

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



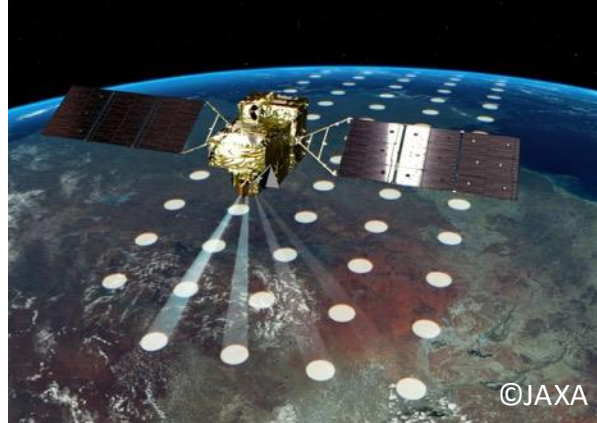
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National Institute for Environmental Studies
Japan

Greenhouse gas measurements from space

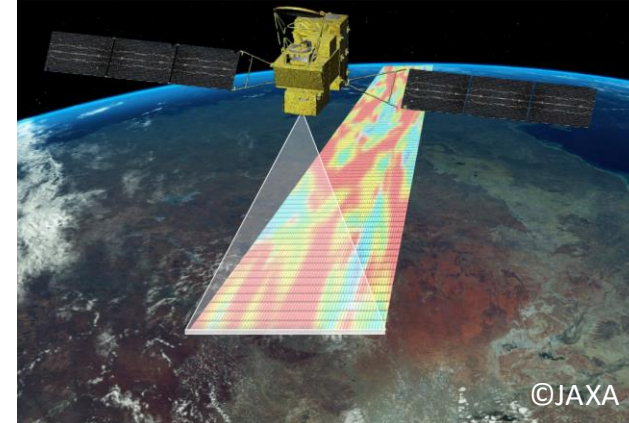
GOSAT 2009 --



GOSAT-2 2018 --



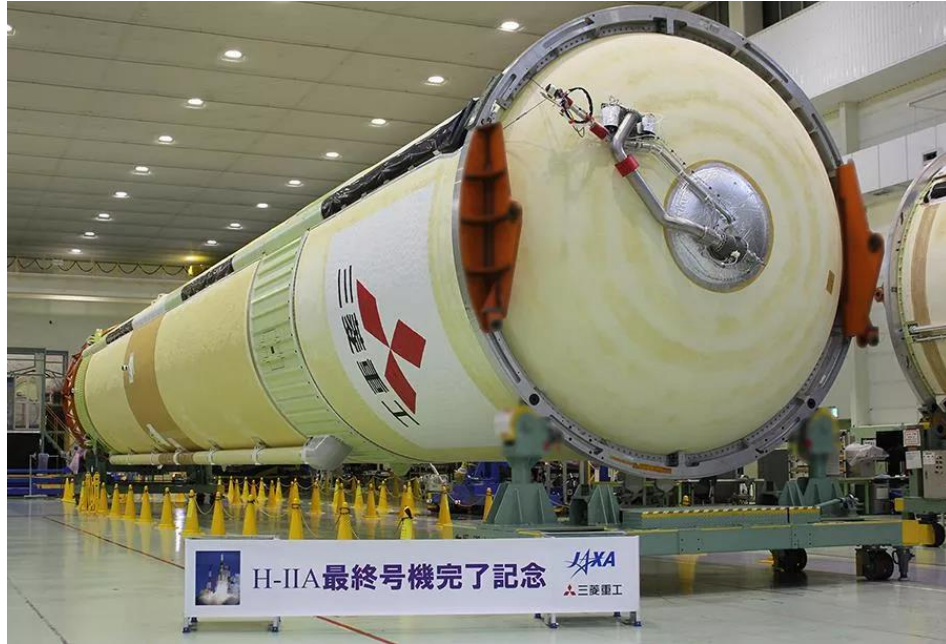
GOSAT-GW



- GOSAT -- The world-first GHG observation satellite, with international community efforts incl. US and Europe
- Funded by MOEJ and MEXT, operated by NIES and JAXA
- JAXA is responsible for the launch, L0 and L1; NIES for L2 (and higher research products such as fluxes)

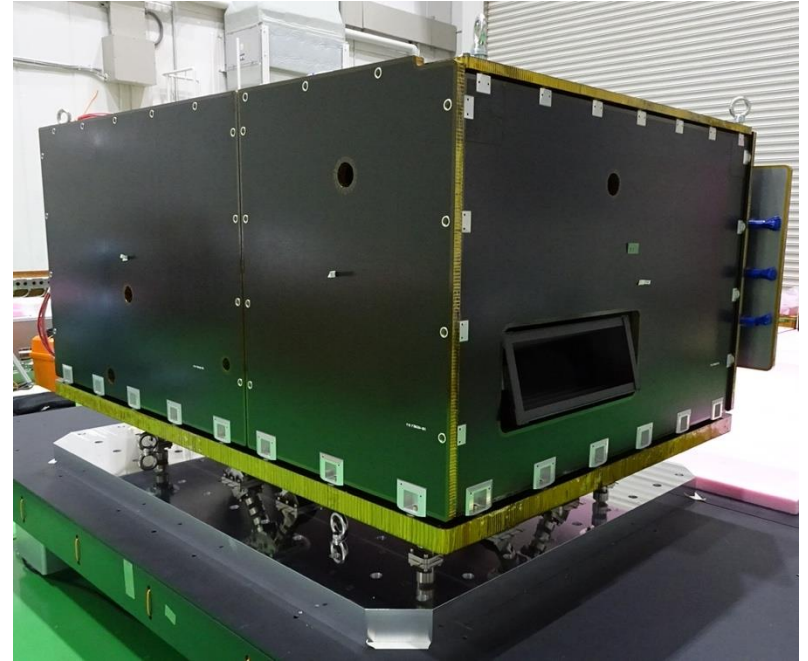
Rocket is ready, sensor in testing

H-IIA rocket No.50 (last!) completed



<https://www.mhi.com/jp/news/24092502.html>

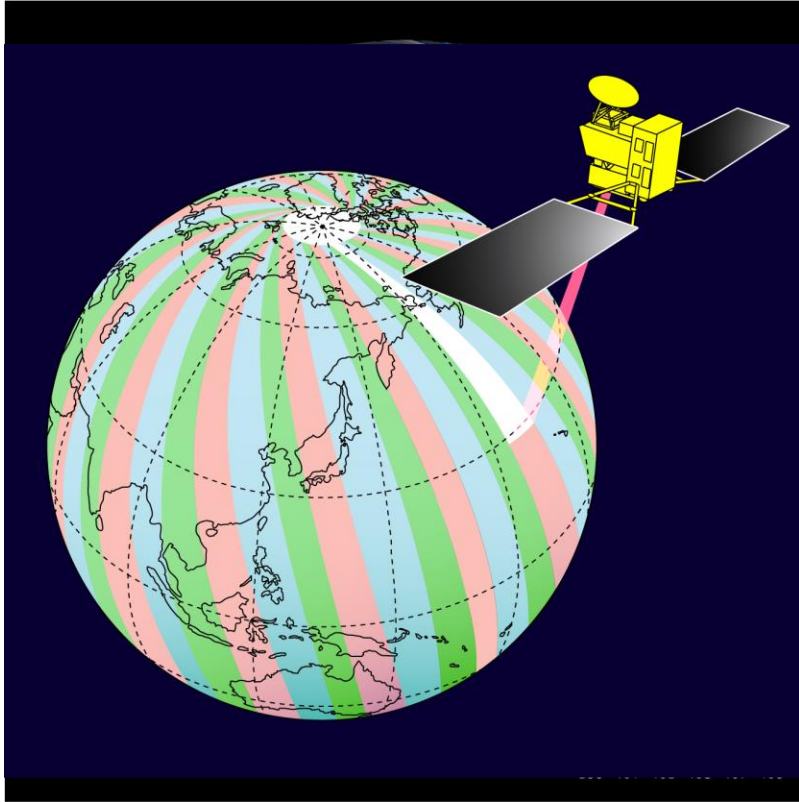
Pre-Flight Model



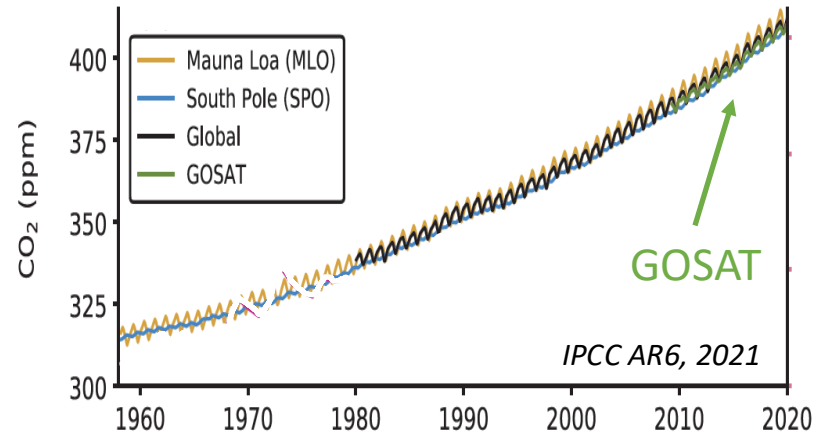
©JAXA

- Pre-flight model ground test is in progress
- Planned to be launched by the end of Japan's fiscal year 2024

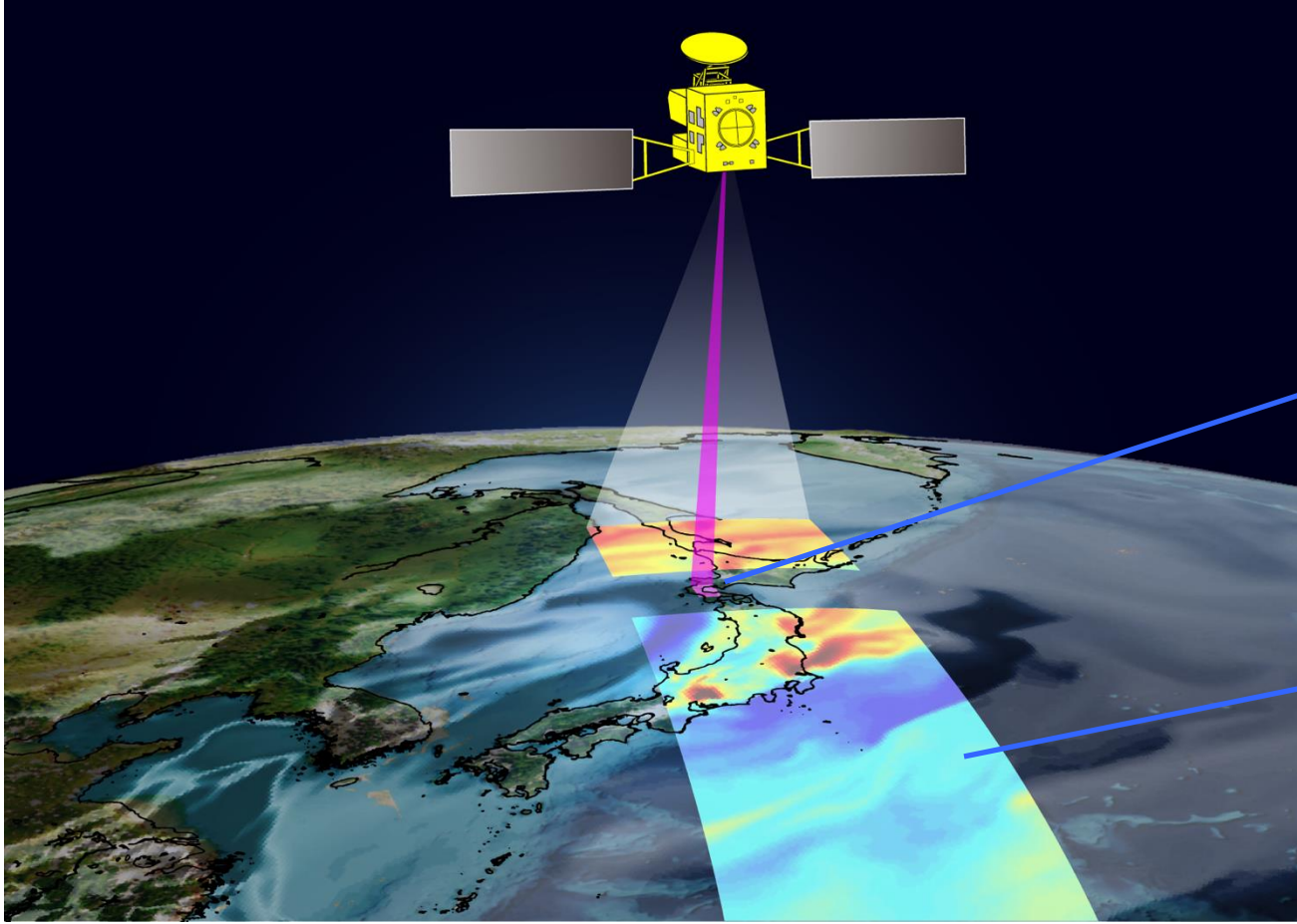
3-day dense global coverage of CO₂, CH₄ & NO₂ observations



- Monitoring of whole atmosphere global-mean concentrations of GHGs – CO₂ and CH₄
- Verification of country-level anthropogenic emissions inventory of GHGs – CO₂ and CH₄
- Detection of GHGs emissions from large emission sources, such as megacities, power plants, and permafrost



Focus-mode makes high spatial resolution measurements



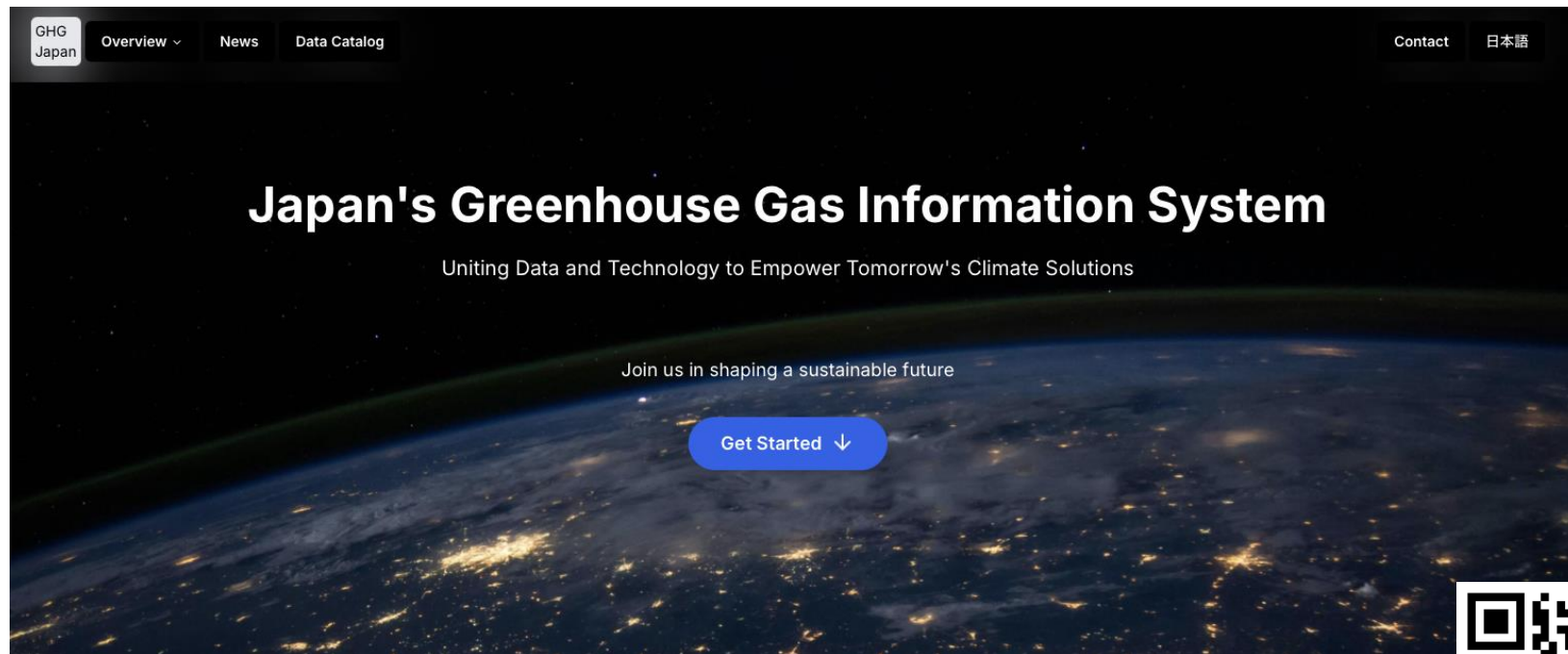
Focus Mode

- Target area $\approx 90 \text{ km} \times 90 \text{ km}$
- Footprint $\approx 1 - 3 \text{ km}$
- Push-broom, AT/CT Pointing Func.
- Optional, upon request

Wide Mode

- Wide swath $\approx 911 \text{ km}$
- Footprint $\approx 10 \text{ km}$
- Push-broom, No AT/CT Pointing
- Standard operation

Planning of the Japan GHG Center



- “One stop” information hub/platform for scientists, policymakers, business leaders, and more
- Unified, strong messaging on urgent needs of climate change mitigation
- Global Stocktake, WMO’s GGGW, UNEP’s IMEO, and business applications



Active research – Basis of GHG Center

ground



Cape Ochi-ishi



Hateruma Island



Mt. Fuji

ship



TRANS FUTURE 5

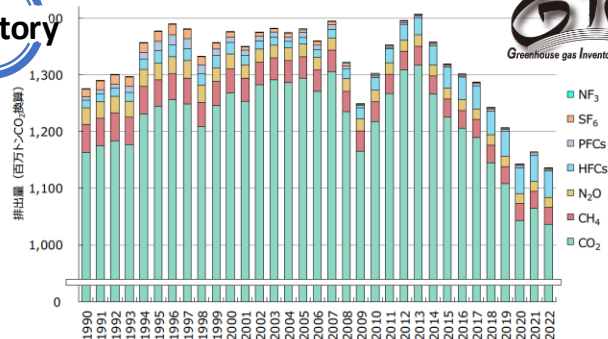


NEW CENTRY 2



FUJITRANS WORLD

inventory

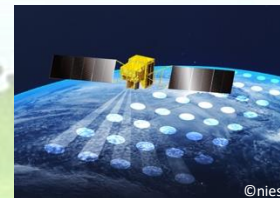


GIU
Greenhouse gas Inventory Office of JICA

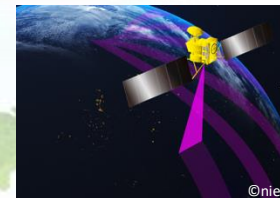
satellite



GOSAT



GOSAT-2

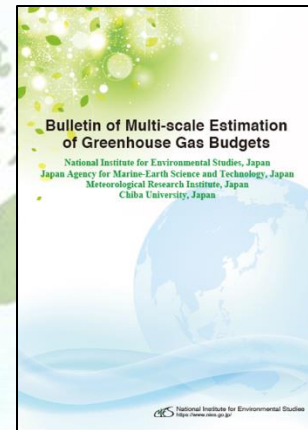
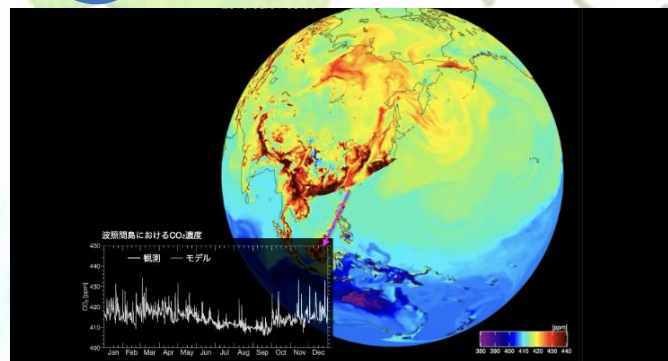


GOSAT-GW

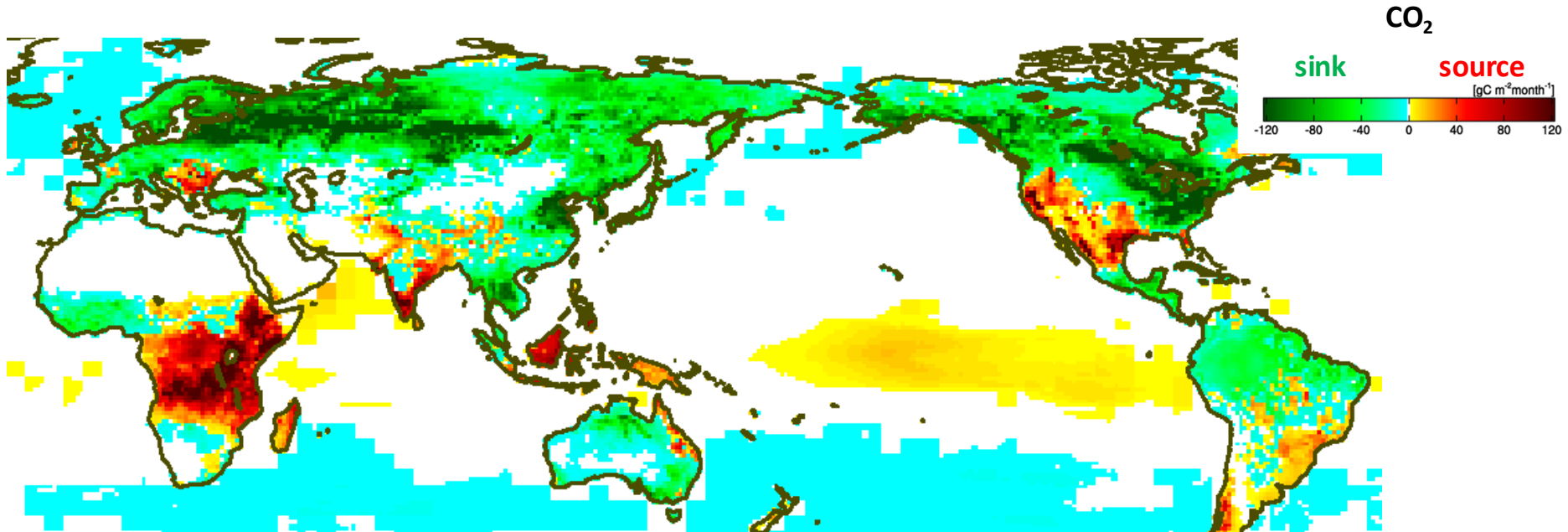
model



aircraft



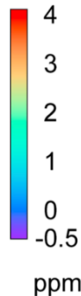
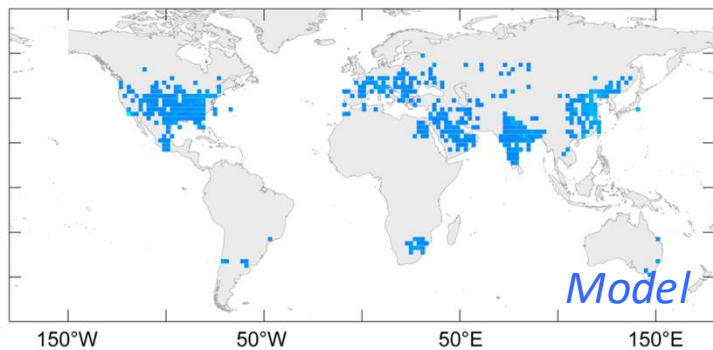
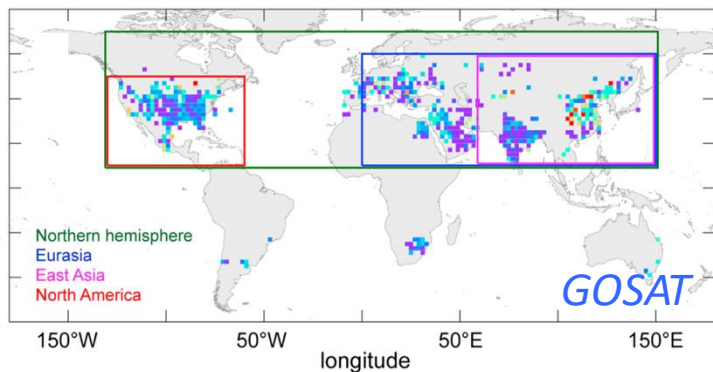
High-resolution simulations of global carbon cycle



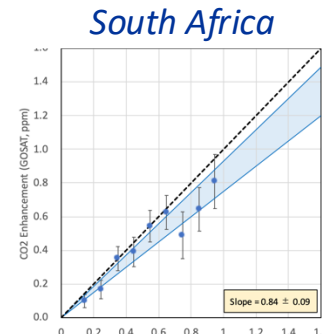
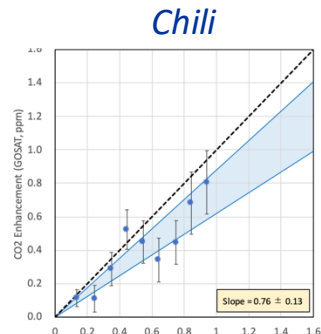
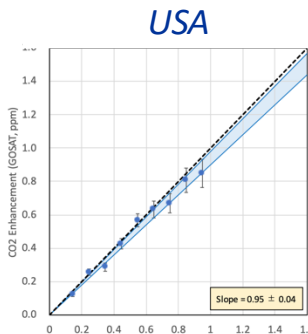
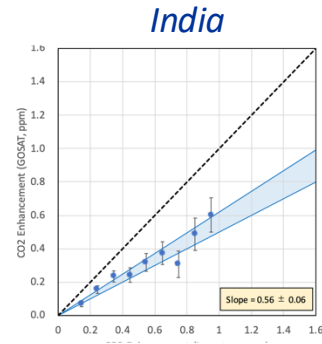
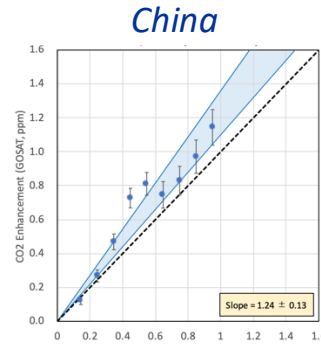
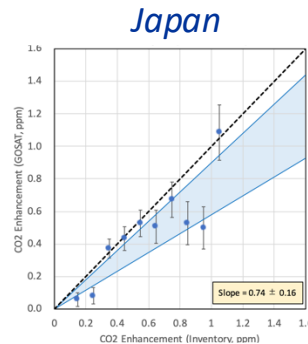
Niwa et al., Prog. Earth Planet. Sci., 2022

- Inverse analysis of the sources and sinks of CO₂ on the global scale
- New, high-resolution (1x1 deg) estimates reveal detailed features of the emissions in North America and the uptake in western Siberia
- Further work will contribute to the operational monitoring of CO₂ sources and sinks on the globe

Verification of country-level emissions of CO₂, 2009-2024



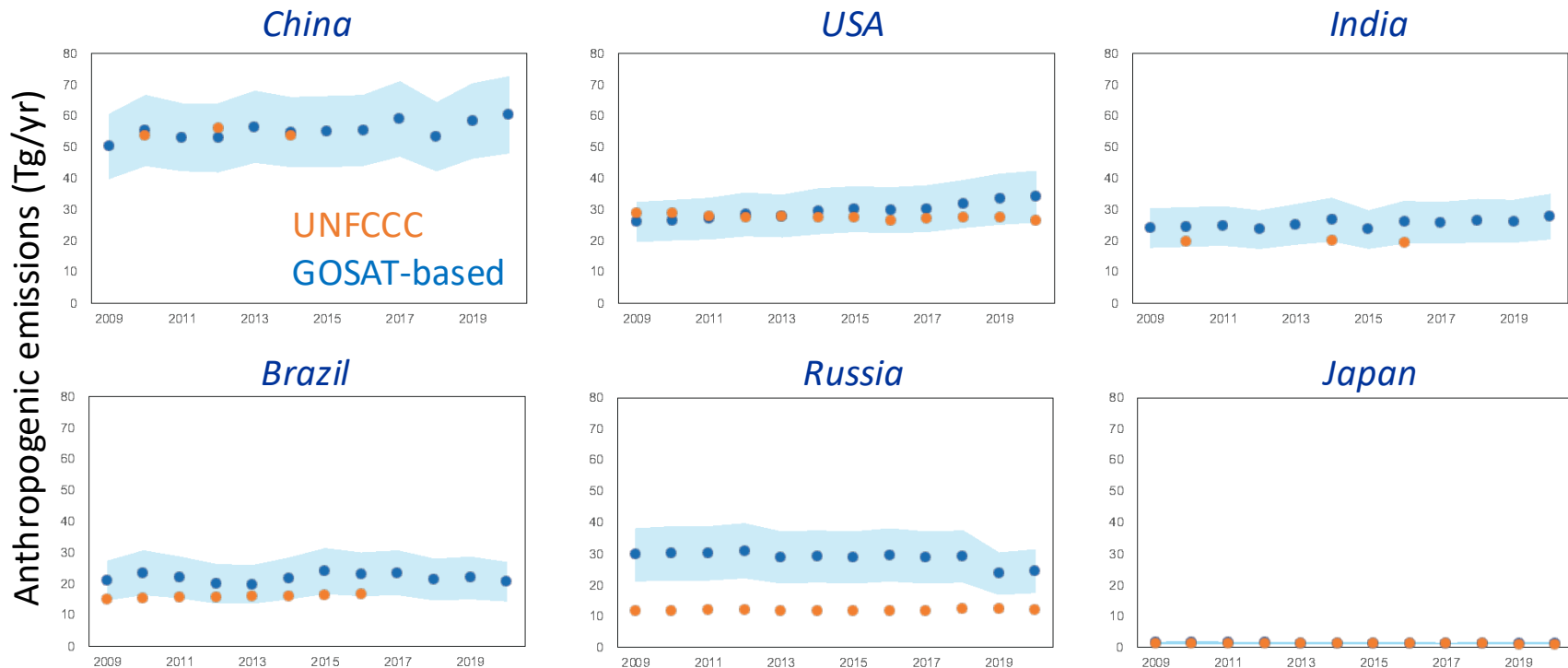
GOSAT (ppm)



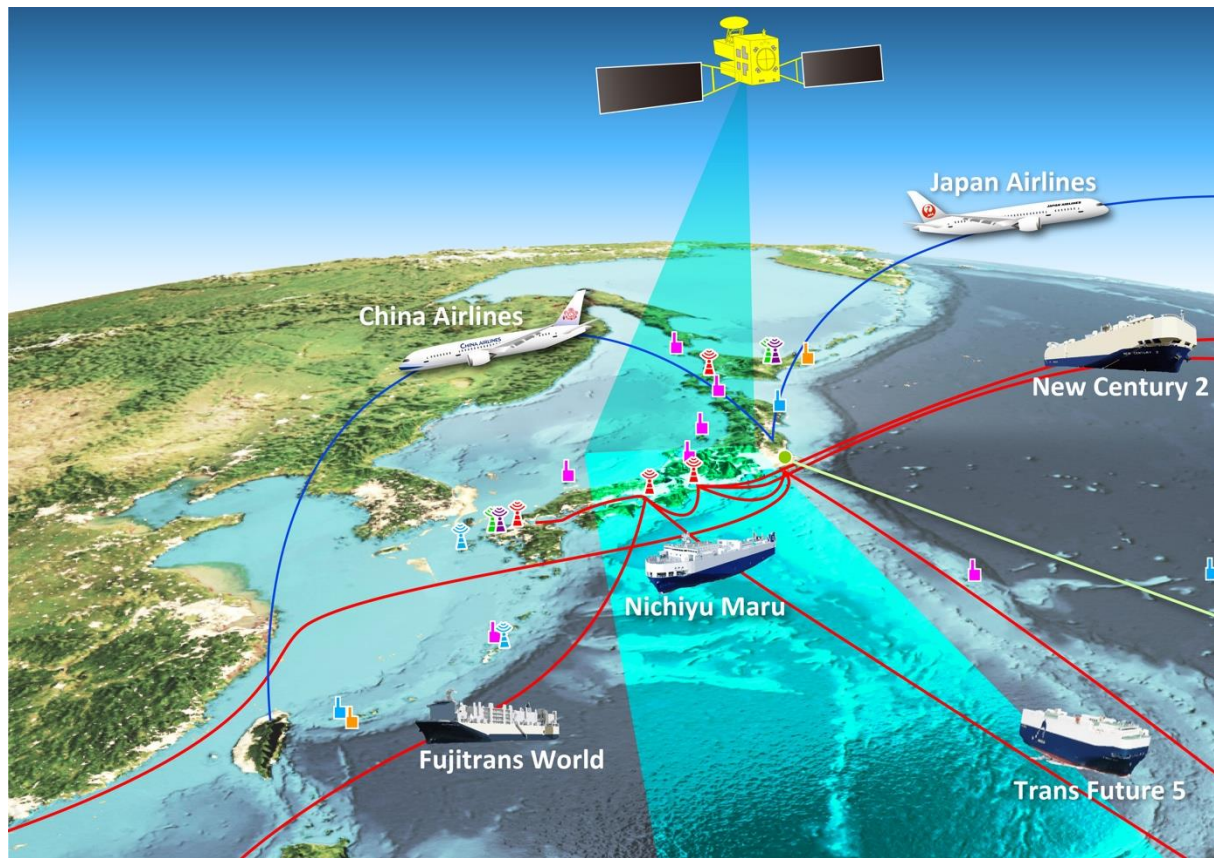
Model (ppm)

- GOSAT-derived top-down estimates help us verify or evaluate bottom-up emission inventories
- Country-level assessment is still challenging, but advancing

Verification of country-level emissions of CH₄, 2009-2020



- We will strive to update the verifications/evaluations of the country-level CO₂ and CH₄ emissions
- New research for more years and more countries/areas



<https://gosat-gw.nies.go.jp/en/>

- With the Japan GHG Center to come soon, we will advance integrated assessments of GHG emissions/fluxes (i.e. best practices on bottom-up vs. top-down inventory comparisons) **AND** spreading information as “one voice” to help support climate change mitigation policies
- Multi-agencies/institutes’ efforts for “**all-Japan, one-team**” national initiative to better serve for the global society