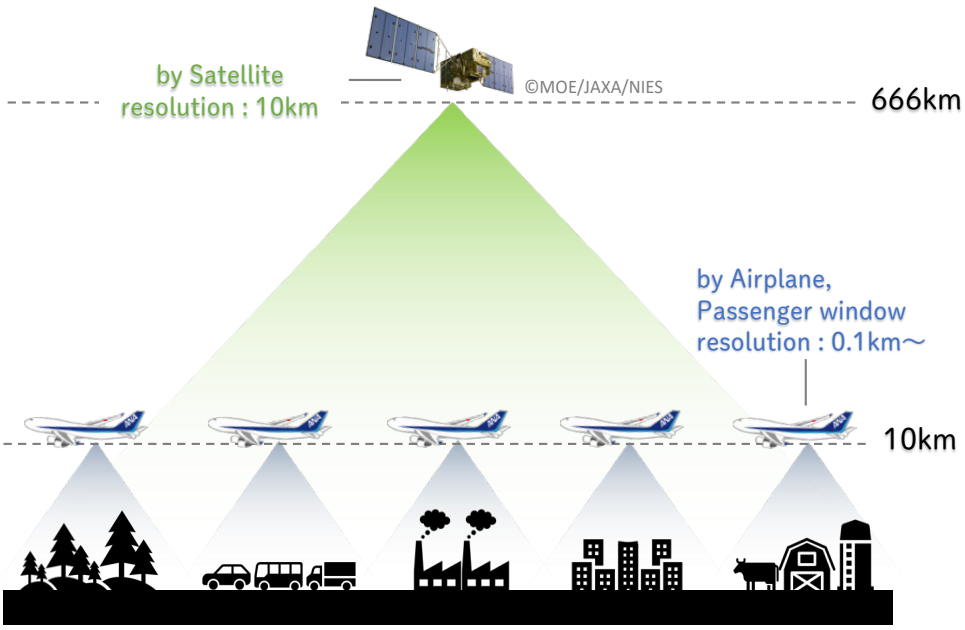
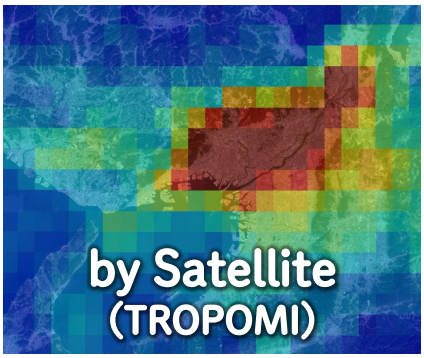
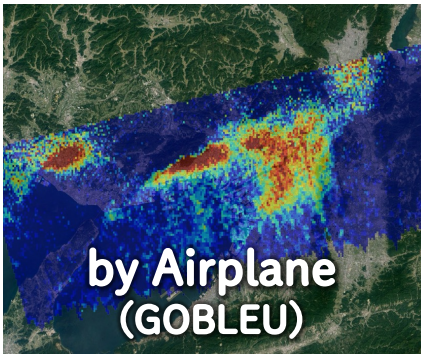
Greenhouse gas Observations of Biospheric and Local Emissions from the Upper sky

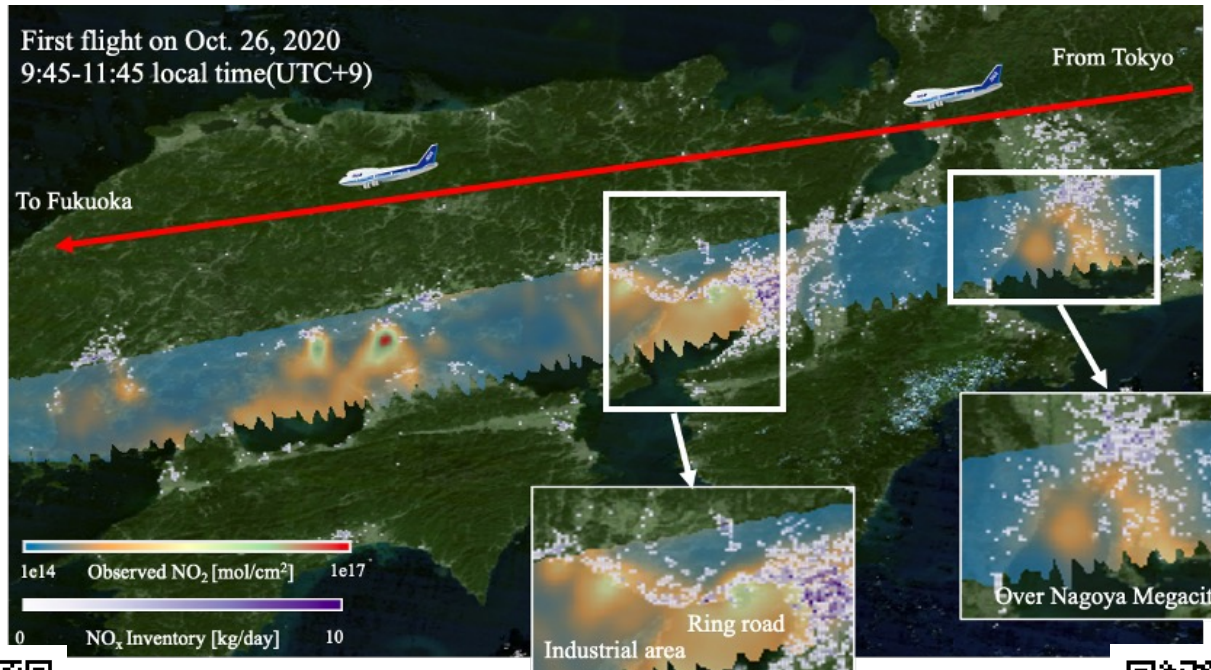
GOBLEU project is a collaboration between JAXA and All Nippon Airways (ANA) to observe greenhouse gases from aircraft.
Currently, we are conducting observation experiments from aircrafts to improve the accuracy of observation data.
While satellite observations of greenhouse gases have a resolution of about 10 kilometers, aircraft observations have a much higher resolution of about 0.1 kilometers. Consequently, aircraft observations of greenhouse gases provide more detailed information about their distribution and concentration than satellites observations.







Observation Data: From Tokyo to Fukuoka, ANA flight NH247



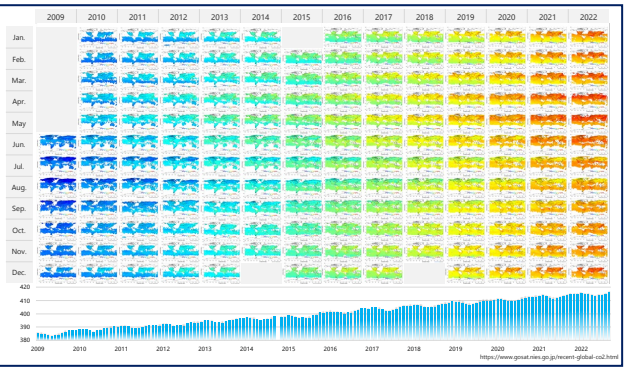
JAXA/EORC GOBLEU

ANA Space Project

Japan Aerospace Exploration Agency (JAXA)

Greenhouse Gases Observing Satellite(GOSAT) is an Earth observation satellite and the world's first satellite dedicated to greenhouse gas monitoring. GOSAT(launched in 2009) and GOSAT-2 (launched in 2018) have been continuously observing atmospheric carbon dioxide and methane for about 15 years.

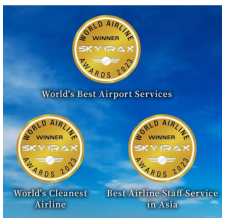
Items	GOSAT	GOSAT-2
Total Mass	1,750kg	1,800kg
Altitude	666km	613km
Measurement Targets	CO_2, CH_4, SIF	CO_2, CH_4, CO, SIF
Footprint size	10.5km	9.7km

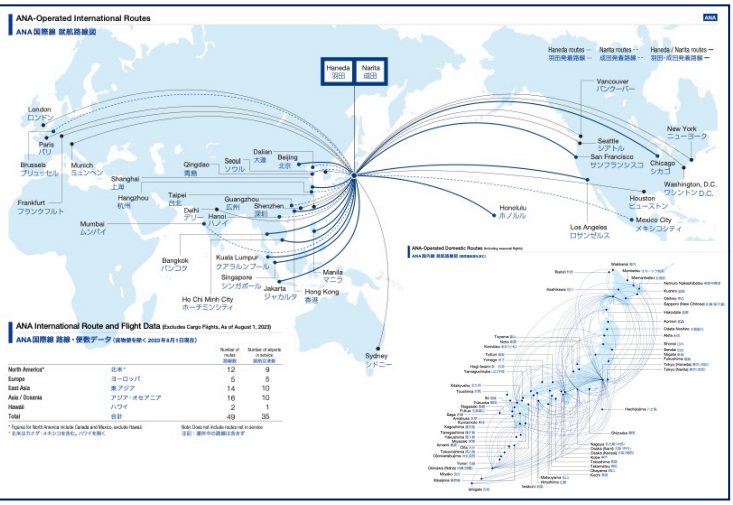


All Nippon Airways (ANA)

ANA A STAR ALLIANCE MEMBER

ANA operates services to both domestic and international destinations and is Japan's largest airline. ANA was founded in 1952 and joined as a member of the Star Alliance in October 1999.
In 2020, in response to JAXA's request for more detailed observations of greenhouse gases, JAXA and ANA launched a joint project called GOBLEU.
This project aims to explore the possibility of greenhouse gases observations and identification for the source of greenhouse gases in specific areas from the top of the troposphere using the passenger aircraft instead of the satellites.

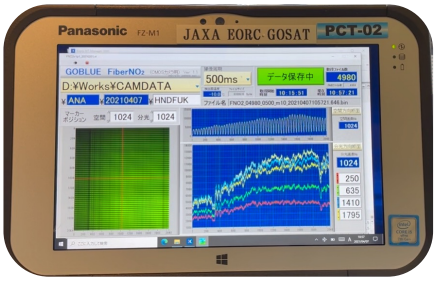


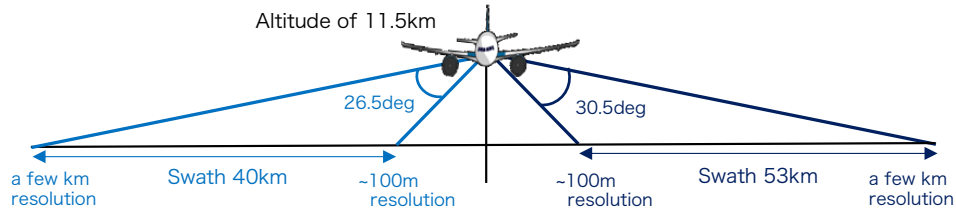


Observation Method

1. Bring the observation equipment on board the aircraft.
2. Install the observation equipment onto the cabin seat.
3. Fasten the observation equipment to the seat with a seatbelt.
4. Observe greenhouse gases in the atmosphere using an imaging spectrometer through the window.

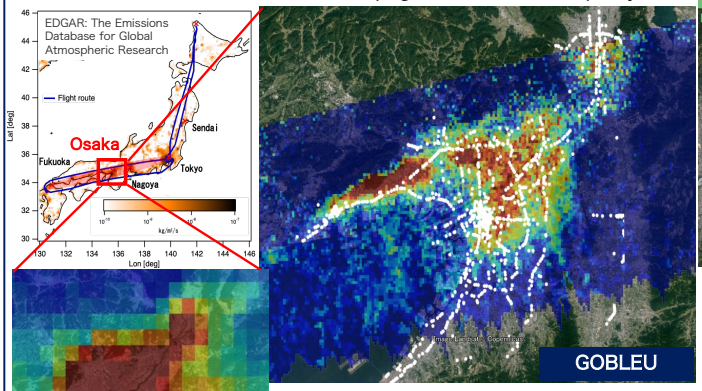
The observed spectral data can be checked in real-time inside the aircraft. It has been confirmed in advance that the observation equipment does not interfere with the aircraft operations.
The full configuration includes four seats, with two persons on each side, for the measurement of CO_2, SIF, and NO_2.





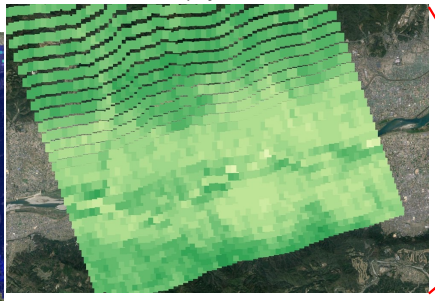
Observation Data

anthropogenic NO_2 emission proxy



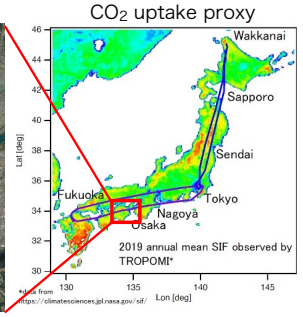
NO_2 2023-5-15
ESA-TROPOMI vs GOBLEU
(Tokyo Haneda - Nagasaki)
Kobe - Osaka
dotted line : Heavy traffic roads

Solar-Induced chlorophyll Fluorescence (SIF)



SIF 2023-5-16
GOBLEU
(Nagasaki - Tokyo)
Yoshino River
Tokushima

CO_2 uptake proxy



Items	GOBLEU
Total Mass	30kg
Altitude	10km ± 2km
Measurement Targets	NO_2, CO_2, CH_4, SIF
Observation width	50～100km
Footprint size	100m～

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