

The mission overview using the TANSO-3 on GOSAT-GW

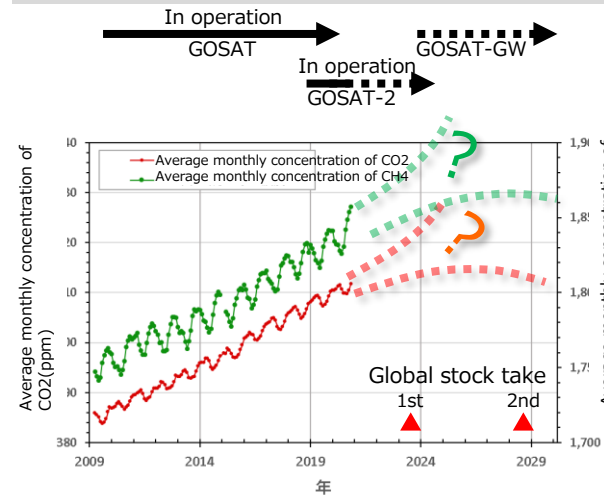
TSUJIIHARA Hiroshi, ISONO Kazuo, MATSUSHIMA Akihiro, TANAKA Masashi

Office of Global Environment and Decarbonizing Innovation Research, Global Environment Bureau, Ministry of the Environment, Japan

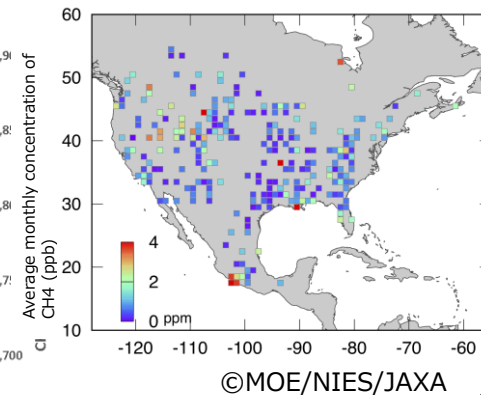
Achievements of GOSAT since 2009

- Contributed to the scientific understandings of climate change by revealing the global increases of GHG concentrations
- Showed the possibility of utilizing the satellite data for estimating the emissions from the large-scale sources

monthly average concentrations:



Checking the national inventory reports from a country

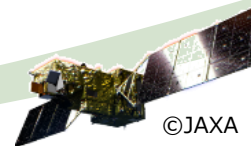


Targets of GOSAT series

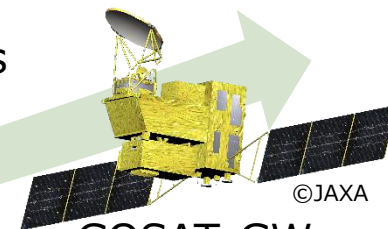
- Continuously observing the global atmospheric GHG concentrations
- Monitoring the emissions from the large-scale point sources
- Used for checking the national GHG inventory reports with the data obtained from satellites



GOSAT (since 2009)



GOSAT-2 (since 2018)



GOSAT-GW
(since JFY2023)

Image courtesy of JAXA

TANSO-3: Development inheritance from TANSO-2

TANSO-3 : Realizing the surface observations

In order to develop TANSO-3 which inherits the purpose of “monitoring emissions from the large-scale point sources,” it is desirable to make surface observations, instead of conventional point observations. The TANSO-3 enables spatially detailed

TANSO-3 observation target gas: NO₂

When CO, which is known as a tracer for identifying CO₂ emissions originating from combustion, and CO₂ are observed simultaneously by the TANSO-3, a large cooling system is required. Considering technical difficulties and development schedules, we decided to make the TANSO-3 equipped with a function to monitor NO₂, which is a tracer for identifying CO₂ emission sources originating from fossil fuels.

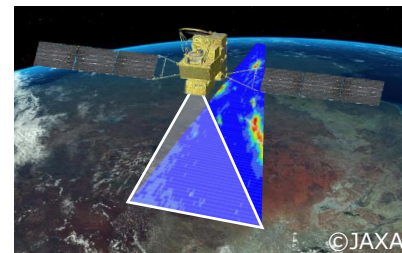
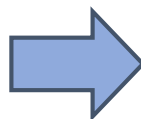
Two observation modes of the TANSO-3

In order to simultaneously achieve two objectives of TANSO-3: “continuously observing the global atmospheric GHGs” and “monitoring emissions from the large-scale point sources,” TANSO-3 has two observation modes: focus mode and wide mode.

Target gas:
CO₂, CH₄, and CO



Observation image of the TANSO- 2 on the GOSAT-2



Observation image of the TANSO-3 on the GOSAT-3

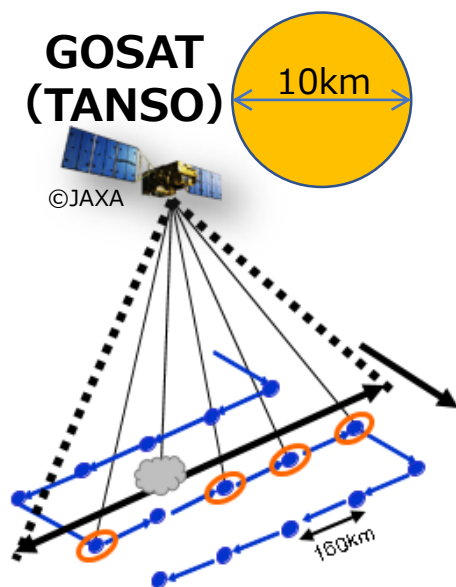
Target gas:
CO₂,CH₄, and NO₂

It is the world's first and only one to have two functions: a wide mode and a focus mode, and simultaneous observation of three gases, CO₂, CH₄, and NO₂.

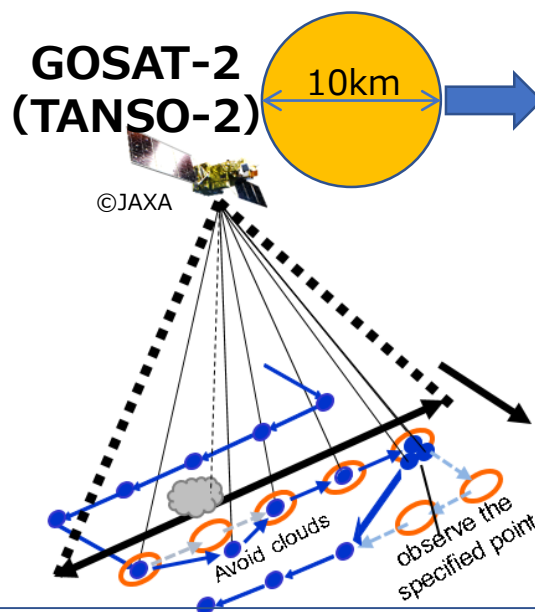
Overview of the TANSO-3

GHG sensor	TANSO-FTS	TANSO-FTS-2	TANSO-3
satellite	GOSAT	GOSAT-2	GOSAT-GW
method	FTS	FTS	grating
Observation gas	CO ₂ , CH ₄	CO ₂ , CH ₄ , CO	CO ₂ , CH ₄ , NO₂
Others		Function to automatically avoid clouds and observe	Wide mode, Focus mode*1

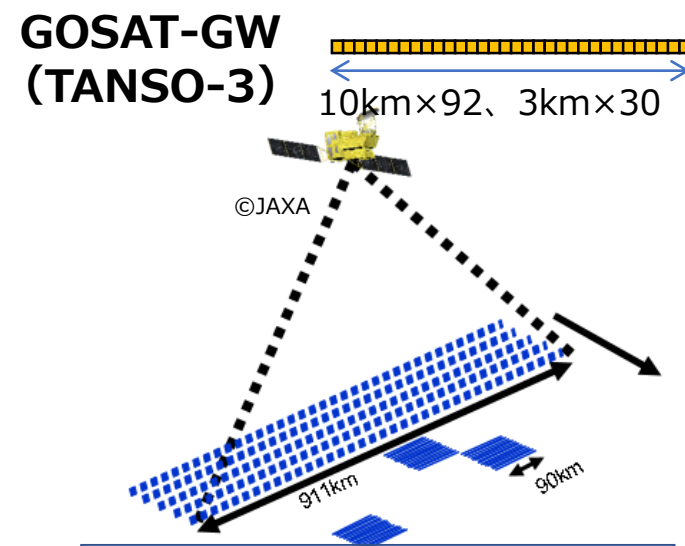
*1: The observation plan is under consideration



Observing one element with a FOV Φ 10km intervals grid width 160 km. **If there are clouds in the FOV, the GHG concentrations cannot be calculated.**



It is possible to observe the **specified point** with one element with FOV Φ 10km. The sensor can detect clouds by itself and **automatically avoid them.**

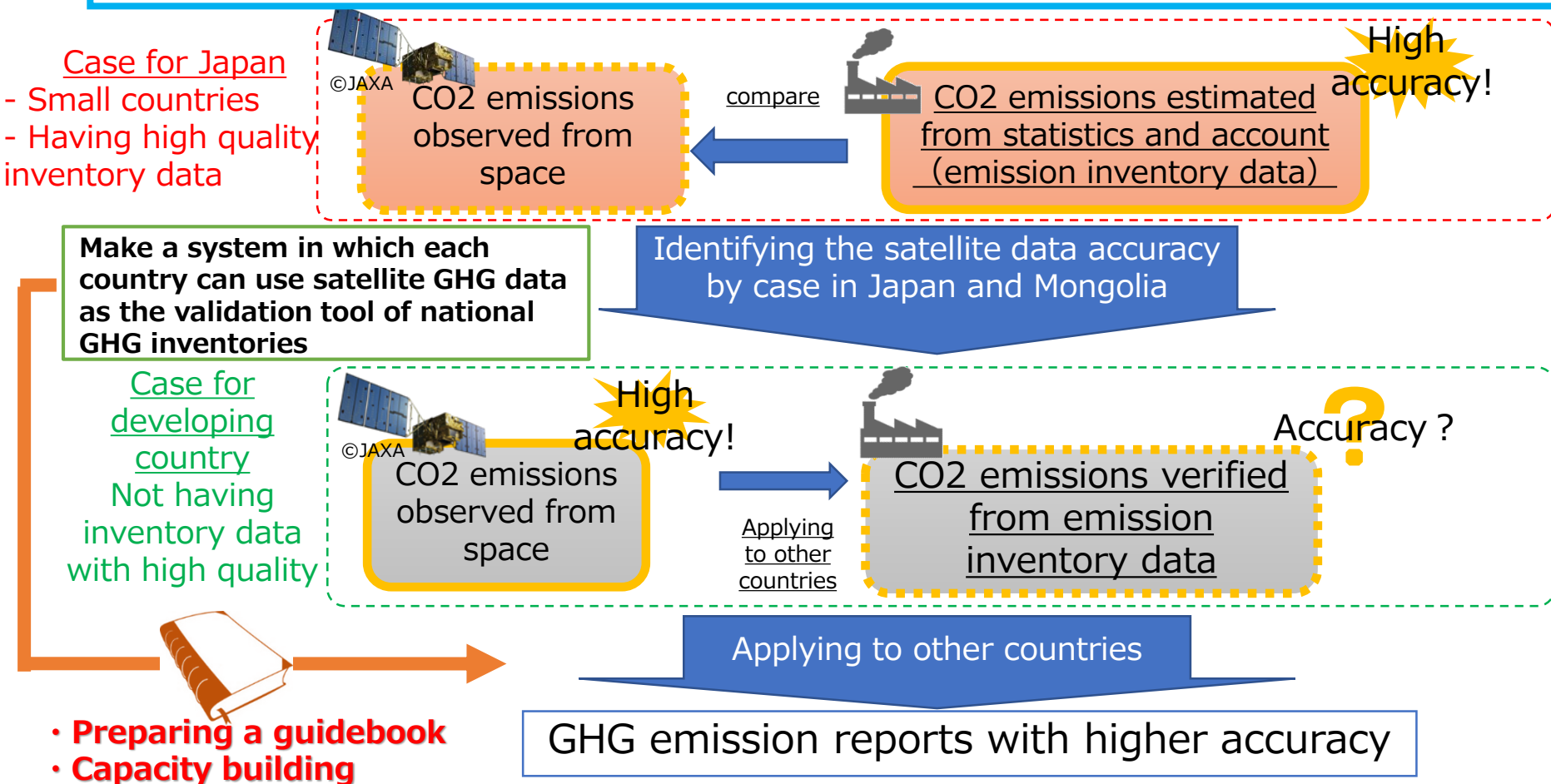


It is possible to observe the entire globe with a spatial resolution of 10 km in the wide mode, or the specified range (90 km width) with a spatial resolution of 3 km in the focus mode.

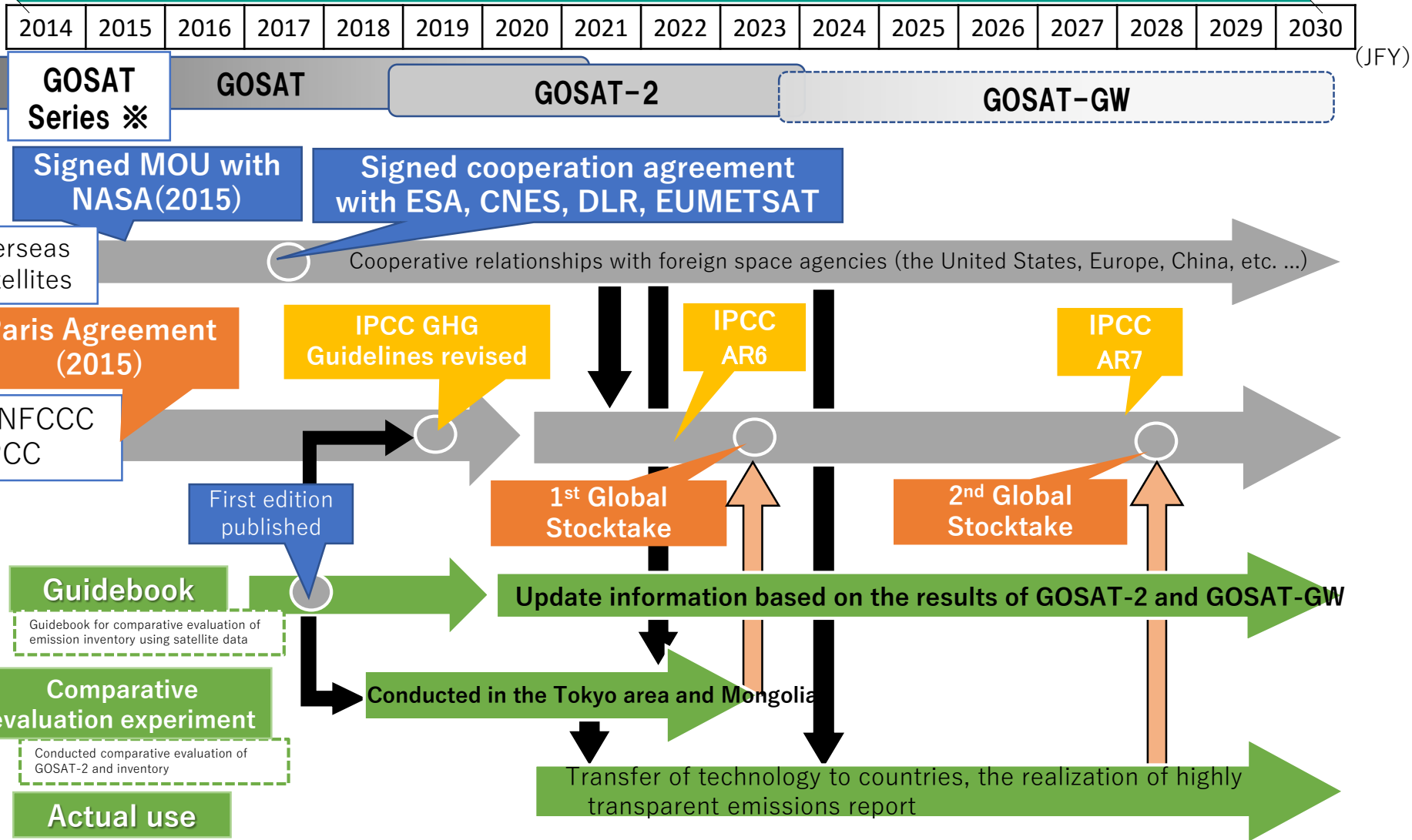
Toward Comparison Tools

As stipulated in Paris Agreement, Each Party shall regularly provide a national inventory report of anthropogenic emissions by sources and removals by sinks of GHGs under the enhanced transparency framework of Paris Agreement.

Comparing GHG emissions and removals reporting with satellite data will be a key to verify accounting for anthropogenic GHG emissions and removals in a more transparent way, which will contribute to implementation of the Paris Agreement.

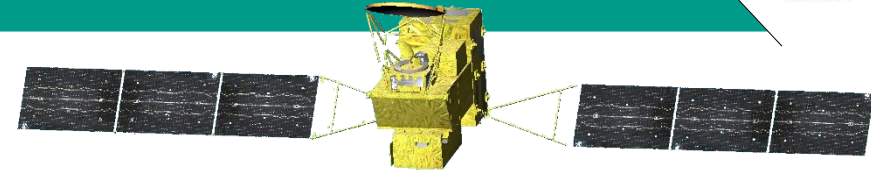


Activities for the progress confirmation of climate change measures



※The increase in space debris has become a concern in the continuous observation of the earth. The Government of Japan has set up measures to prevent space debris on government satellites, and the Ministry of the Environment will consider taking measures in coordination with related organizations to prevent the GOSAT series from staying as space debris.

Way Forward



©JAXA

- ✓ GOSAT-GW will be launched in Japan FY2023
- ✓ Will develop methodology to estimate anthropogenic GHG emissions and removals with satellite data
- ✓ Will input to the IPCC GHG Inventory Guidelines to enable all countries to utilize the GOSAT series data for checking the national GHG inventory reports
- ✓ Will promote training practitioners engaged in GHG inventories and accounting in developing countries with the guidebook.
- ✓ Will collaborate with other countries for monitoring GHG emissions