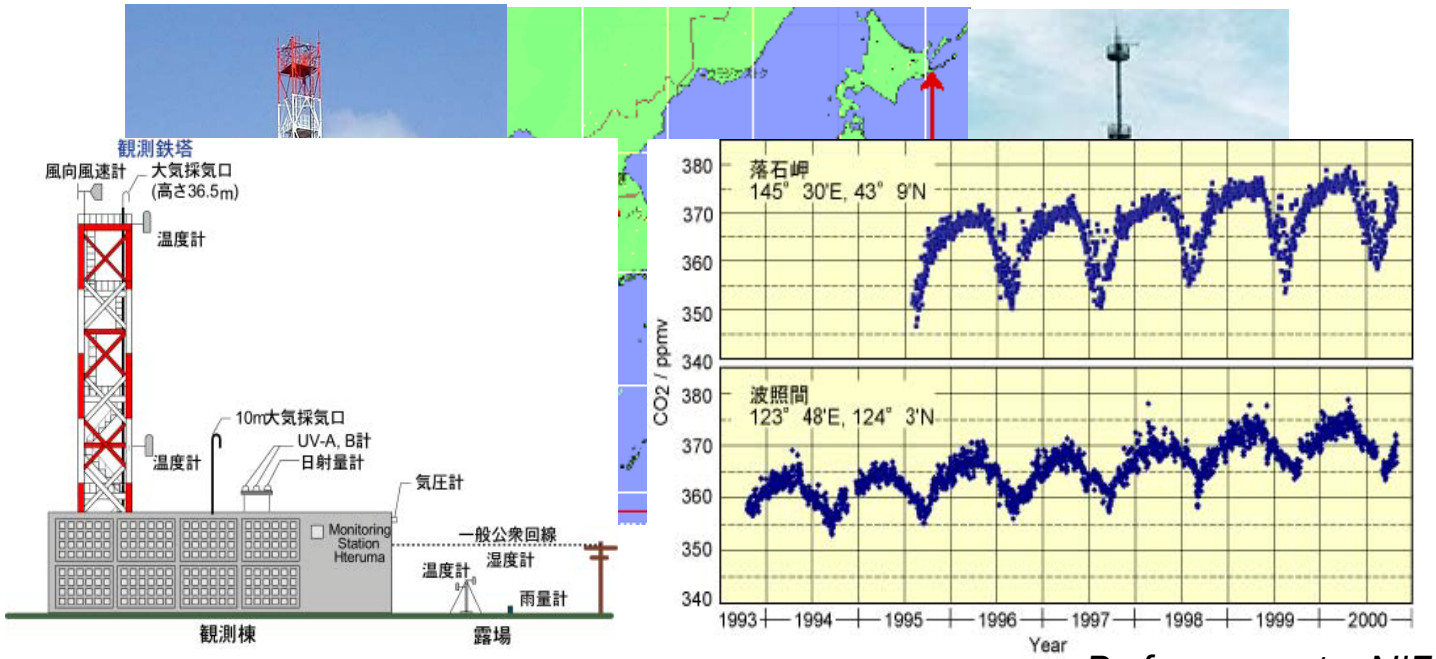
Sea level rise

Observation of Greenhouse Gases

Observation of Greenhouse Gases

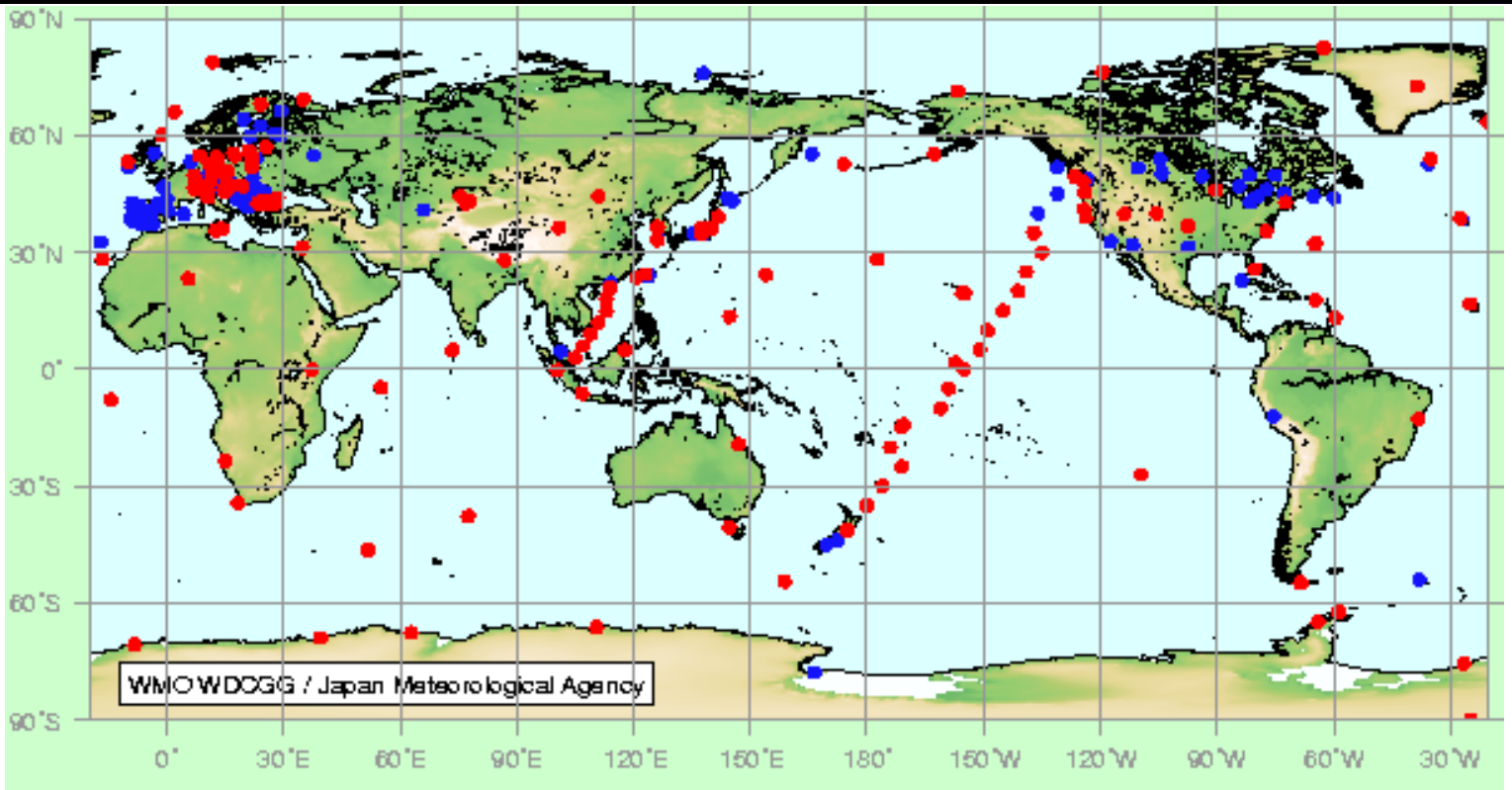
➢ Observation on the ground

There are many ground stations observing the Greenhouse gases. (312 stations, as of Apr.19)



Reference to NIES web site

Observation of Greenhouse Gases



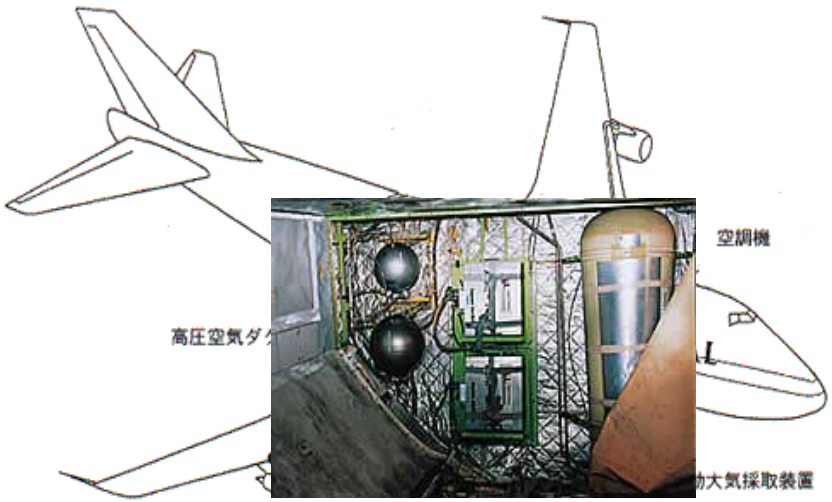
The figure shows the distribution of the fixed stations that contribute data to the WDCGG. The red symbol " • " denotes that the data from the station has been updated in the last 365 days.

Reference to World Data Center for Greenhouse Gases (WDCGG)

Observation of Greenhouse Gases

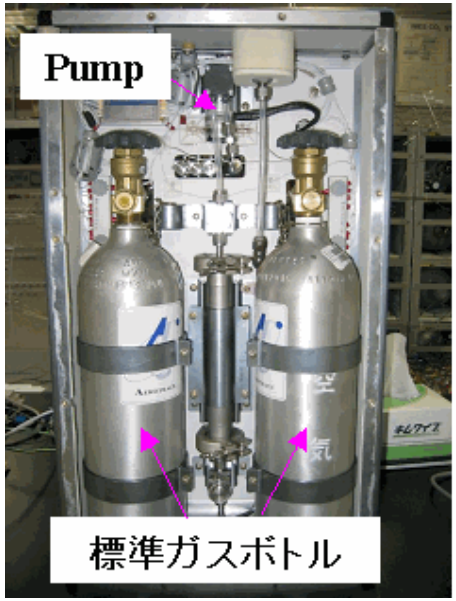
- Observation by aircraft

  The commercial airlines are observing Greenhouse gases using the equipment loaded on planes.



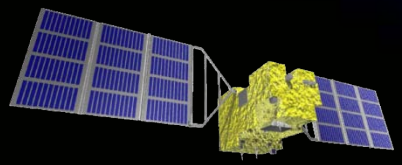
Location of these Equipment

Automatic Air Sampling Equipment (ASF)



Continuous CO_2 Measuring Equipment (CME)

Reference to JAL Foundation web site



Observation of Greenhouse Gases

However, the observation points are not enough, not even .....

Significance of monitoring from Space

Significance of monitoring from Space

The Earth observation have several purposes.

Weather forecast

to know Global Environment

to monitor Disaster

to make Map

Significance of monitoring from Space

Concerning the observation of Greenhouse gases, the merits of observation from Space are

- Increase the observation points
- Global and Even observation
- Long term and Periodical observation
- Same sensor (observing by same equipment)

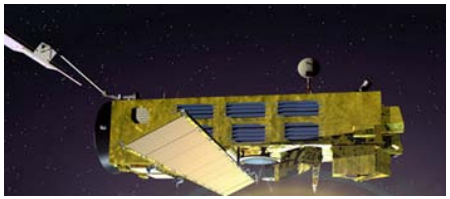
Examples of Observation from Satellite

Examples of Observation from Satellite

These are the first generation of space based CO_2 monitoring satellites have recently been deployed.

NASA/Aqua
AIRS

ESA/EnviSat
SCIAMACHY



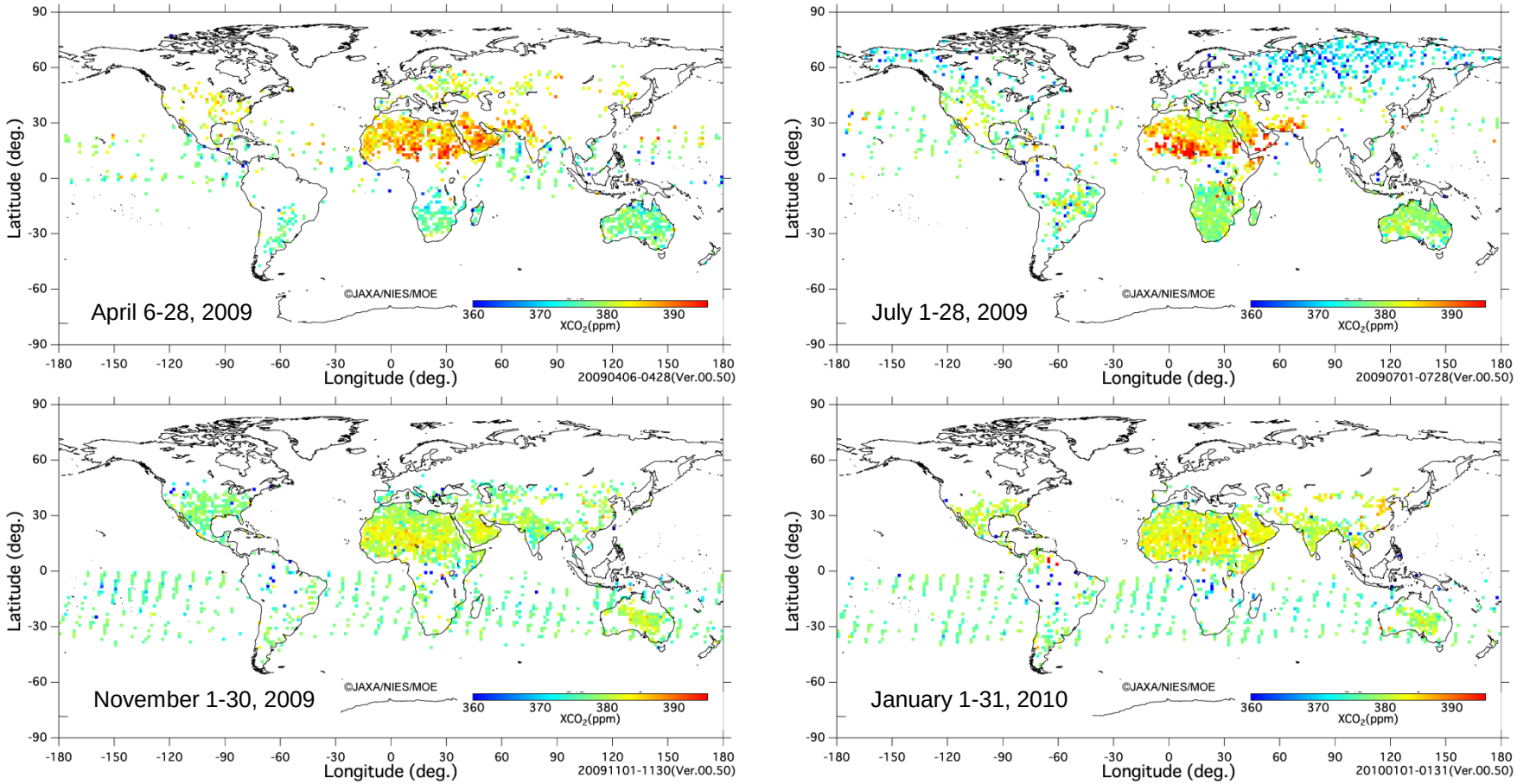
EUMETSAT/Metop
IASI

JAXA/GOSAT
TANSO-FTS/CAI

Greenhouse gas measurements from space provide a global perspective that is essential for understanding Global Warming.

Examples of Observation from Satellite

- Example of GOSAT data observing CO_2.

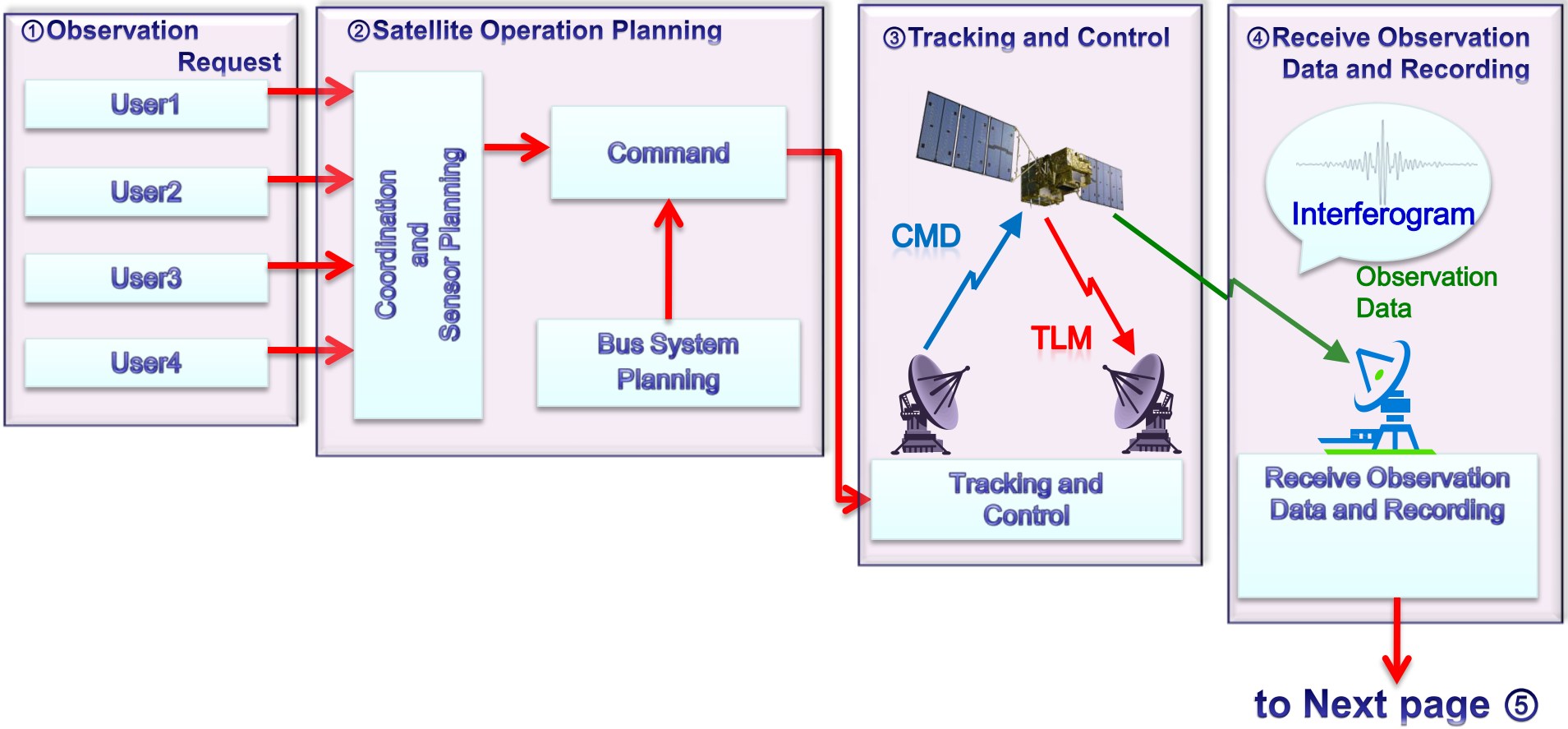


Monthly Global Map of the CO_2 column-averaged volume mixing ratios in 1.5 deg by 1.5 deg mesh

Contribution of the Space operations

Contribution of the Space operations

- Example of outline for GOSAT operation.

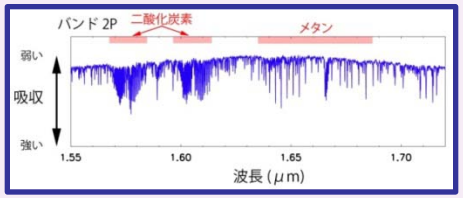


Contribution of the Space operations

from previous page ④

⑤ Data processing
(Level 1 processing)

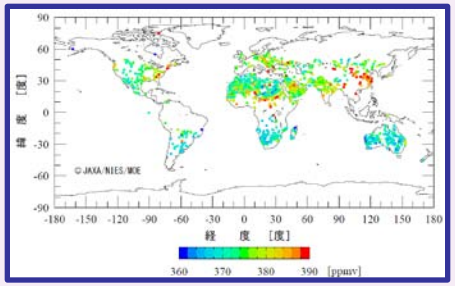
L1 data processing



Spectrum

⑥ Data processing
(Level 2 processing)

L2 data processing



Column abundances

⑦ Data processing
(High-order processing)

High-order processing

Amount of CO_2 flux

⑧ Data distribution

Data Distribution (JAXA)

Data Distribution (NIES)

Scientists, Agencies, and all other users

Contribution of the Space operations

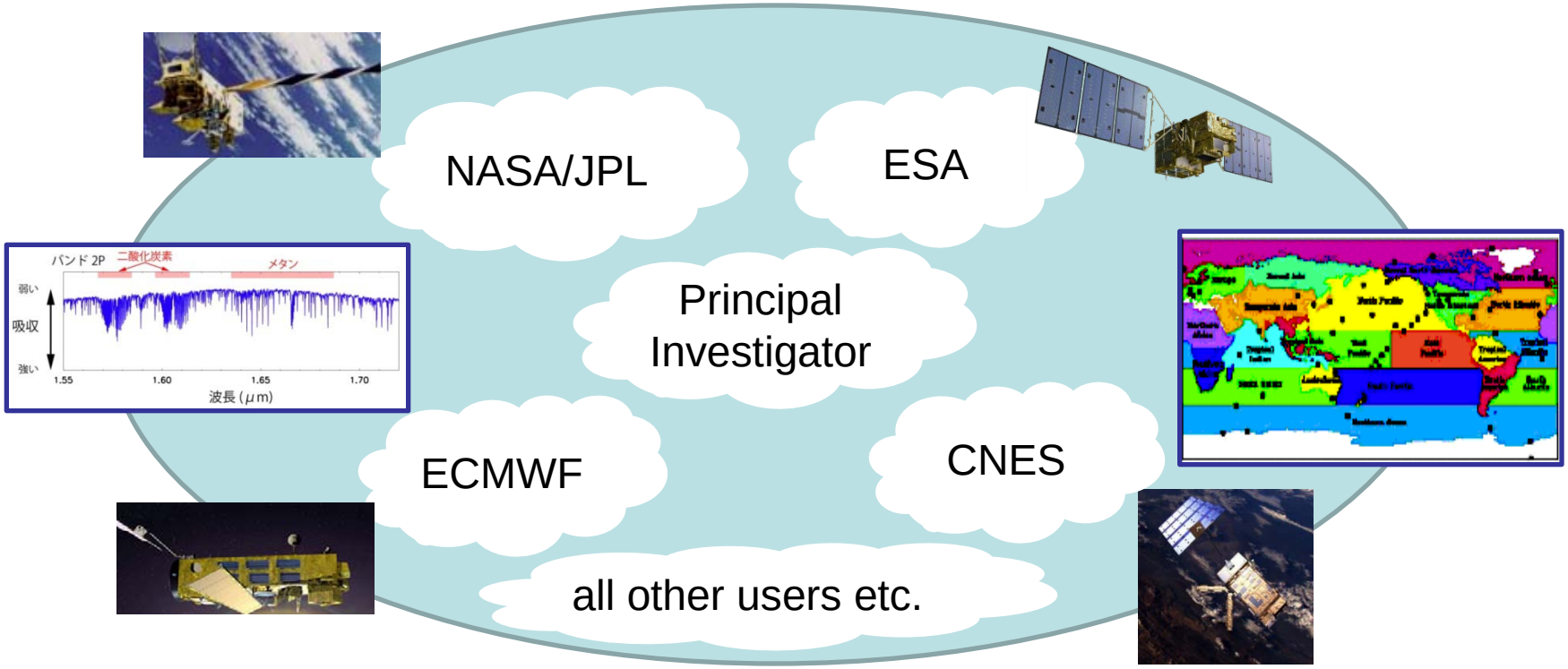
To keep the monitoring from Space, and get these significant Greenhouse gases observation data, stably and routinely .....

Contribution of the Space operations

Space operation is very IMPORTANT, such as Spacecraft Control system, Ground station network, Flight Dynamics, Mission data processing .....

And also, Our imaginative and creative Idea.

Contribution of the Space operations



The data of Greenhouse gases observed from Space is distributed to the world, and will be contributed to clarify the Climate Change and stop the Global Warming.