

NASA–Japan Joint Observations for GOSAT-GW Data Validation

—Airborne Observation of Greenhouse Gas Emissions in Metropolitan Tokyo—

Monday, March 2, 2026
Ministry of the Environment, Japan
National Institute for Environmental Studies
Japan Agency for Marine-Earth Science and Technology
National Aeronautics and Space Administration

The Ministry of the Environment of Japan (MOE), the National Institute for Environmental Studies (NIES), the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), and the National Aeronautics and Space Administration (NASA) will conduct a joint international field campaign, the Tokyo-Field Campaign (TOKYO-FC), to validate data from the new Global Observing SATellite for Greenhouse gases and Water cycle “Ibuki-GW” (GOSAT-GW), launched on June 29, 2025. The campaign will observe greenhouse gas emission sources in Japan both from the sky and from the ground. During TOKYO-FC, two research aircraft—one from the United States and one from Japan—equipped with observational instruments will be based at Mt. Fuji Shizuoka Airport. The teams will conduct coordinated flights over major emission sources in Japan, including large metropolitan areas. The observational data obtained during TOKYO-FC, together with ground-based observations collected across Japan, will be used to evaluate the accuracy of the GOSAT-GW satellite data.

1. Background and Objectives of the Campaign

The Ministry of the Environment of Japan (MOE), in cooperation with the National Institute for Environmental Studies (NIES) and the Japan Aerospace Exploration Agency (JAXA), has been observing atmospheric greenhouse gases by utilizing the Greenhouse Gases Observing Satellite (GOSAT) series. The aim has been to advance climate change science and contribute to climate change policies and evaluations. The third satellite in the GOSAT series, the Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW, “Ibuki-GW”), was successfully launched at 1:33 a.m. on June 29, 2025 (JST). The satellite carries the “Total Anthropogenic and Natural Emissions Mapping SpectrOmeter-3 (TANSO-3)”, which observes the major greenhouse gases—carbon dioxide (CO₂) and methane (CH₄)—as well as nitrogen dioxide (NO₂), a key atmospheric air pollutant. The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) is jointly conducting research and development with NIES under the project titled “Development of retrieval algorithms, construction of data processing systems, establishment of product validation frameworks, and studies on data utilization for NO₂ concentration observations using the Global Observing SATellite for Greenhouse gases and Water cycle”.

For satellite-based observational data to be scientifically useful, it is essential to conduct validation studies that evaluate their accuracy and precision. This requires the use of independent, higher-accuracy data obtained from other observations, such as ground-based and aircraft observations. The Tokyo-Field Campaign (TOKYO-FC) is an international airborne observation campaign conducted under the Implementing Arrangement based on the “Framework Agreement between Japan and the United States of America for Cooperation in the Exploration and Use of Outer Space”. Its purpose is to validate and evaluate the TANSO-3 data products and to confirm that they meet the accuracy requirements necessary

for global atmospheric composition monitoring and emissions estimation.

2. Validation methods

GOSAT-GW flies at an altitude of approximately 666 km and observes the entire globe within three days. TANSO-3 onboard GOSAT-GW has two observation modes: wide mode and focus mode. The wide mode observes Earth's surface with a swath of at least 900 km and a spatial resolution of around 10 km, while the focus mode targets finer areas, such as urban regions, with a swath of at least 90 km and a spatial resolution of 1–3 km. During the TOKYO-FC campaign (7–31 March 2026), TANSO-3 will operate in its focus mode to conduct detailed observations of major greenhouse gas emission sources across Japan, including large metropolitan areas such as Tokyo and Osaka. Two aircraft—one operated by NASA and the other by Japan—will be based at Mt. Fuji Shizuoka Airport. From there, they will fly together to regions observed by TANSO-3 and conduct coordinated measurements, including horizontal transects, overflights of ground-based reference sites, and vertical profile flights. The aircraft profiles will help link satellite column observations with atmospheric concentrations near the surface, which is essential for the identification and quantification of emission sources.

King Air (NIES and JAMSTEC)

NIES and JAMSTEC use the “King Air 200T” aircraft (Diamond Air Service, Inc.). The King Air 200T aircraft is used for profile flights to link surface observations with column observations from GOSAT-GW. The concentrations of CO₂, CH₄ and NO₂ are measured by sampling outside air through an external air inlet. The aircraft is also equipped with a spectrometer that measures vertical column density of NO₂ by utilizing the distinct absorption features in the sunlight reflected at the land or ocean surface.

G-III (NASA)

NASA uses the “Gulfstream-III (G-III)” aircraft. The G-III is equipped with two spectrometers, which measure CO₂, CH₄, and NO₂.

3. Prospects

The data obtained from TOKYO-FC are planned to be used to evaluate the accuracy of the TANSO-3 Level 2 products, including the vertical column density¹ of NO₂ and the column-averaged dry-air mole fractions² of CO₂ and CH₄. The public release of the Level 2 products is scheduled for spring 2027. These products will be used for applications such as monitoring monthly mean global atmospheric concentrations of CO₂, validating national anthropogenic greenhouse gas inventories reported by individual countries, and monitoring large emission sources of greenhouse gases.

4. Annotations

1. Vertical column density

The number of gas molecules per unit area in a vertical column extending from Earth's surface to the top of the atmosphere.

2. Column-averaged dry-air mole fractions

The ratio of the total column amount of a greenhouse gas to the total column amount of dry air.

5. Related press release

- Tokyo - Field Campaign
<https://espo.nasa.gov/tokyo-fc> (Clicking this link will lead to an external site)
- Earth observations using the Greenhouse gases Observing SATellite (GOSAT) series
<https://www.env.go.jp/en/earth/cc/gosat.html>
- Press release “First observations by the Total Anthropogenic and Natural emissions mapping Spectrometer-3 (TANSO-3) onboard the Global Observing SATellite for Greenhouse gases and Water cycle “IBUKI GW” (GOSAT-GW)”

https://www.env.go.jp/press/press_00386.html

- Press release “Initial analysis results of focus-mode observation data from the Total Anthropogenic and Natural emissions mapping SpectrOmeter-3 (TANSO-3) onboard the Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW, “IBUKI GW”)”

https://www.env.go.jp/en/press/press_02489.html