# The GOSAT-GW greenhouse gas observation mission and the planning of the Japan GHG Center

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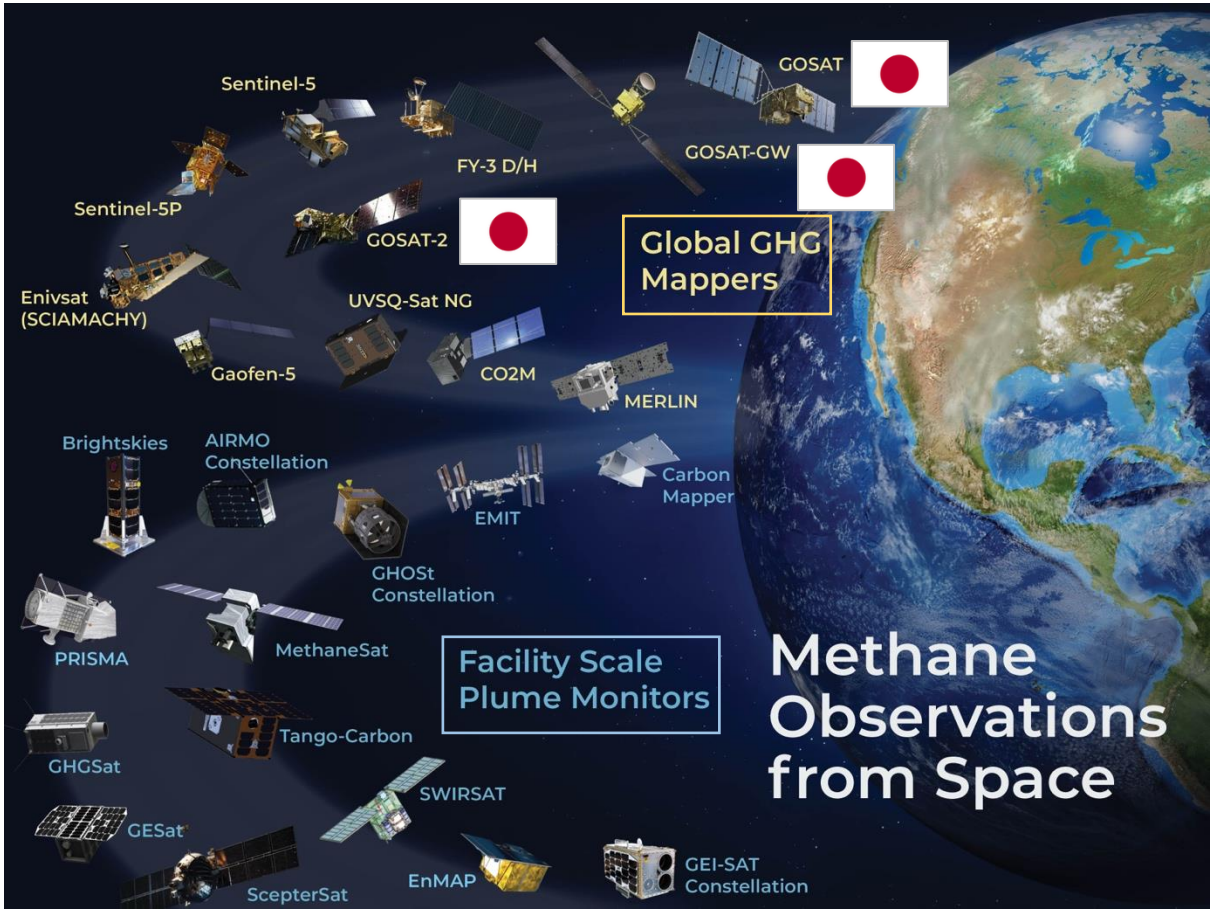
# Measurements of greenhouse gases from space




*Growing constellation of GHG concentrations observations from the global to the facility scale*

https://database.eohandbook.com/ghg/

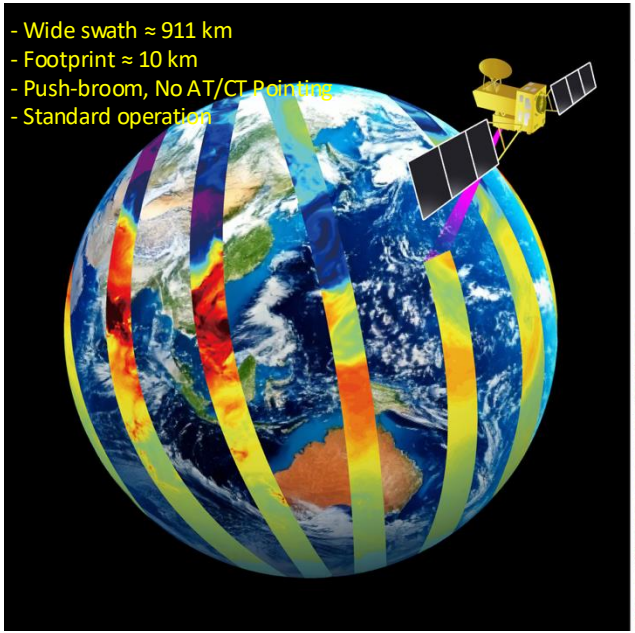
# Successful launch of GOSAT-GW in June 2025

The GOSAT-GW satellite was launched at 1:33:03 am Japan time on 29th June at Tanegashima Space Center with the 50th H-IIA rocket, the last vehicle of the H-IIA series

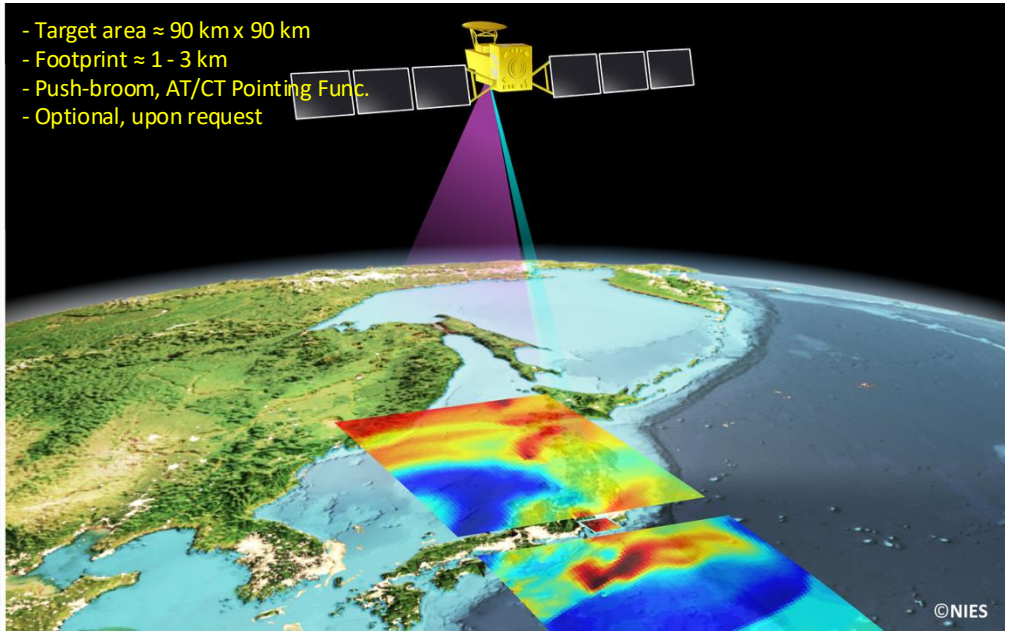
# 3-day dense global coverage of $CO_2$, $CH_4$ & $NO_2$ observations

- Monitoring of whole atmosphere global-mean concentrations of GHGs – $CO_2$ and $CH_4$
- Verification of country-level anthropogenic emissions inventory of GHGs – $CO_2$ and $CH_4$
- Detection of GHGs emissions from large emission sources, such as megacities, power plants, and permafrost

**Wide Mode**

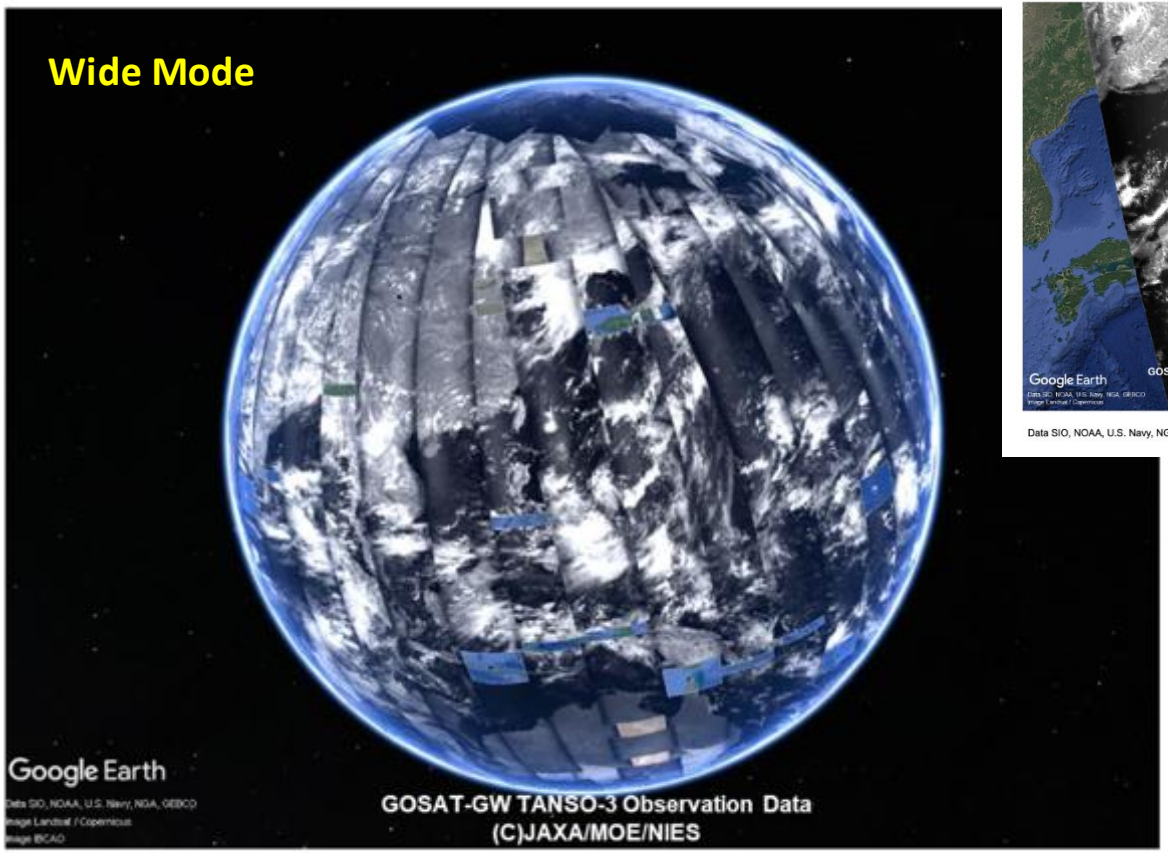



**Focus Mode**

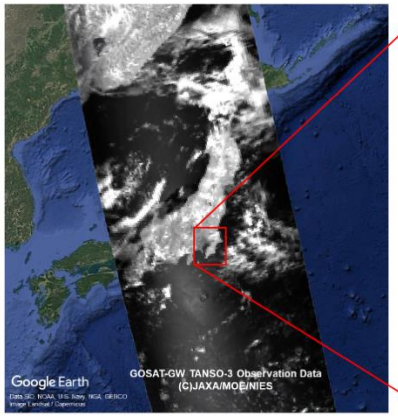



https://esd.nies.go.jp/ja/da/

# First light: Wide Mode, July 14-16




Data SIO, NOAA, U.S. Navy, NGA, GEBCO Image Landsat / Copernicus Image IBCAO

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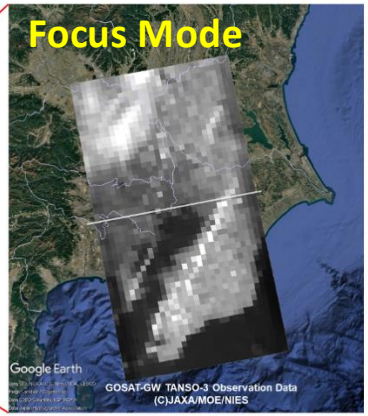



Data SIO, NOAA, U.S. Navy, NGA, GEBCO Image Landsat / Copernicus Data
LDEO-Columbia, NSF, NOAA Data Japan Hydrographic Association

NIES

JAXA

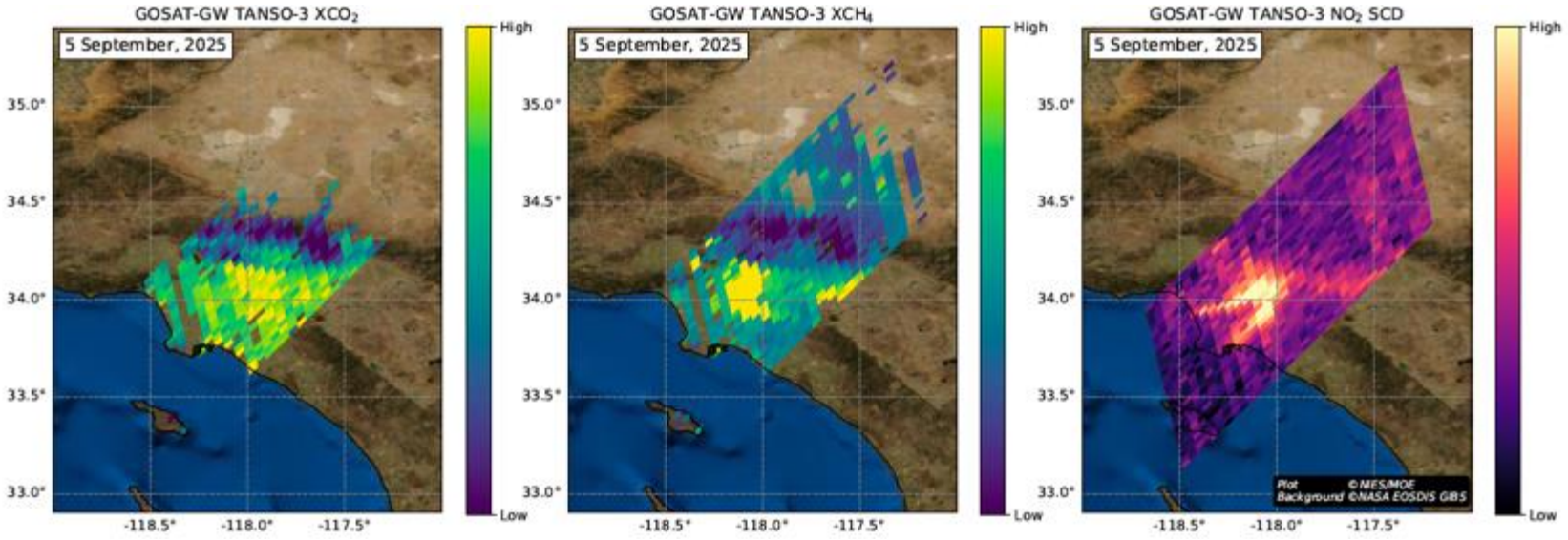
Ministry of the Environment
Government of Japan

https://www.nies.go.jp/whatsnew/20250826/20250826-e.html

# First results of co-located $CO_2$, $CH_4$, and $NO_2$ from GOSAT-GW

*Focus Mode*

$CO_2$ $CH_4$ $NO_2$




*Yu Someya, Tamaki Fujinawa, Hyunkwang Lim, NIES*

!! CAUTION !! Initial analysis based on preliminary data

NIES

Ministry of the Environment
Government of Japan

# Many research activities provide scientific supports for policy

## NIES

- Research-based long-term monitoring
- Japan's emission inventory
- GOSAT series L2+, Carbon cycle modeling

## Ministry of the Environment, Japan

- Climate change policies
- GOSAT series operation and funding

**ground**

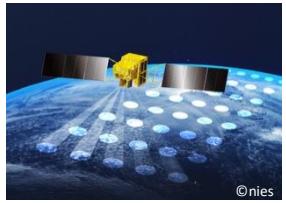
Cape Ochi-ishi

Hateruma Island

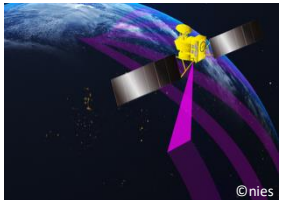
Mt. Fuji

**satellite**

GOSAT



GOSAT-2



GOSAT-GW

**ship**

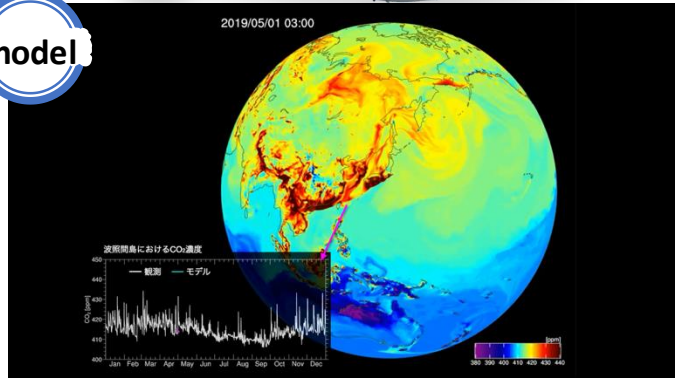
TRANS FUTURE 5

NEW CENTRY 2

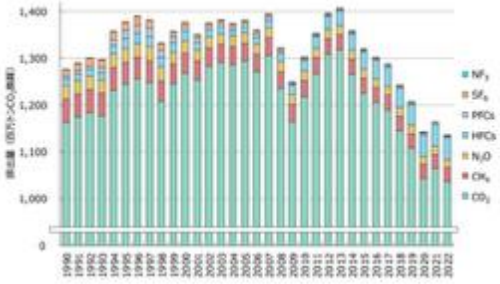
FUJITRANS WORLD

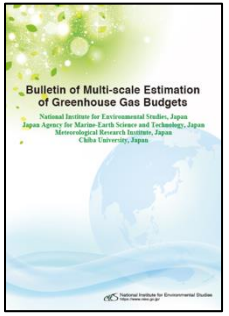
**aircraft**


**model**




**inventory**



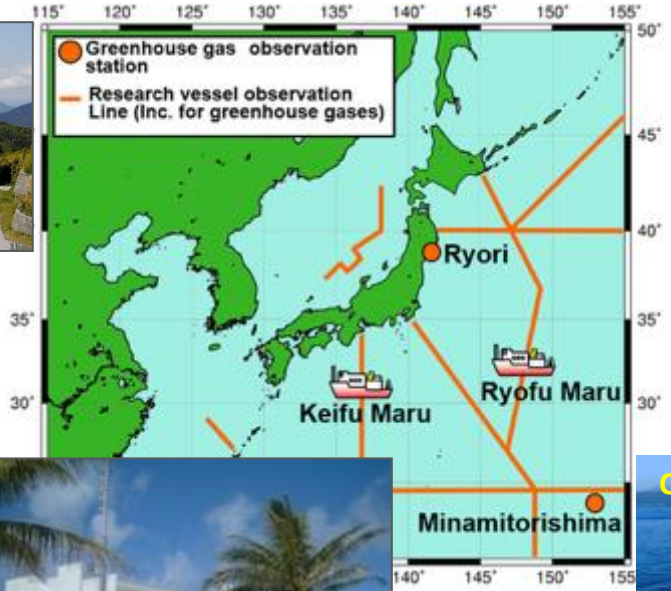



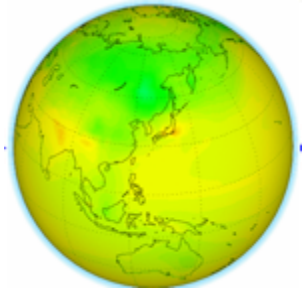
# Many research activities provide scientific supports for policy

**Japan Meteorological Agency**
- Operational monitoring for GAW
- WDCGG database

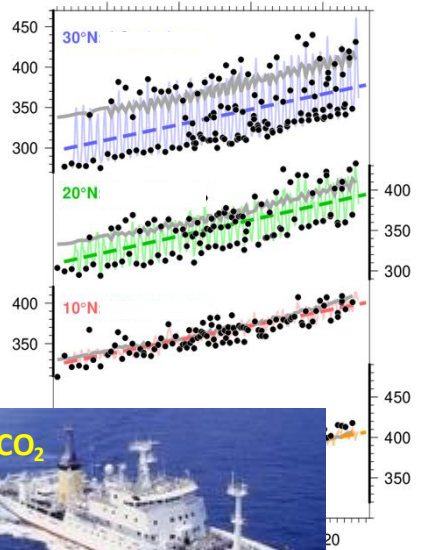
**Meteorological Research Institute**
- Research observations and modeling
- Joining CONTRAIL, RECCAP and TransCOM


**WMO-GAW regional station Ryori (RYO)**



Sea surface $pCO_2$







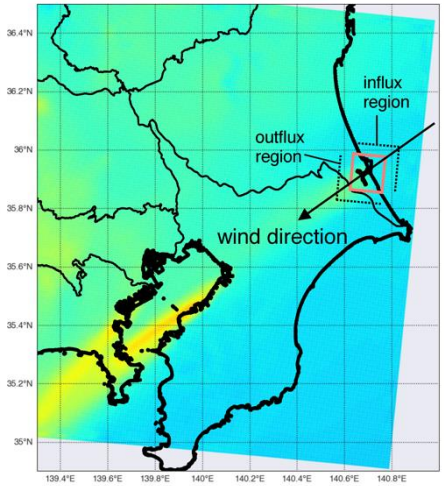

World Data Centre for Greenhouse Gases

# Many research activities provide scientific supports for policy

## JAMSTEC

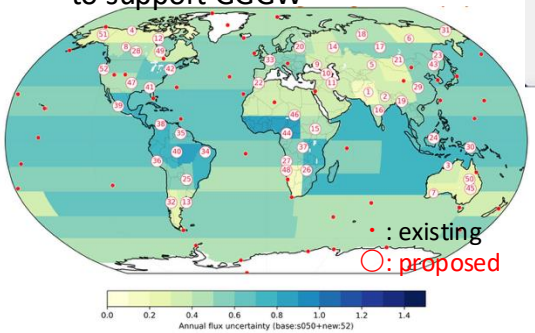
- Research vessels
- Carbon cycle modeling, GOSAT-GW modeling

Mirai II (icebreaker):
Arctic research vessel
to start in 2027



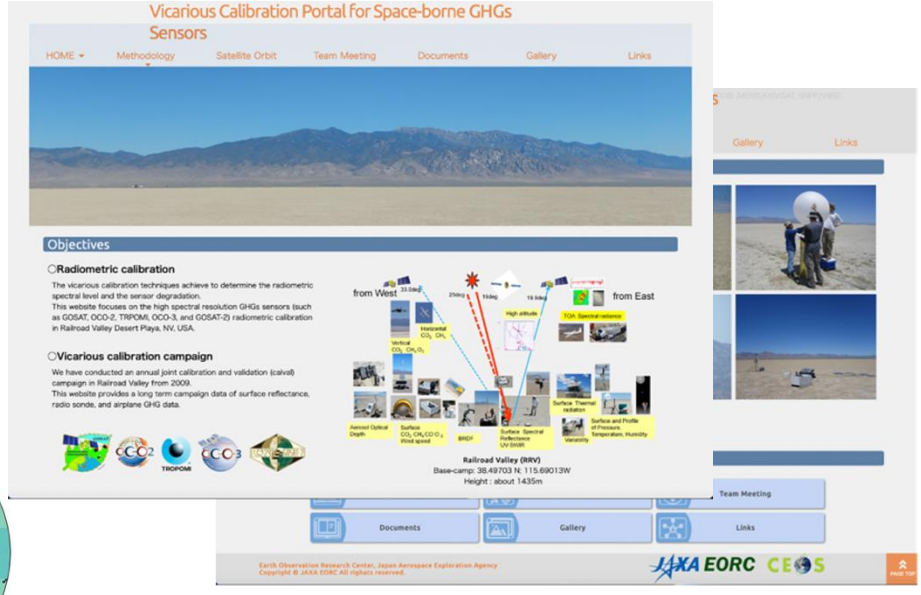

Emissions estimation from point sources using 1x1 km$^2$ model

Advanced flux estimation system to support GGGW




## JAXA

- GOSAT series L1
- Long-term vicarious calibration for space-based GHG data

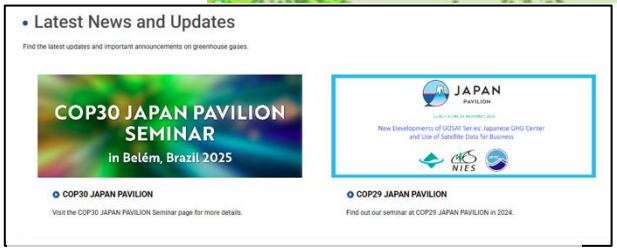


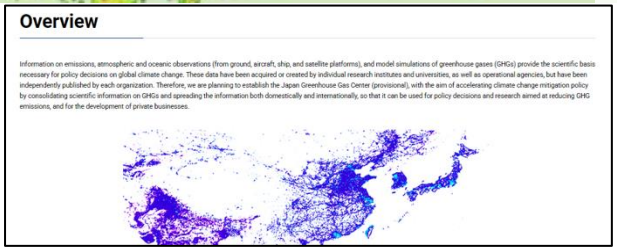

- **6 instruments** joined (GOSAT/OCO-2/OCO-3/TROPOMI/GOSAT-2/TEMPO)
- 16 years of campaign data (mainly surface reflectance) were reprocessed with the JAXA's improved processing algorithm

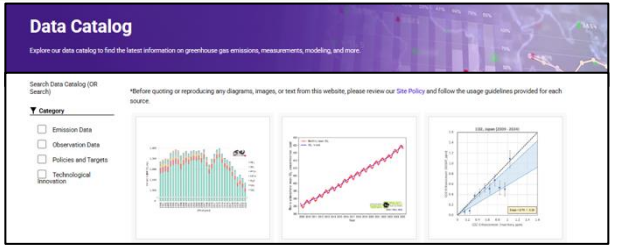
# The Japan GHG Center initiative (under discussion)

to help support climate change mitigation policies


https://esd.nies.go.jp/ghg-information/en/index.html



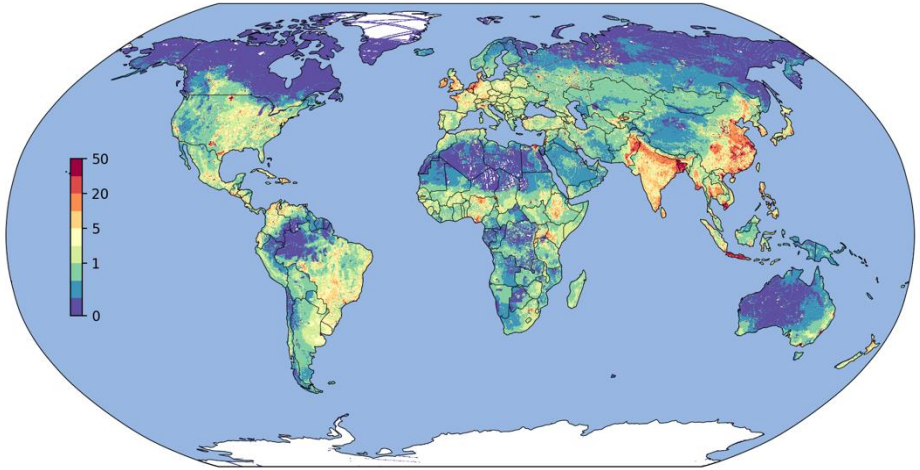

***High-level objective*** **(under discussion)**

- "One stop" information hub for scientists, policymakers and business leaders, for strong messaging on urgency of climate change mitigation
- Multi-agencies/institutes' efforts for the "all-Japan, one-team" national initiative to better serve for the global society
- We will advance integrated assessments of GHG emissions/fluxes for Global Stocktake, WMO's GGGW, UNEP's IMEO, and business

# “Flux” information for climate change mitigation policy

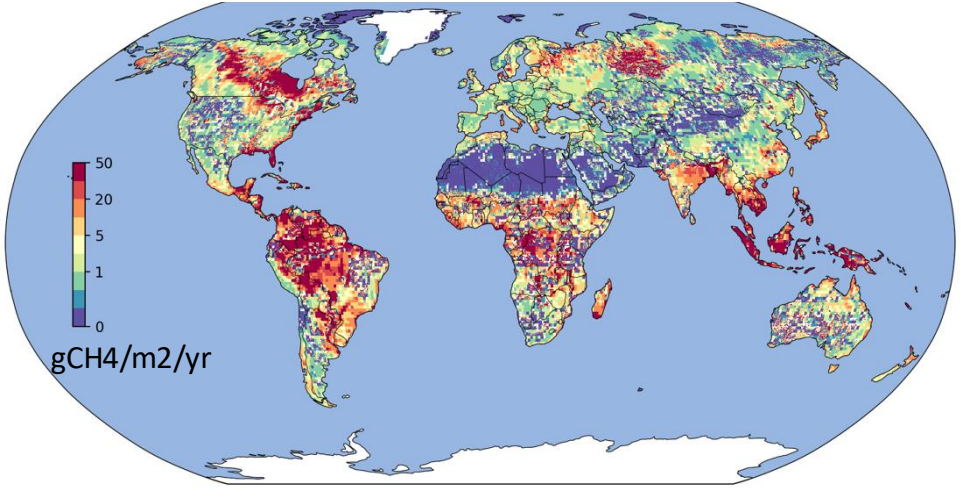
## $CH_4$ emissions derived from GOSAT data, 2009-2022

Anthropogenic emissions, total




Total = oil and gas, fossil, agriculture, landfill, biomass burning

Natural wetland emissions

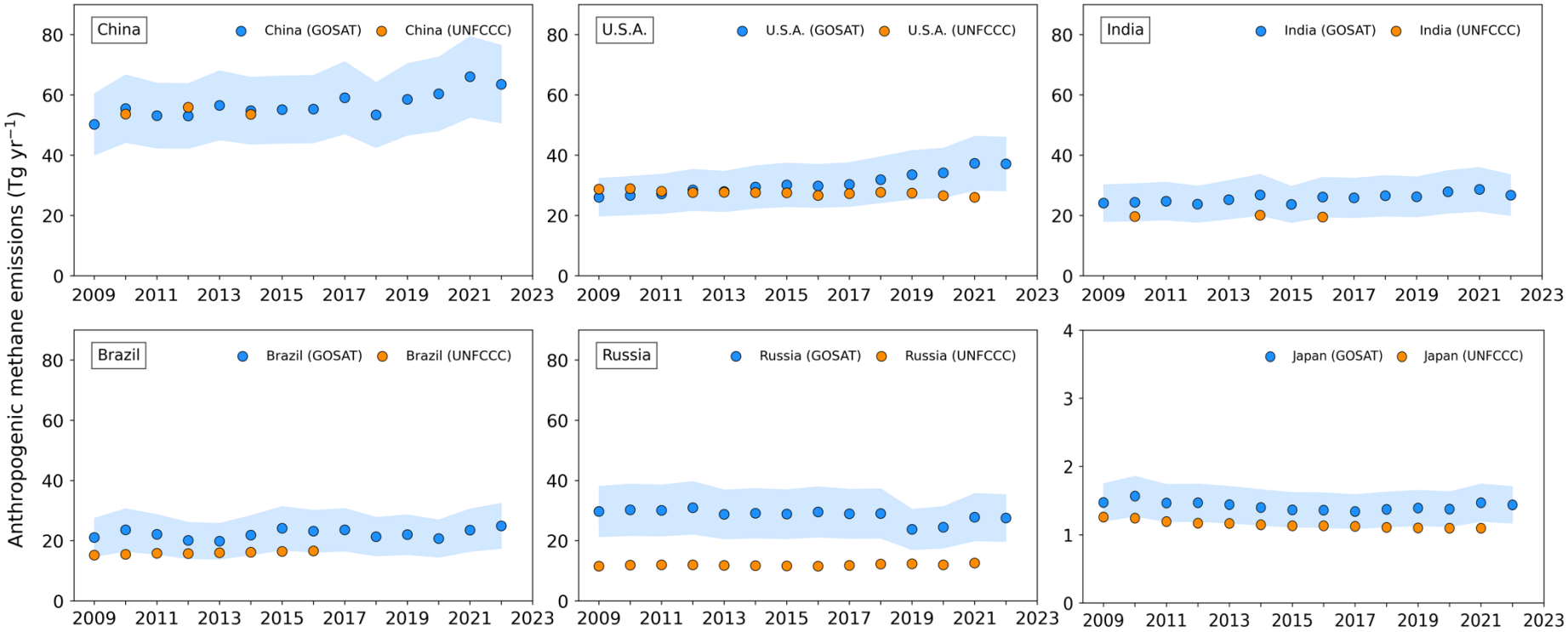



*Janardanan et al., 2024, 2025*

Anthropogenic emissions in Asia are substantial contributors to the global total emissions

# “Flux” information for climate change mitigation policy

**Anthropogenic $CH_4$ fluxes from inversion analyses of GOSAT data (Janardanan et al. 2024, 2025) and UNFCCC inventories**

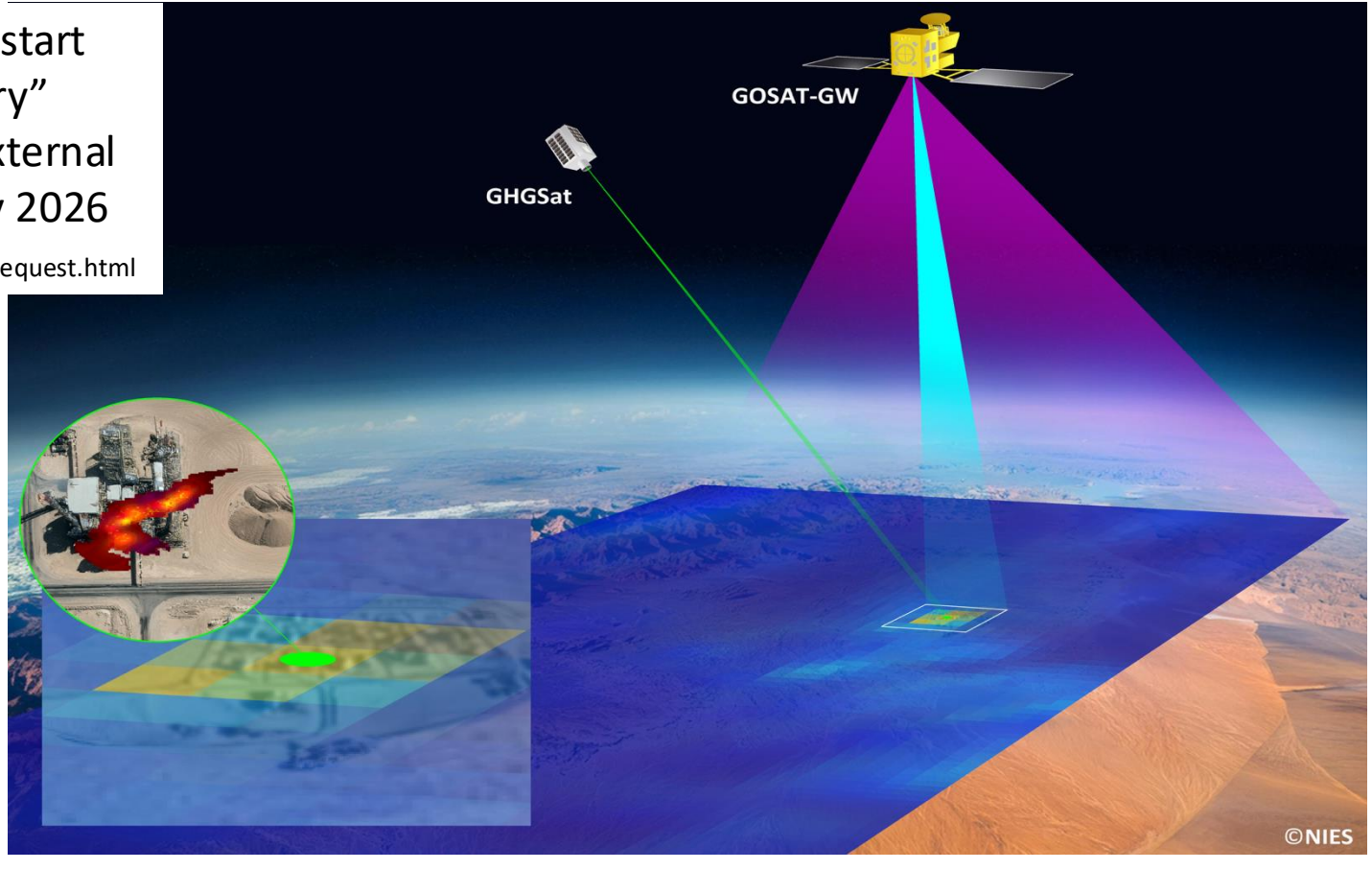



Satellite-based estimates are helpful as a supplement to the UNFCCC emission inventories

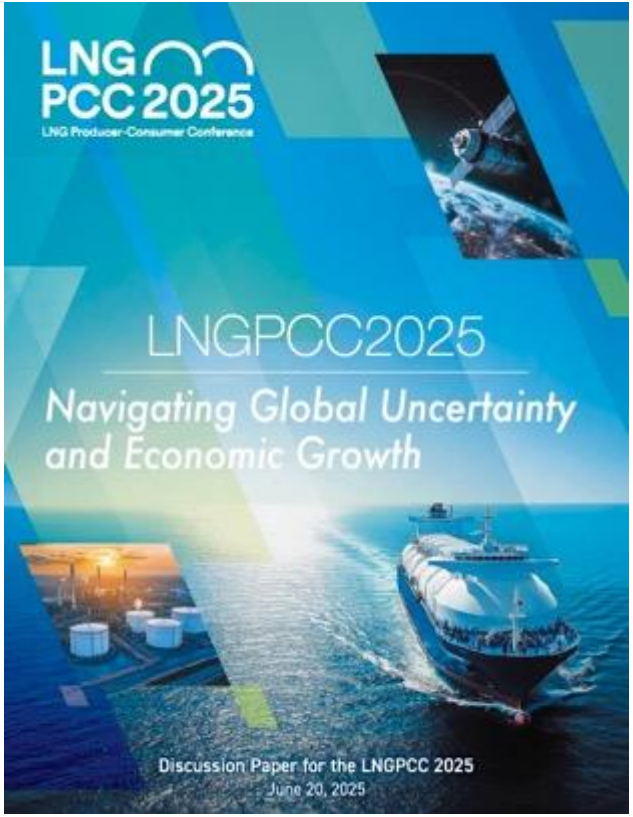
# International collaborations to better identify/quantify $CH_4$ emissions

NIES and MOE will start sharing “preliminary” TANSO-3 data to external partners in January 2026

https://gosat-gw.nies.go.jp/en/request.html



# Japan's inter-agency collaboration with IMEO on methane




***Joint Statement on Technical Collaboration and Data Transparency on Methane Abatement from LNG Value Chain***
by
Ministry of Economy, Trade and Industry of Japan (METI)
Ministry of Environment of Japan (MOE)
Japan Organization for Metals and Energy Security (JOGMEC)
National Institute for Environmental Studies (NIES)

"MOE, NIES and UNEP's IMEO will collaborate on the usage of data from GOSAT-GW when it becomes available, and IMEO will integrate the data from GOSAT-GW into IMEO's Methane Alert and Response System (MARS), which notifies government and industry stakeholders of large emissions to enable swift mitigation."

METI Ministry of Economy, Trade and Industry
Ministry of the Environment Government of Japan
JOGMEC
NIES