CGMS-37, JAXA-WP-01
Prepared by JAXA
Agenda Item: B.3
Discussed in Plenary

Update on the Status of JAXA's Current Satellite Systems

The current status of JAXA's Advanced Land Observing Satellite (ALOS) – "Daichi" and Greenhouse gases Observing SATellite (GOSAT) – "Ibuki" is updated. The Daichi completed its three-year regular operation phase, and entered the post operation phase, while the Ibuki completed its Initial functional check phase.

Daichi (ALOS)

1. Completes regular operation phase

On February 25, 2009, The Daichi completed its three-year regular operation phase, and entered the post operation phase.

Since its launch on January 24, 2006, The Daichi has been utilized on many occasions such as mapping and observation of sea ice and forests in addition to emergency observations during disasters. The operation of the Daichi will be continued for two more years as a post operation to make and expand satellite use by contributing to our daily lives as social and public infrastructure. JAXA will also explore new fields for its use.

2. Contribution to Sentinel Asia Step 2

In response to the APRSAF-14 recommendation, the new JPT meeting was held in Kobe, Japan in June 2008, and the Sentinel Asia Step 2 project was initiated.

In addition to Step 1's Earth observation satellites such as Daichi (JAXA), MTSAT-1R (JMA) and IRS (ISRO), new Earth observation satellites such as the Korean Multi-purpose Satellite (KOMPSAT-1, KARI), Thai Earth Observation System (THEOS, GISTDA), and communications satellites such as the wideband Internetworking Engineering Test and Demonstration Satellite (WINDS, JAXA) have joined. In addition, cooperation for emergency observation in the Asia-Pacific region between Sentinel Asia and the International Charter for Space and Major Disasters was agreed at the JPT meeting held in Bali, Indonesia in July, 2009.

Besides, in order to extend Step1's focus on wildfires and flood, glacier lake outburst flood (GLOF) working group was initiated at the 2nd JPT meeting of Step2 held in Bali, Indonesia in July, 2009.

3. Reference

http://www.jaxa.jp/projects/sat/alos/index_e.html

Ibuki (GOSAT)

1. Successfully launched and completed the critical operation phase

The Greenhouse Gases Observing Satellite "IBUKI" (GOSAT) was launched by the H-IIA Launch Vehicle No. 15 (H-IIA F15) at 3:54:00 a.m. on January 23, 2009 (Universal Time, UT) from the Tanegashima Space Center.

The launch vehicle flew smoothly, and, at about 16 minutes after liftoff, the separation of the IBUKI was confirmed.

At 8:15 a.m. on January 24, 2009 (UT) on the next day of the launch, IBUKI completed the critical phase operation, and moved to the initial functional check phase to be checked the onboard equipment function for about three months.

Fig.1 Launch of GOSAT/H-IIA F15 (Courtesy of Mitsubishi Heavy Industries, Ltd.)

2. "First Light" of SWIR Acquisition

On February 7, 2009(UT) the "First Light" successfully acquired by the Ibuki during the course of its initial functional check. The data was acquired by the onboard sensors of the Ibuki, the Fourier Transform Spectrometer (TANSO-FTS) and the Cloud and Aerosol Imager (TANSO-CAI), which were just activated.

The figure 2 shows the interferogram acquired by the TANSO-FTS as the first light when the IBUKI passed over Japan at around 4:00 a.m. (UT) and the figure 3 shows the spectrum transformed from the interferogram shown in the figure 2.

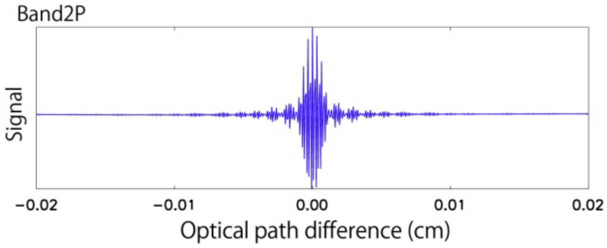
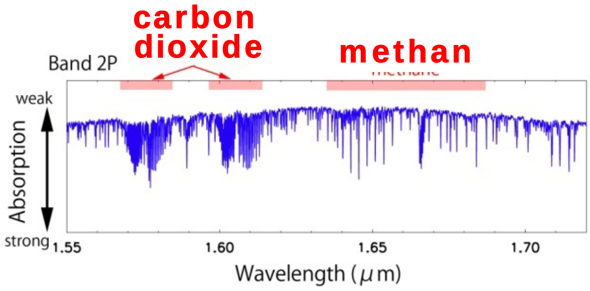


Fig.2 TANSO-FTS “First Light” (Interferogram) Hida-city, Gifu on February 7, 2009 around 4 a.m.(UT)



*Redbar shows gas absorption band

Fig.3 Spectrum derived from the interferogram shown in the figure 2

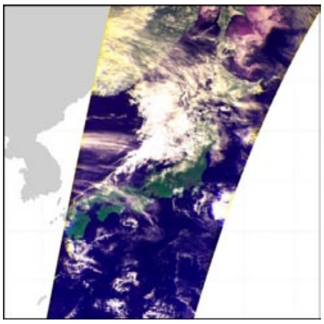


Fig. 4 TANSO-CAI "FIRST LIGHT" (false color-composite image)

Figure 4 shows the first light of the TANSO-CAI, false color-composite image acquired from the orbit over Japan at around 1300 (JST) on Feb. 7 2009.

Figure 5 shows the spectrum of each band transformed from the the First Light ,interferogram. Greenhouse gases have the characteristics to absorb infrared signal at specific wave lengths. When Greenhouse gasses are concentrated in greater volumes, absorption becomes stronger and light intensity becomes weaker.

Fig.5 shows that each absorption line is clearly separated and identified. These data show that the positions of the is virtually identical to the simulation data by National Institute for Environmental Studies (NIES) (Shown in figure 6). This shows that the functions of the TANSO-FTS was confirmed nominal as designed.

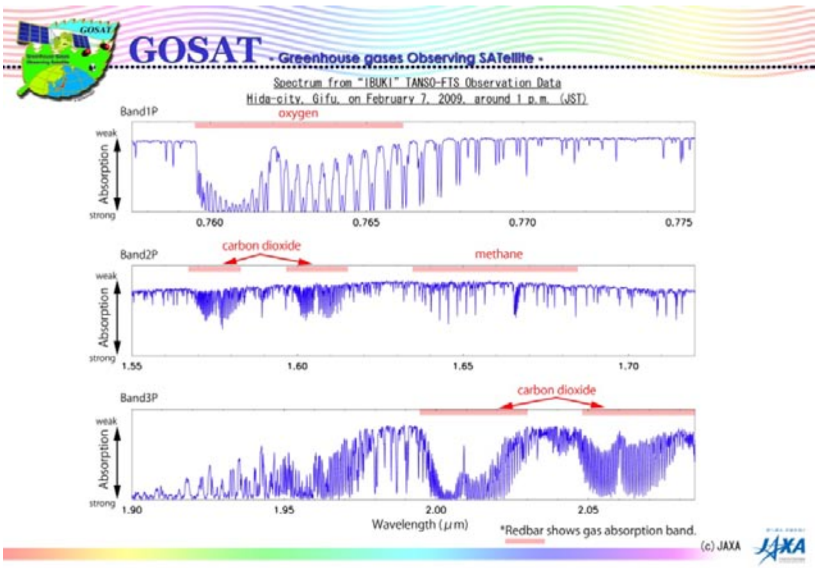


Fig. 5 Spectrum of Band 1,2 and 3 from “IBUKI” TANSO-FTS observation data acquired over the Hida City, Gifu on Feb. 7,2009

The absorption lines of the observation data match those of the simulations by National Institute for Environmental Studies (NIES) (Shown in figure 6). This shows that the functions of the TANSO-FTS was confirmed nominal as designed. we could confirm that the spectroscopic performance of the TANSO-FTS was as designed.

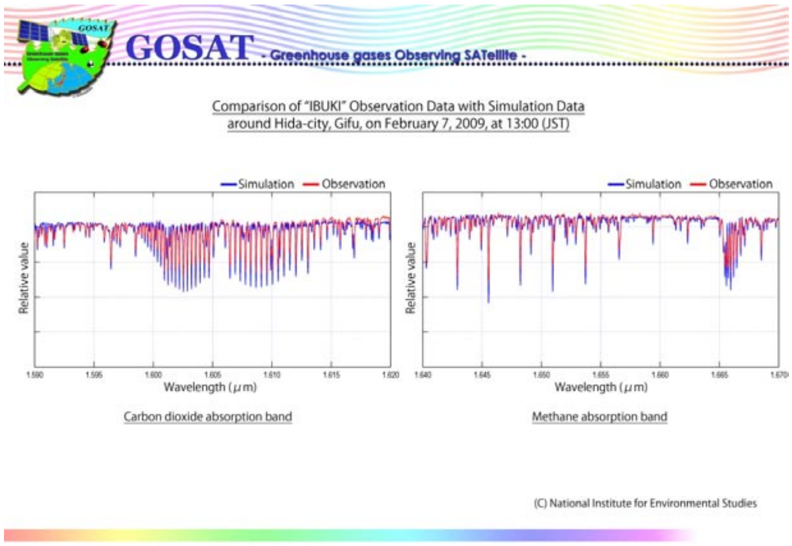


Fig. 6 Comparison of IBUKI observation data with simulation data

3. "First Light" of TIR Acquisition

On March 12, 2009(UT) the "First Thermal Infrared (TIR) spectra" successfully acquired by the TANSO-FTS on the Ibuki (GOSAT) after the functional check of detector cooler during the course of its initial functional check.

Figure 7 shows the spectrum of thermal infrared band acquired when Ibuki passed over the southern Pacific Ocean(point 1 in the figure 1) in the daytime and Egypt(point 2 in the figure 1) in the nighttime on March 11, 2009 (UT).

Figure 7 shows that each absorption line is clearly visible. We confirmed the TANSO-FTS worked normally in all observation bands and TIR could observe the absorption spectra of carbon dioxide and methane during both day and night.

Figure 8 shows the comparison of the observation data with the simulation results *. The comparison demonstrated that the absorption line positions are in good agreement. We could thus confirm that the spectroscope performed as designed.

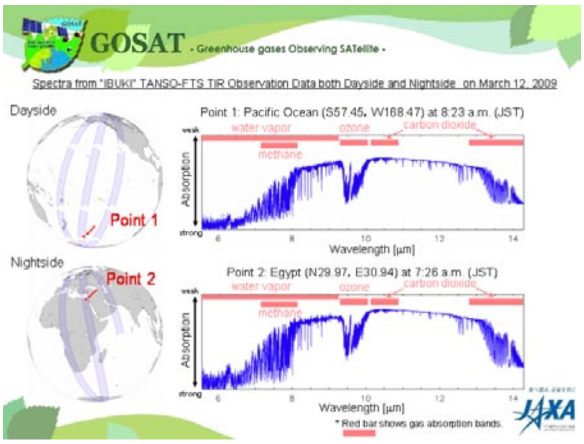


Fig. 7. Spectra from "IBUKI" TANSO-FTS TIR Observation Data both Daytime and Nighttime on March 11, 2009 (UT).

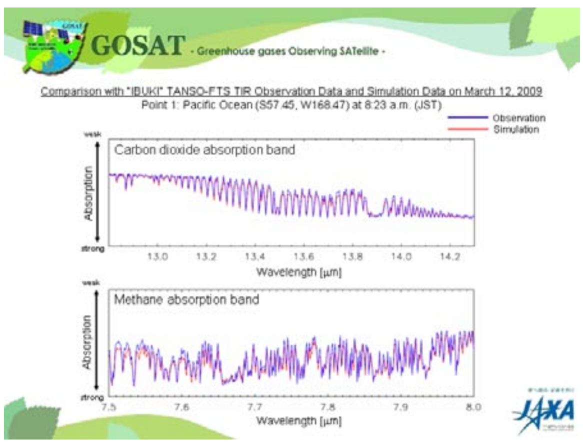


Fig. 8 Comparison of "IBUKI" TANSO-FTS TIR Observation Data and Simulation Data on March 11, 2009(UT).

* The simulation data was calculated by the radiative transfer model (LBLRTM), using sea-surface temperature from NOAA, and temperature and water vapor profiles from Grid Point Value of the Japan Meteorological Agency.

4. Completion of the Initial functional check phase

The Ibuki was finished successfully to be checked the nominal function and performance of the onboard mission instruments, the satellite bus system and the ground system and completed the initial functional check phase on April 10, 2009 and moved to the initial calibration and verification operation phase.

5. Initial Analysis of Observation Data

It was obtained that analysis results of the carbon dioxide and methane column averaged dry air mole fraction over land for April 20-28, 2009 for the first time from the "IBUKI". These data were obtained from TANSO-FTS shortwave infrared bands using clear-sky observations determined from TANSO-CAI data.

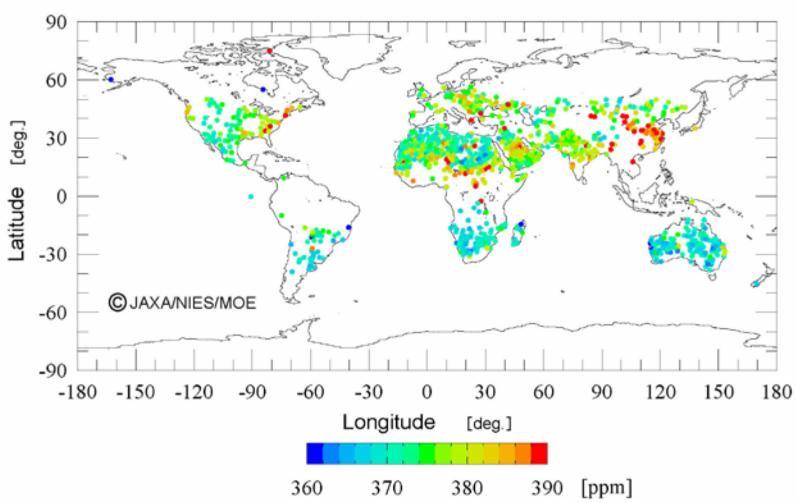
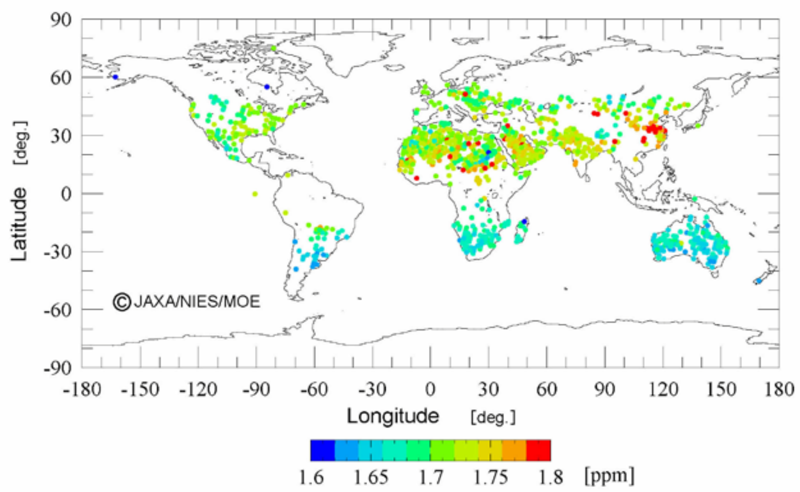


Fig. 9. XCO2 (Column averaged dry air mole fraction : uncalibrated data)

Figure 9 and 10 shows the carbon dioxide and methane column averaged dry air mole fraction distribution. In this connection, data are excluded where the associated radiance spectra are saturated, and where noise is relatively large due to weak ground surface reflection.These carbon dioxide and methane data show that the density data was mostly consistent with the conventional data observed on the ground: the density is high in the Northern Hemisphere and low in the Southern Hemisphere, and this corresponds to the tendency in the later part of April.



XCH_4 (Column averaged dry air mole fraction) (uncalibrated data)

action :

It should be acknowledged that this analysis is based on uncalibrated data and consequently it is not appropriate to interpret estimated individual column averaged dry air mole fraction values. For example, derived XCO2 and XCH4 values are generally lower than model predictions. This is thought to be due to the analysis involving uncalibrated radiance spectrum data and due to the parameter adjustment for the analysis method not being finalized. High concentrations are observed over continental China and Central Africa, which may be caused by measurement interference due to the presence of atmospheric dust. Asian dust (yellow sands) were observed over continental China during the observation period, and the existence of dust storm-like and smoke-like phenomena were observed in the relevant locations in Africa. Future investigation is required to understand these errors.

Future work will include a reanalysis of these data, accounting for the results of data calibration and product validation activities, and adjusting the data processing parameters required for quantitative discussion of the analysis results.

6. Current Status and Future Plan

In September, 2009, an initial calibration of the level 1 data products has been completed. The calibration of the mounted sensors, as well as tuning of the computer processing system, is underway at the Japan Aerospace Exploration Agency and the National Institute for Environmental Studies.

In the future, after confirming the accuracy of calibration and processing activities for observation data (radiance spectra, etc.) and of validation activities based on comparison with ground-based observations, it is planed to be distributed calibrated observation spectrum data (TANSO-FTS data) and observation image data (TANSO-CAI data) (level 1 product) to registered users nine months after the satellite launch (late October 2009). And it is planed to be distributed validated carbon dioxide and methane column abundances and cloud coverage flag data (level 2 product) 12 months after the satellite launch (late January 2010).

7. Reference

http://www.gosat.nies.go.jp/index_e.html
http://www.jaxa.jp/projects/sat/gosat/index_e.html