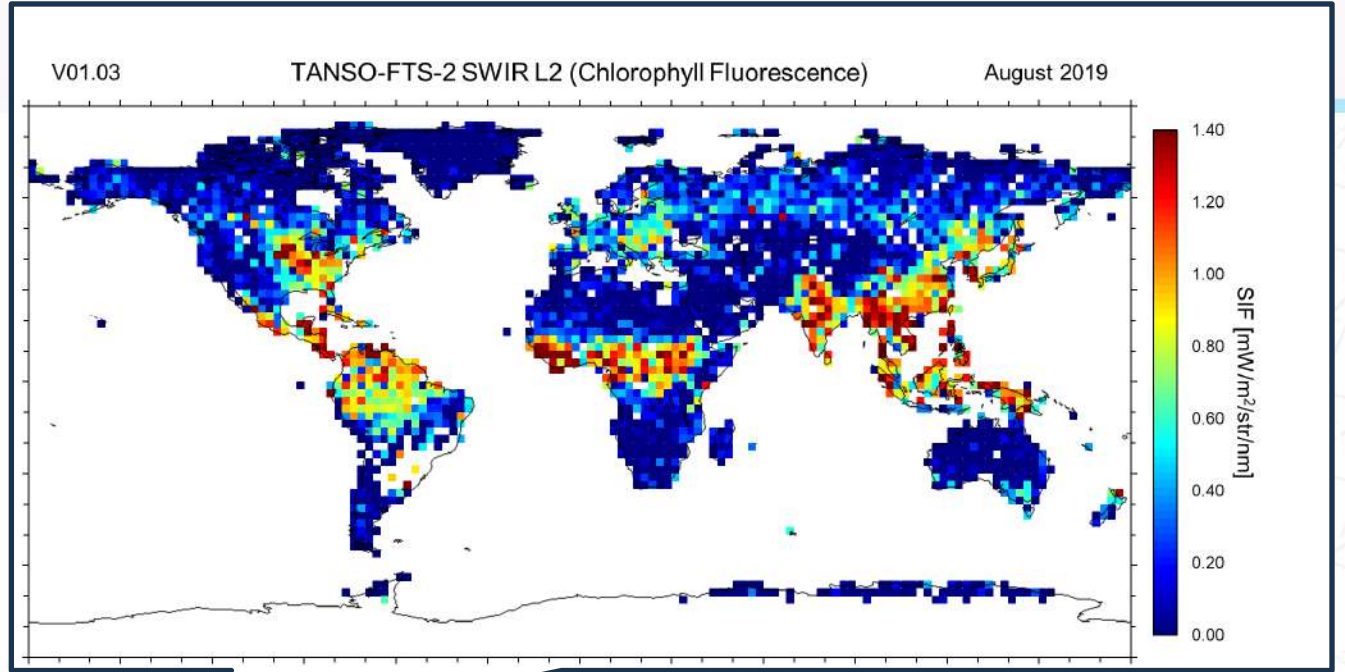


An Overview of Current Studies and Future Plans for SIF Research in the GOSAT Serie

Hibiki Noda, Yukio Yoshida, Makoto Saito,
Hirofumi Ohyama, Tomoki Morozumi, Tsuneo Matsunaga

GOSAT Series

GOSAT (2009-)

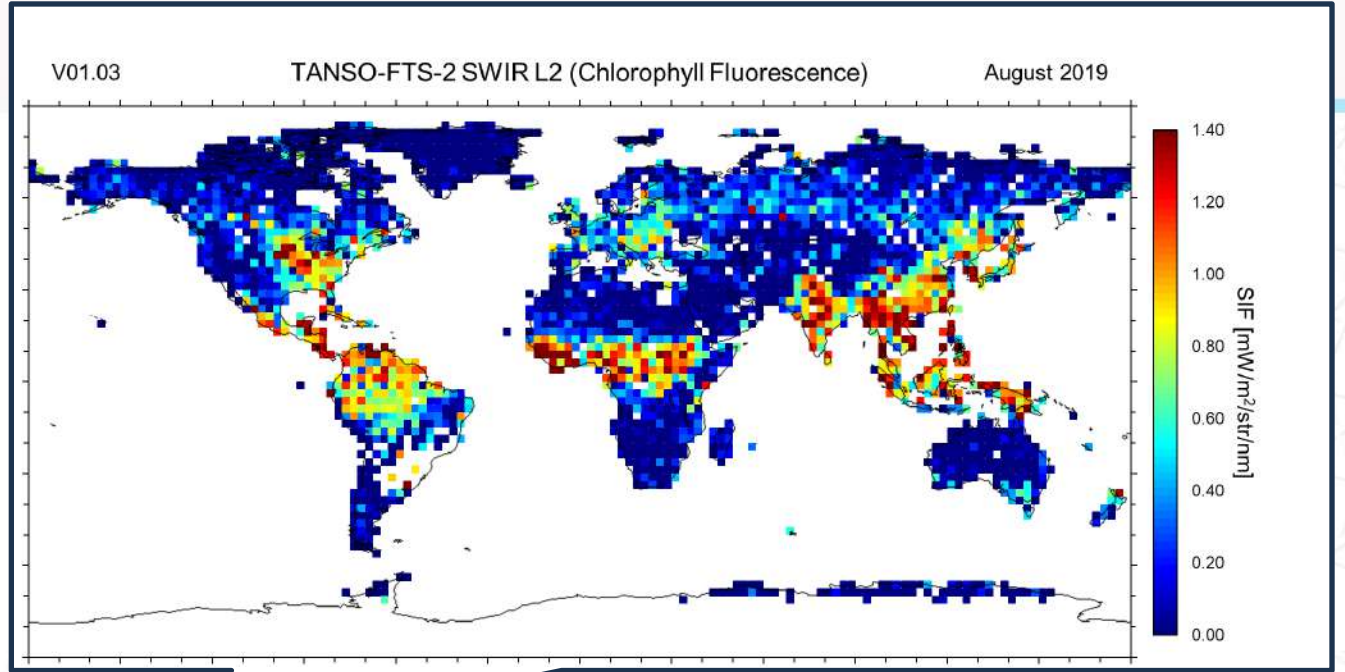


GOSAT-2 (2018-)



GOSAT Series

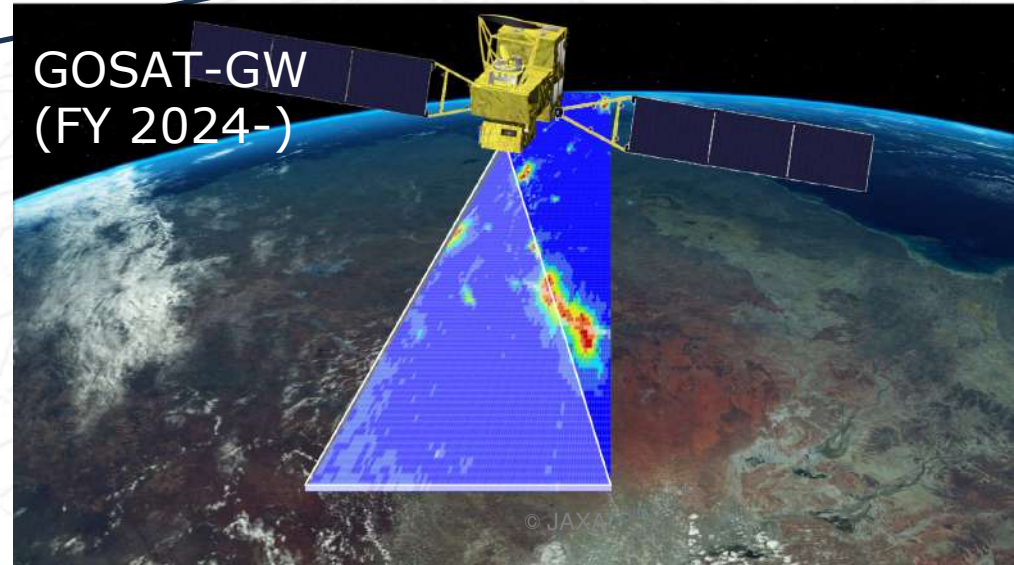
GOSAT (2009-)



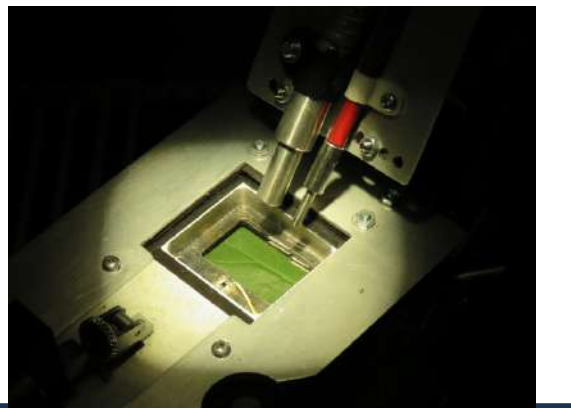
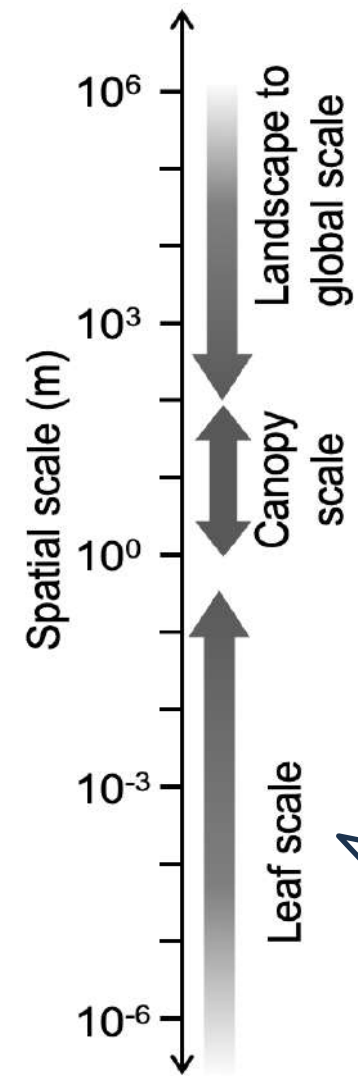
GOSAT-2 (2018-)



GOSAT-GW
(FY 2024-)



SIF studies in GOSAT project



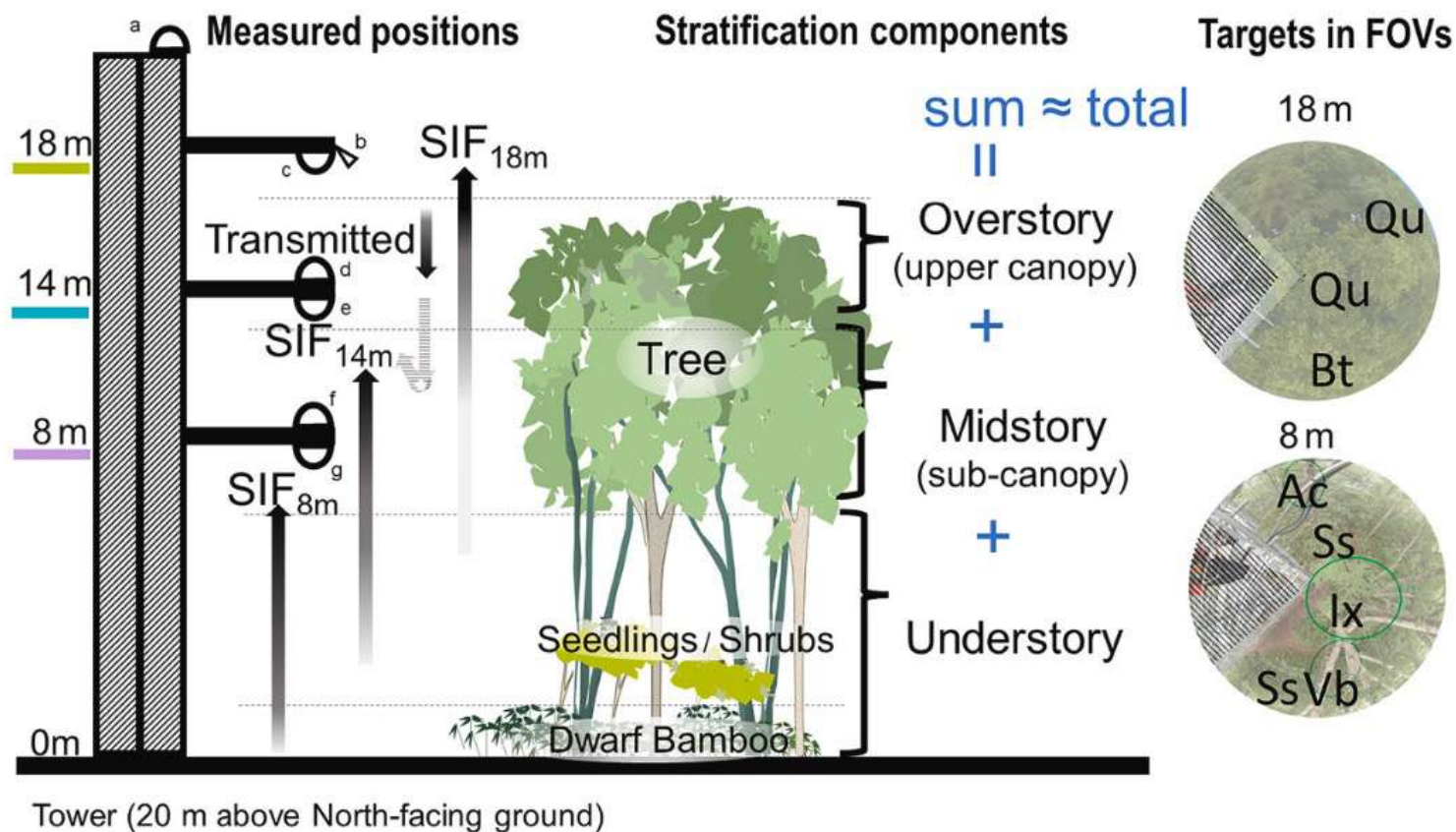
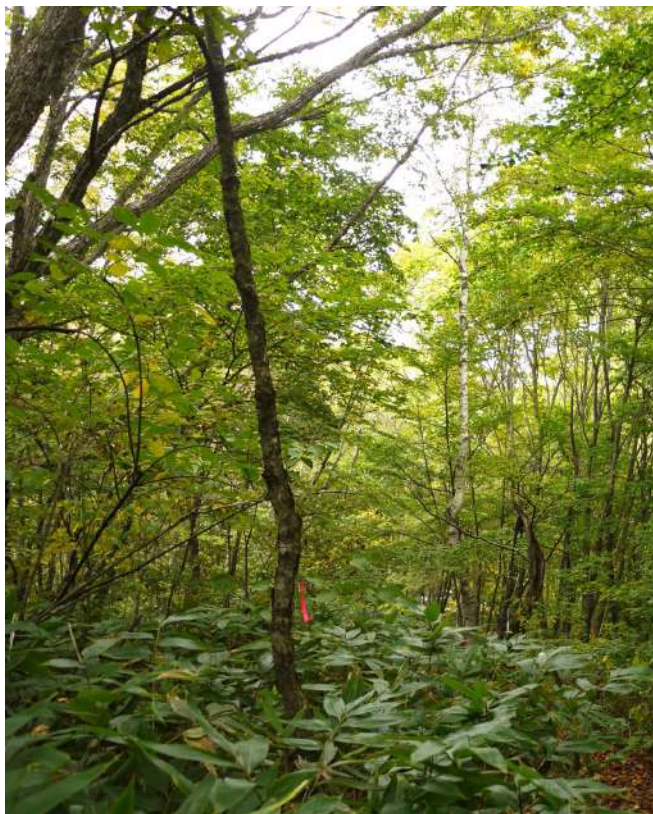
SIF studies in GOSAT project



Dr. Tomoki Morozumi

Canopy structure and SIF in deciduous forest

Deciduous Broadleaf Forest in Takayama, Japan



Morozumi et al. (2023) Remote Sensing of Environment 284, 113340

Contribution of SIF emitted from understory

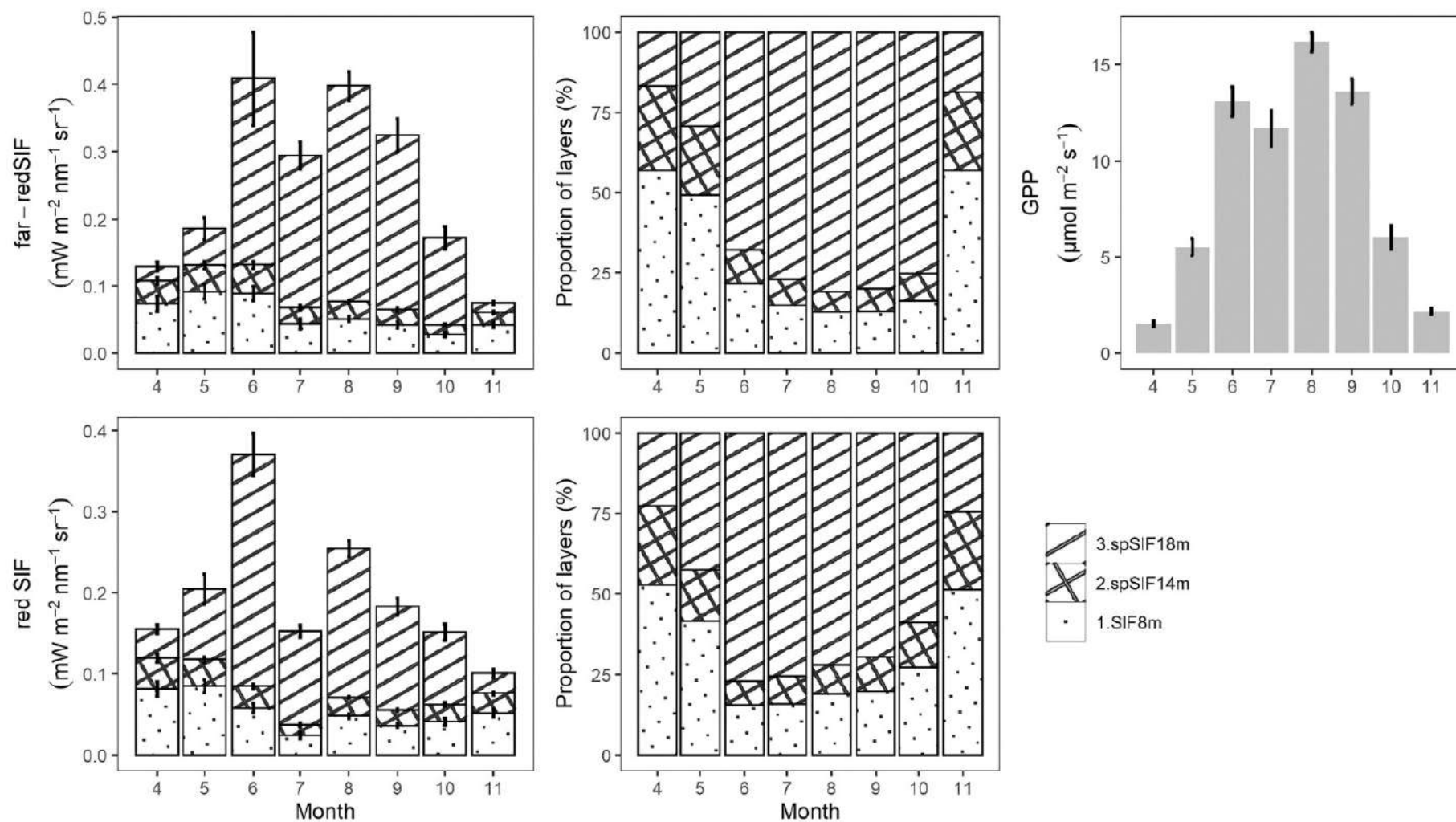
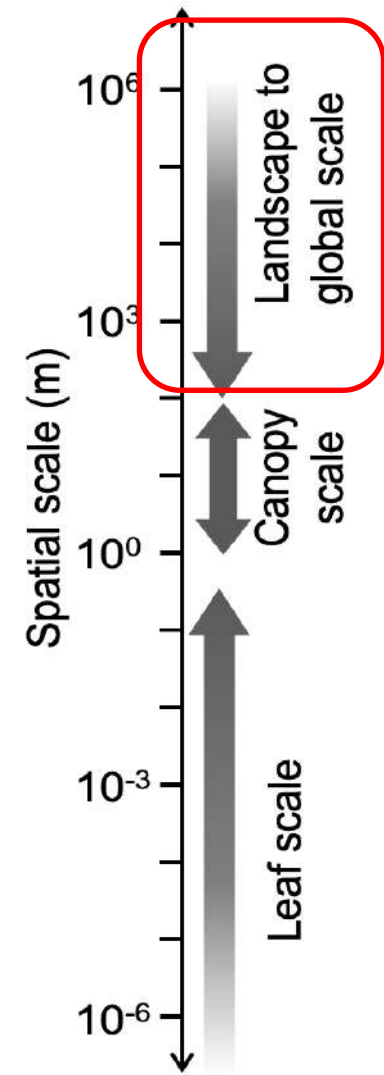
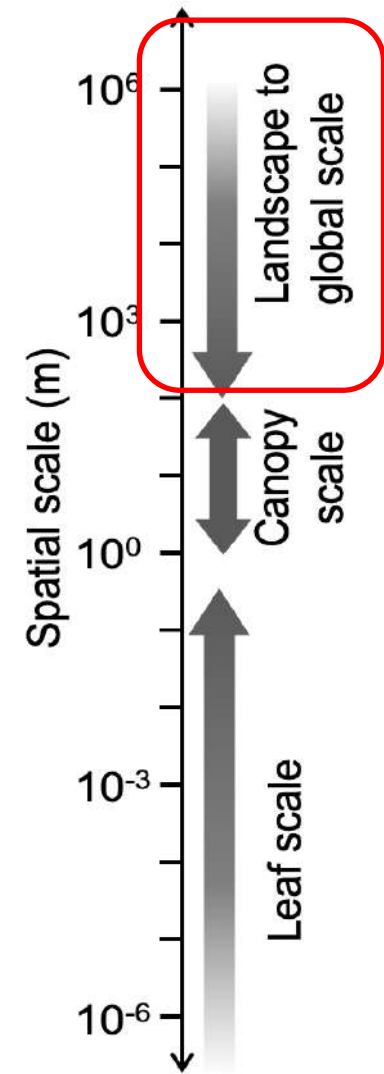


Fig. 7. Monthly mean upwelling far-red and red SIF, where the proportion of layers above the overstory (stripe), midstory (mesh) and understory (dots), and GPP ($\mu\text{mol m}^{-2} \text{s}^{-1}$) from April to November.

SIF studies in GOSAT project



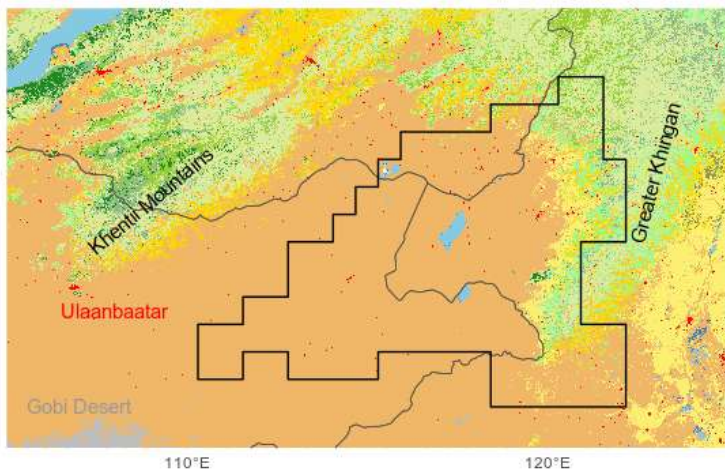
SIF studies in GOSAT project



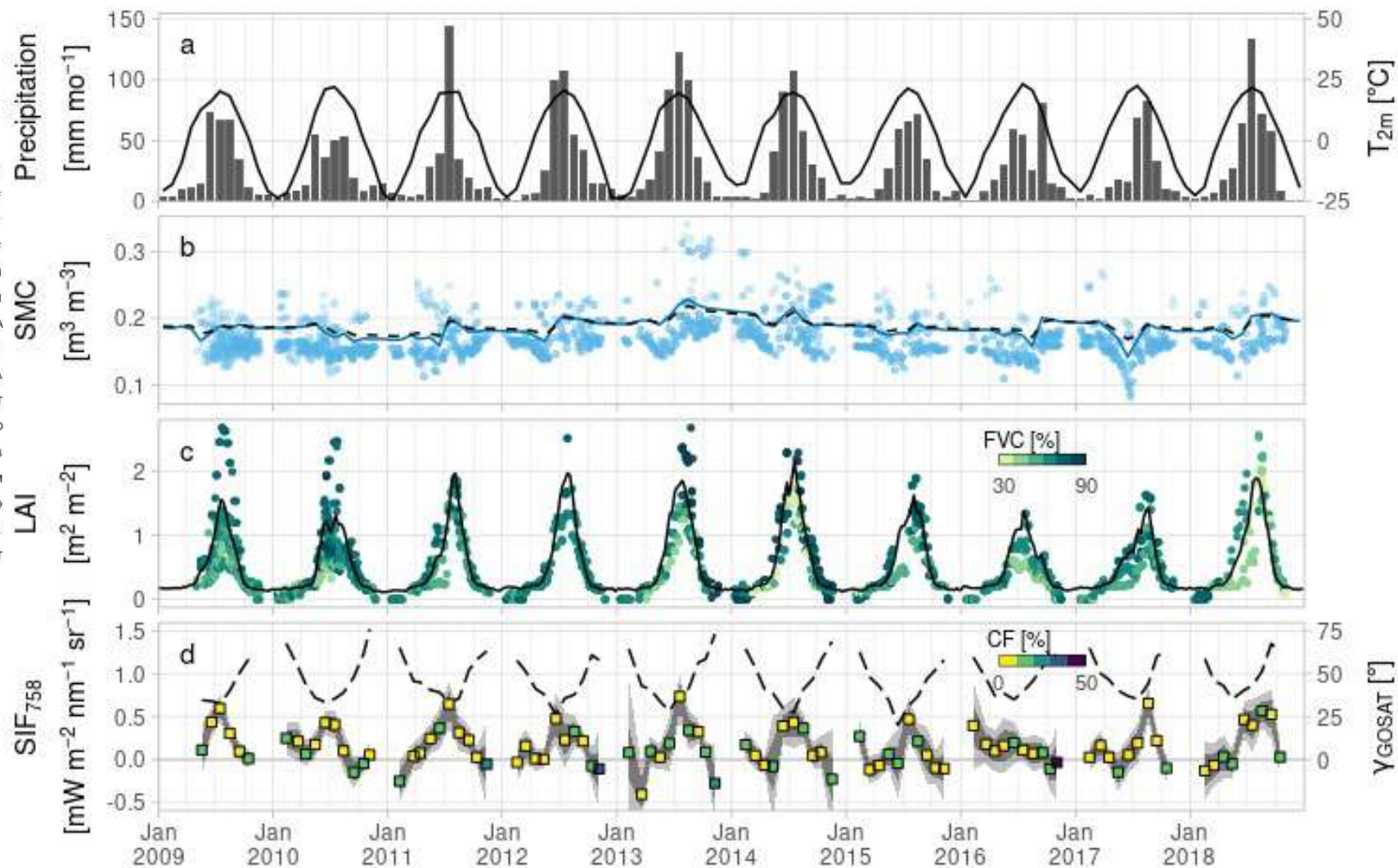
...but we have long-term data from 2009!

GOSAT-SIF in Mongolian Plateau

The Mongolian steppe has been suffering from severe drought for the past decade.



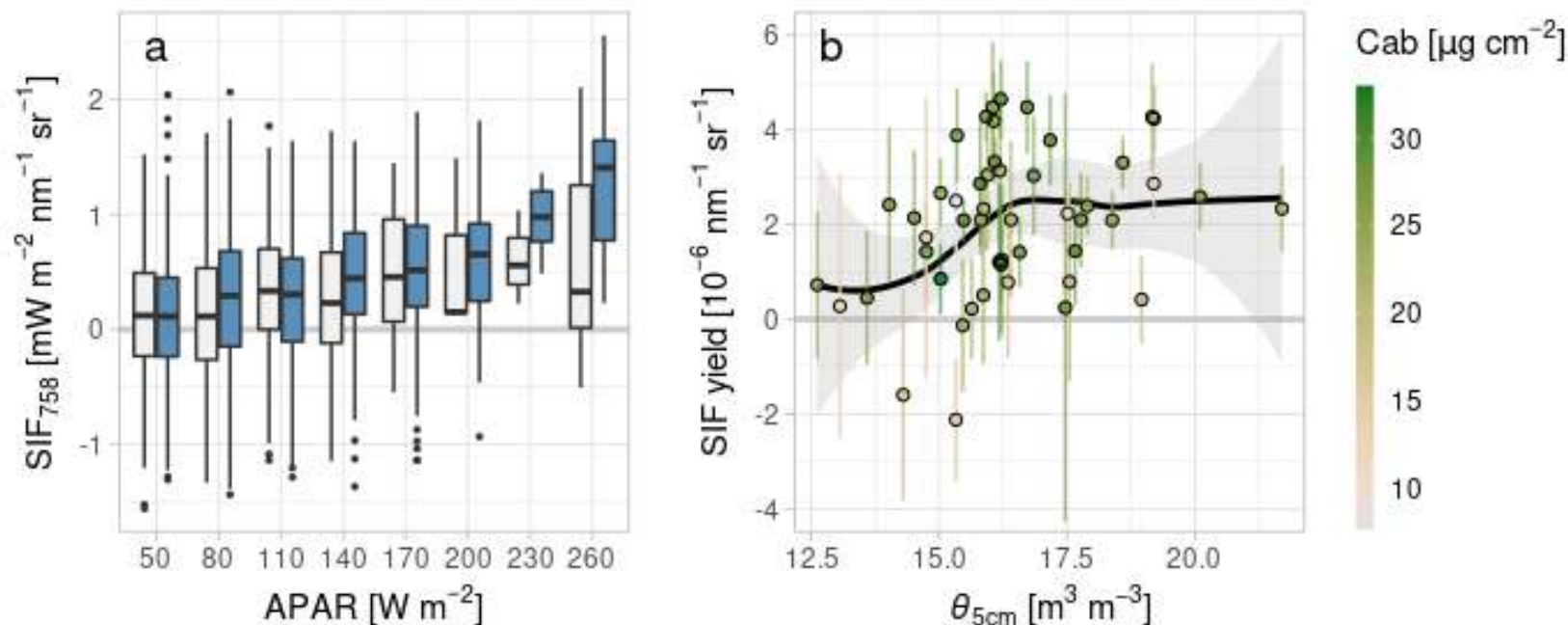
We examined seasonal and annual variations in GOSAT SIF in Mongolian steppe



Kiyono and Noda et al. (2023) JGR Biogeoscience 128, e2022JG007074

Effect of drought on SIF in Mongolian Steppe

Soil water content at 5 cm depth ($\theta_{5\text{cm}}$) vs. SIF

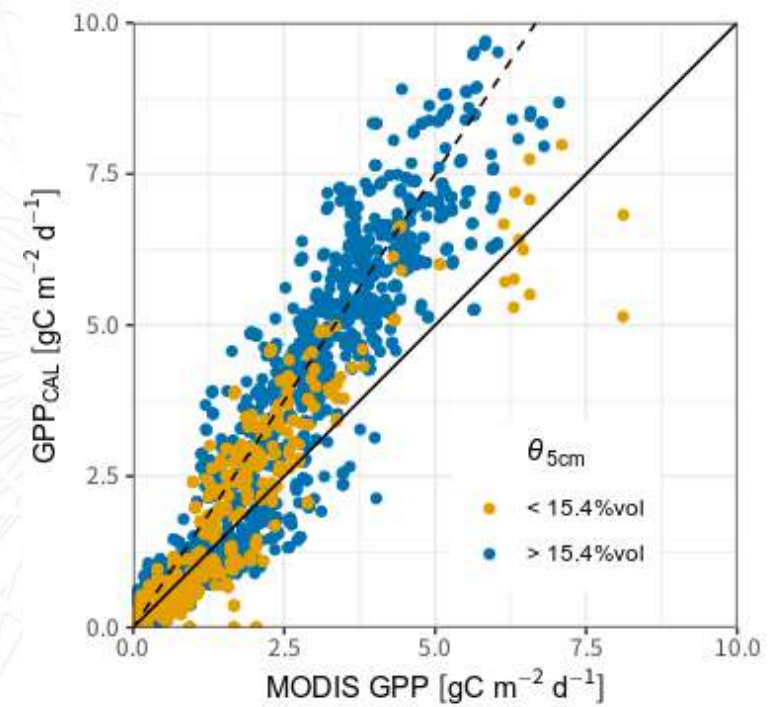
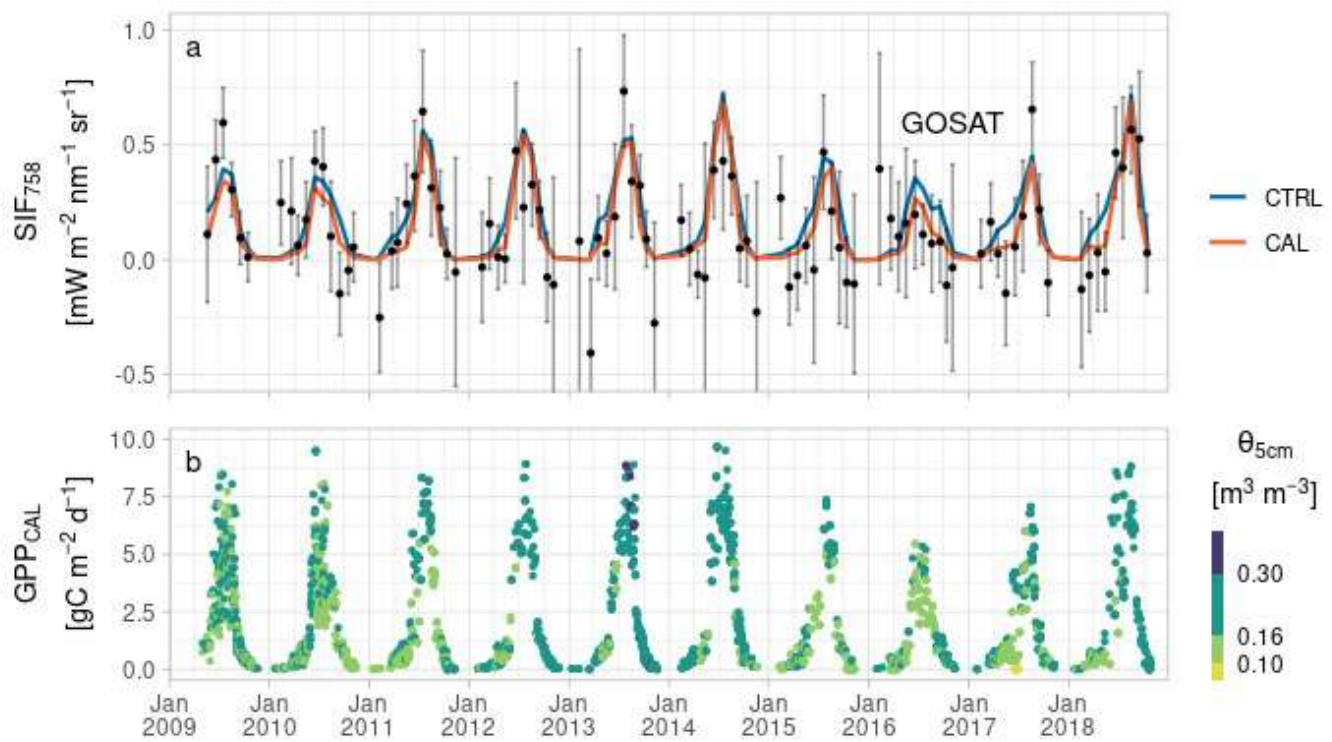
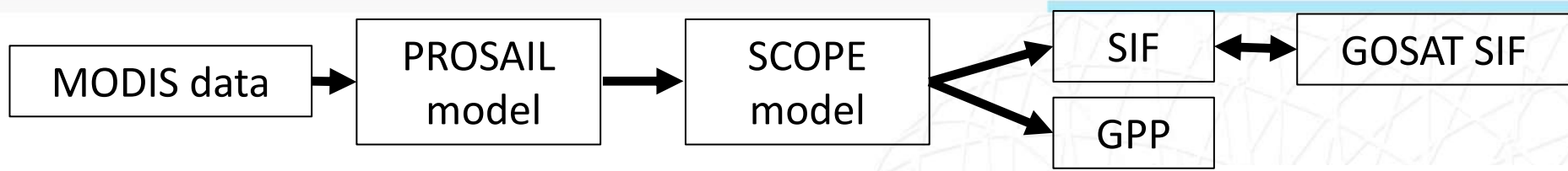


Blue: $\theta_{5\text{cm}} > 15.4\%$ vol
White: $\theta_{5\text{cm}} < 15.4\%$ vol

In Mongolian steppe, SIF is a good indicator of soil drought.

Kiyono and Noda et al. (2023) JGR Biogeoscience 128, e2022JG007074

SIF and GPP estimation by SCOPE model



Madani et al. (2014) have shown that MODIS GPP is about 2/3 of eddy covariance data of grassland in Northern America

Kiyono and Noda et al. (2023) JGR Biogeoscience 128, e2022JG007074

GOSAT-GW

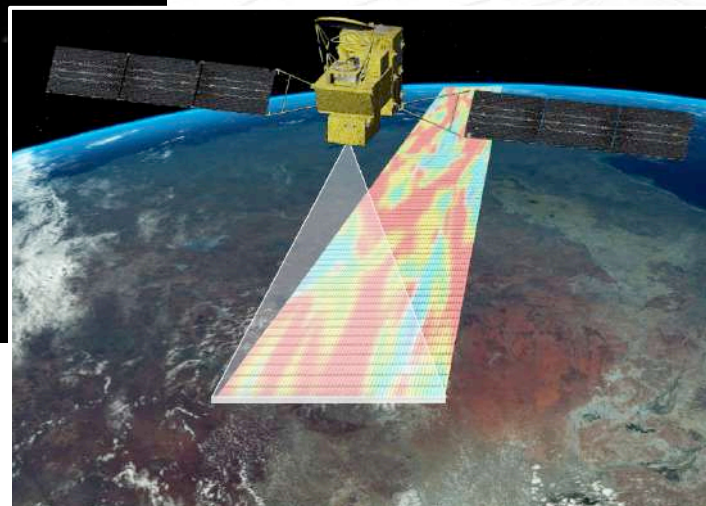
Global Observing SATellite for Greenhouse gases and Water cycle

AMSR-3
(Advanced Microwave Scanning Radiometer)

---> Water cycle

TANSO-3

---> GHGs and SIF

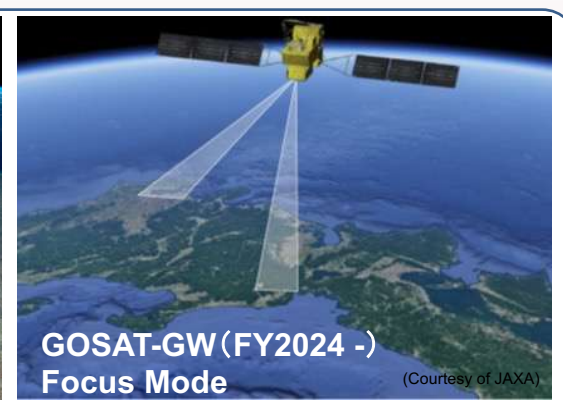
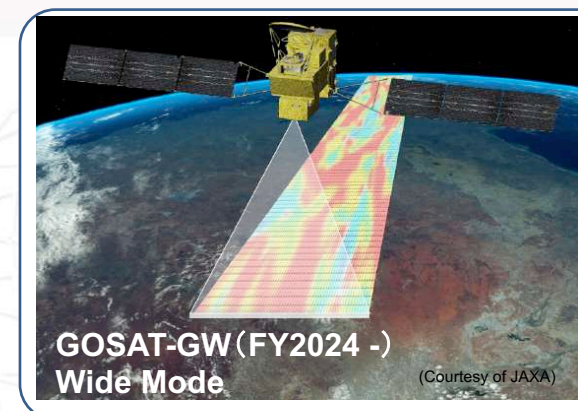


Wide-mode



Focus-mode

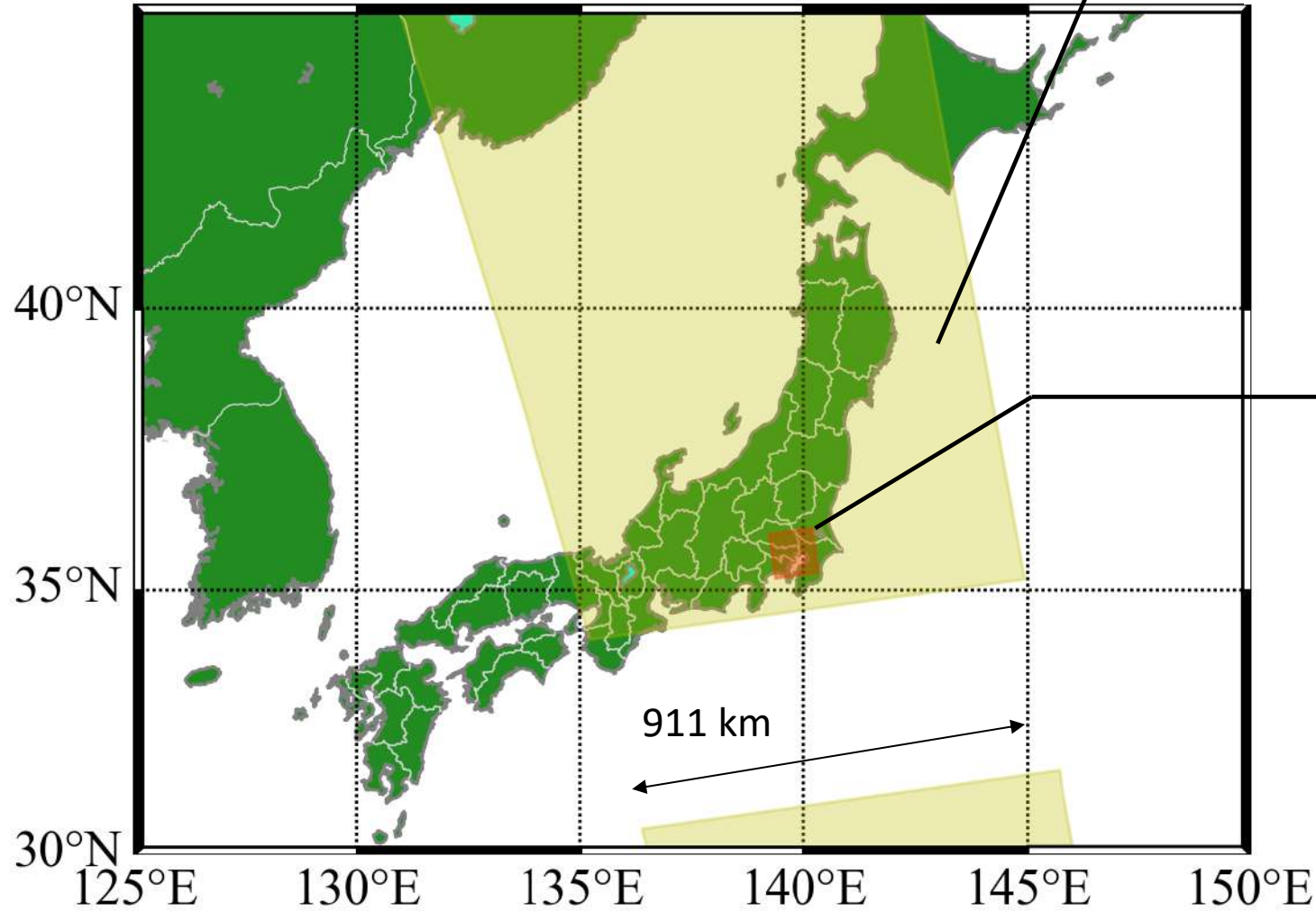
Specifications of GOSAT, GOSAT-2, and GOSAT-GW



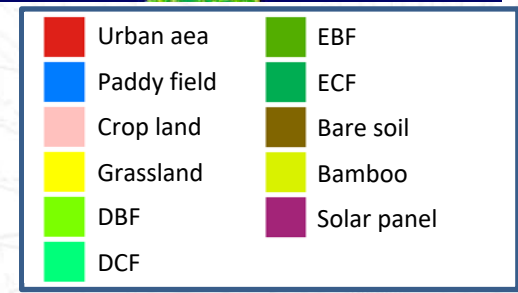
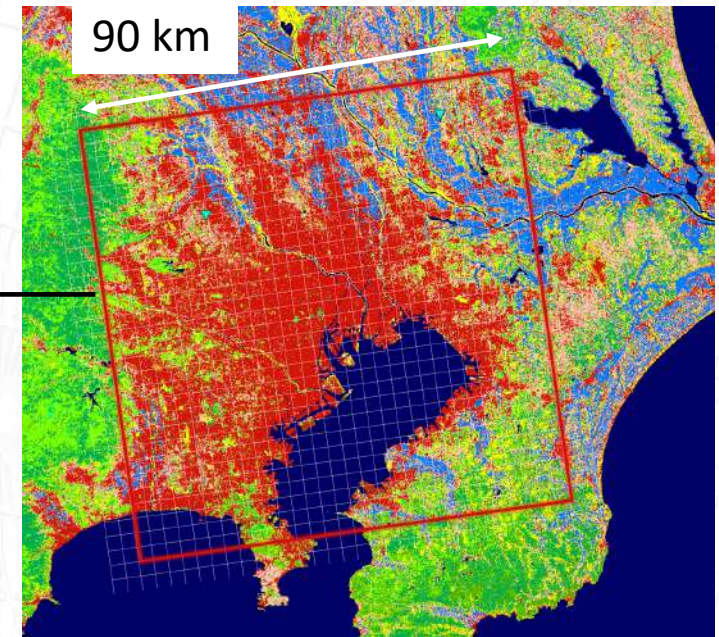
	GOSAT	GOSAT-2	GOSAT-GW
Launch / lifetime	2009 / 5 years	2018 / 5 years	FY2024 / 7 years
Satellite mass / power	1.75 t / 3770 W	1.8 t / 5000 W	2.9 t / 5200 W
Orbit	666 km, 3 days, 13:00, descending	613 km, 6 days, 13:00, descending	666 km, 3 days, 13:30, ascending
Spectrometer	FTS	FTS-2	TANSO-3 (Grating)
Major targets	CO ₂ , CH ₄	CO ₂ , CH ₄ , CO	CO ₂ , CH ₄ , NO ₂
Spectral bands	0.7 / 1.6 / 2 μm + TIR	0.7 / 1.6 / 2 μm + TIR	0.45 / 0.7 / 1.6 μm
Spectral Resolution (Sampling interval)	0.2 cm ⁻¹ , (≈ 0.01 nm @ 0.7 μm, ≈ 0.05 nm @ 1.6 μm)		< 0.5 nm @ 0.45 μm, <0.05 nm @ 0.7 μm, < 0.2 nm @ 1.6 μm
Swath	Discrete, 1 – 9 points	Discrete, 5 points	Selectable, 911 km (Wide Mode) or 90 km (Focus Mode)
Footprint size, nadir	10.5 km	9.7 km	Selectable, 10 km (Wide Mode) or 1 – 3 km (Focus Mode)
Pointing	±20 / ±35 deg (AT/CT)	±40 / ±35 deg (AT/CT)	± 40 / ± 34.4 deg (AT/CT) for Focus Mode
Other instruments	CAI (Cloud and Aerosol Imager)	CAI-2 (Cloud and Aerosol Imager 2)	AMSR3 (Advanced Microwave Scanning Radiometer 3)

Observation plan of GOSAT-GW

Observation area of Wide Mode



Fine Mode coverage and land cover types



GOSAT-GW would be helpful to deepen our understanding of the vegetation response to climate change.

Thank you.

If you are interested in GOSAT series, check out our website

Information of GOSAT Series

GOSAT <https://www.gosat.nies.go.jp/en/>

GOSAT-2 <https://www.gosat-2.nies.go.jp/>

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

Satellite Observation Center

<https://www.nies.go.jp/soc/en/>

Data Archive

GOSAT

https://data2.gosat.nies.go.jp/index_en.html

GOSAT-2 <https://prdct.gosat-2.nies.go.jp/>