

Scientific Application Using GOSAT DATA – Calibration

Japan Aerospace Exploration Agency

Kei Shiomi

*Workshop on Data Utilization of GOSAT “IBUKI”,
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Research proposals on calibration

- “Characterization of micro vibration effect to spaceborne-FTS on orbit”
 - Suto, Kuze, Seki, Nakamura(JAXA)

- “Lunar calibration of TANSO using SELENE spectral profiler data”
 - Matsunaga(NIES), Ohtake, Haruyama(JAXA), Tsuchida, Nakamura, Kodama(AIST), Iwasaki(Univ. Tokyo), Saeki(Osaka Univ.)

- “GOSAT infrared FTS validation and CO₂ retrievals”
 - Strow, Hannon, Imbiriba(Univ. Maryland Baltimore Country)

- “Radiometric and spectral assessment of GOSAT TIR observations”
 - Knuteson, Revercomb, Tobin(Univ. Wisconsin-Madison)

Characterization of micro vibration effect to spaceborne-FTS on orbit (1/2)

■ Purposes

- Assessment of resistance to micro-vibration
- Assessment of methodology of on-orbit evaluation of micro-vibration effect
- Assessment of methodology of pre-flight estimation of sensor environment

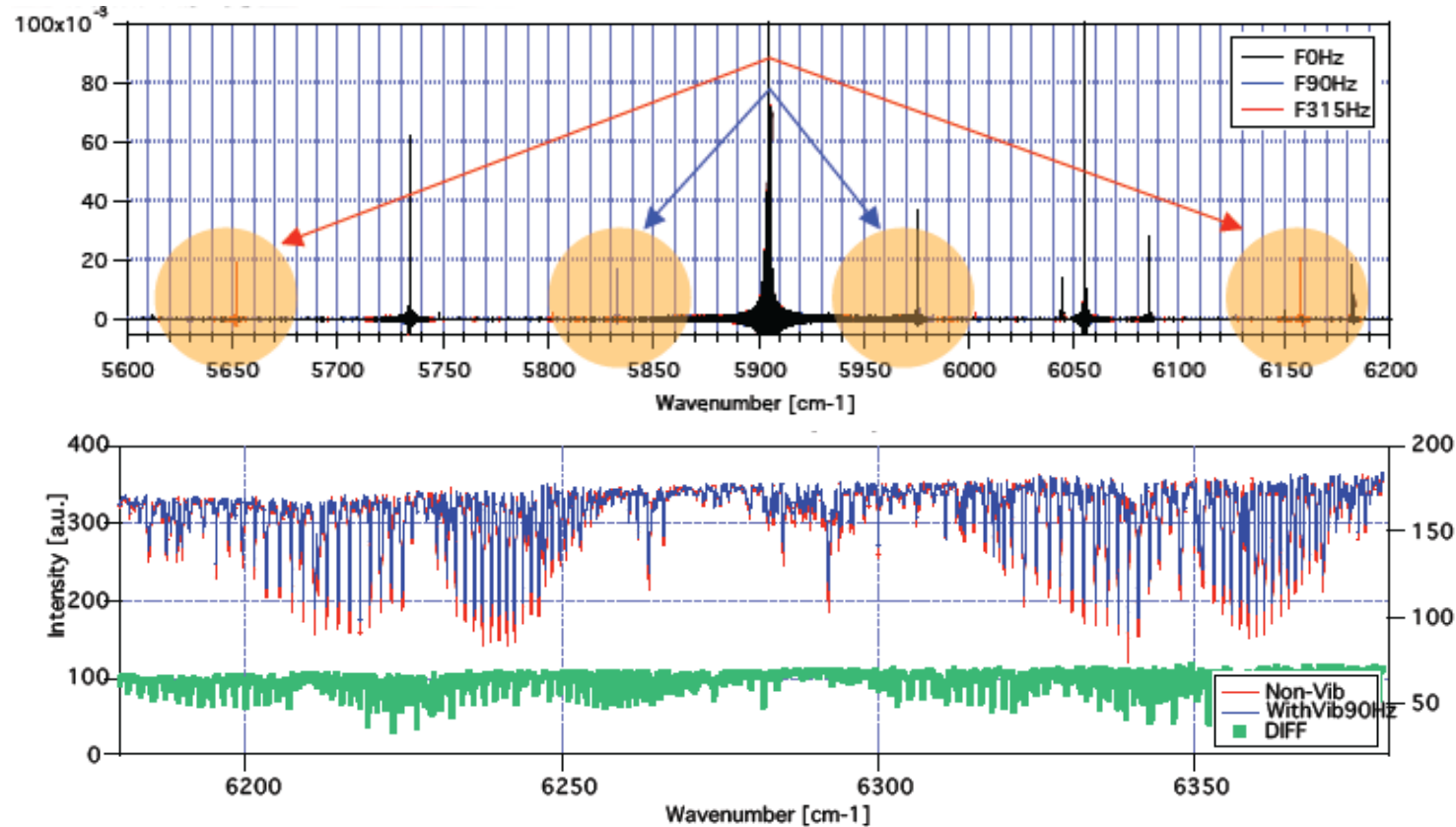
■ Ghost signals come from

- Changing of modulation efficiency
- Sampling jitter
- IFOV jitter

■ ILS laser multiple measurements

- Good SNR (>5000) appropriate for investigation of micro-vibration effect

Characterization of micro vibration effect to spaceborne-FTS on orbit (2/2)



- (Top) Investigation of micro-vibration effect using TSUKUBA airborne simulator of TANSO-FTS
- (Bottom) Simulated 90Hz micro-vibration effect superimposed on the spectrum

Lunar calibration of TANSO using SELENE spectral profiler data (1/2)

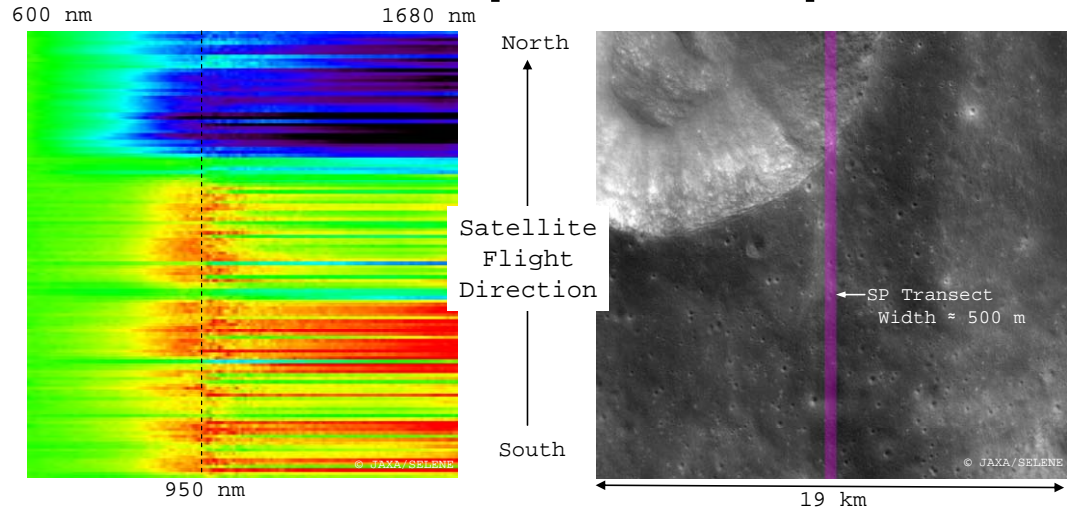
■ Purposes

- Absolute radiometric calibration of FTS and CAI using lunar observation except CAI Band1 0.38 micron

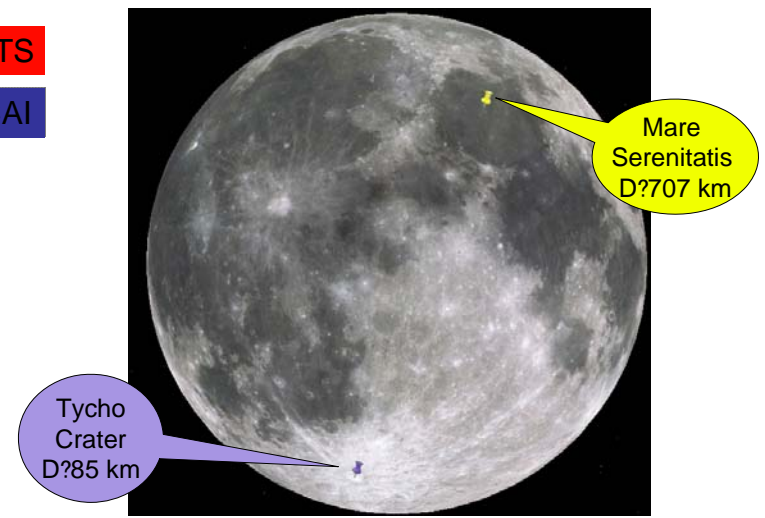
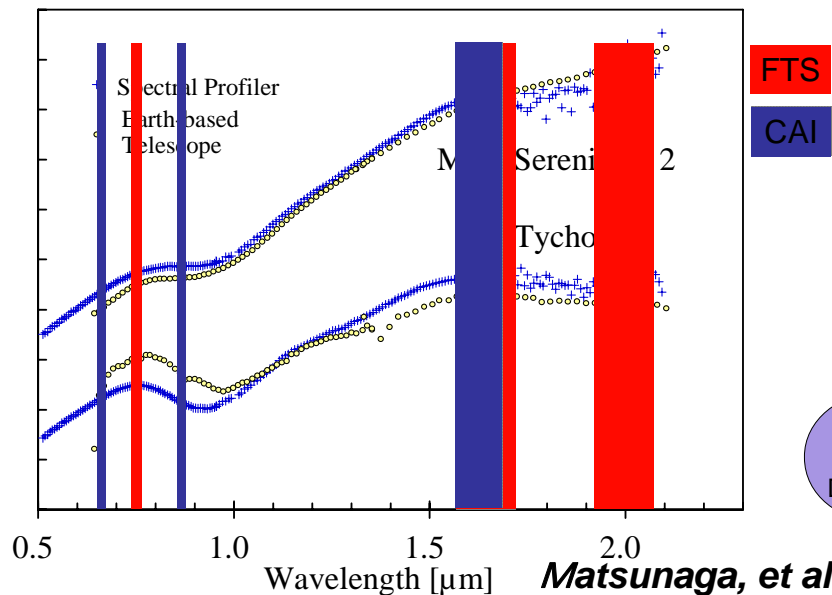
■ Spectral Profiler on SELENE(KAGUYA)

- Lunar global reflectance dataset in nearside produced by
 - Observation from Nov. 2007 to Mar. 2009
 - 0.5-2.6 micron by resolution of 6-8 nm
 - 500 m footprint
- Photometric function applied to UV-NIR region

Lunar calibration of TANSO using SELENE spectral profiler data (2/2)



- (Top) SP first light on Dec. 14, 2007
- (Bottom) Comparison between SP and earth-based telescope observation



Matsunaga, et al., Geophys. Res. Lett., doi:10.1029/2008GL035868, in press.

Dr. Matsunaga's research proposal

GOSAT infrared FTS validation and CO₂ retrievals (1/2)

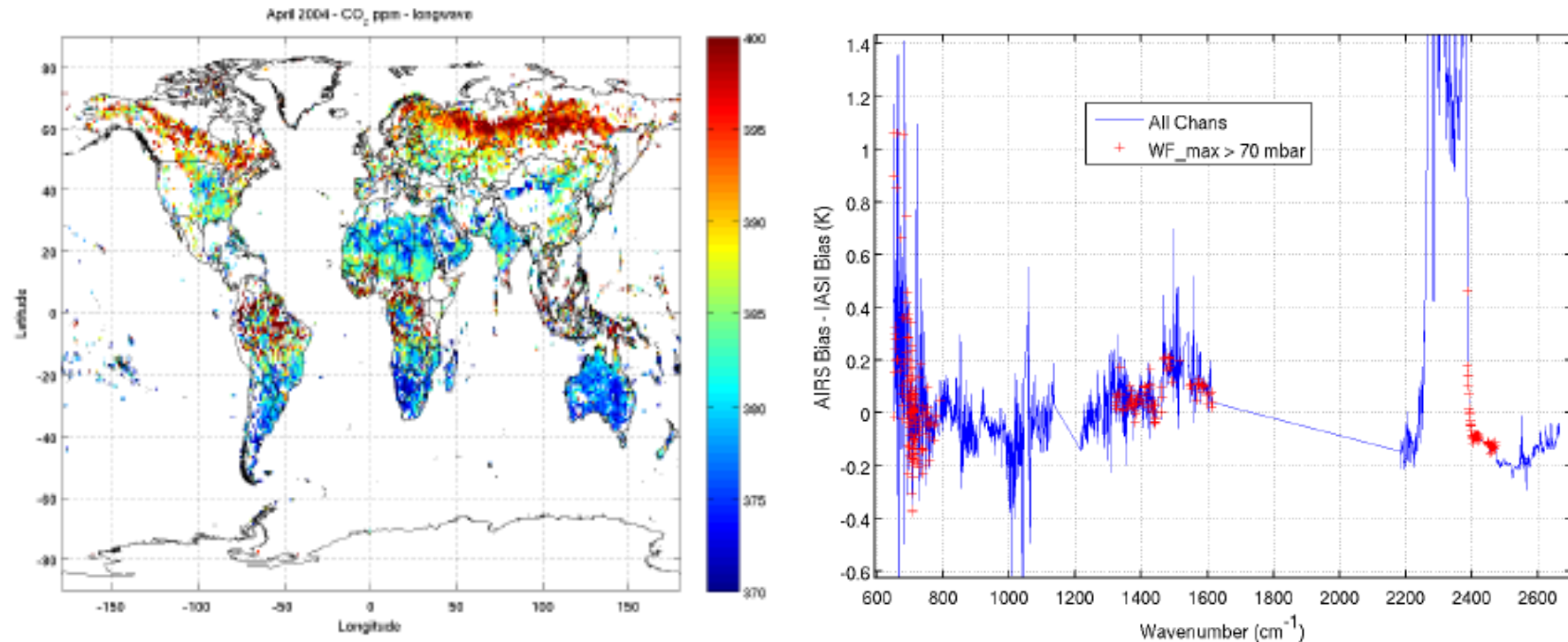
■ Purposes

- Radiometric and spectral calibration using ECMWF and sonde data
- CO₂ retrieval from TANSO-FTS TIR by the application of AIRS and IASI method
- Cross validation of CO₂ of GOSAT and AIRS or IASI

■ Currently, TIR CO₂ is studied from

- Aqua/AIRS from 2002
- MetOp/IASI from 2006

GOSAT infrared FTS validation and CO₂ retrievals (2/2)



- (Left) Preliminary result of Longwave CO₂ retrieval from AIRS in Apr. 2004
- (Right) Cross validation of radiances between AIRS and IASI relative to ECMWF

Radiometric and spectral assessment of GOSAT TIR observations (1/2)

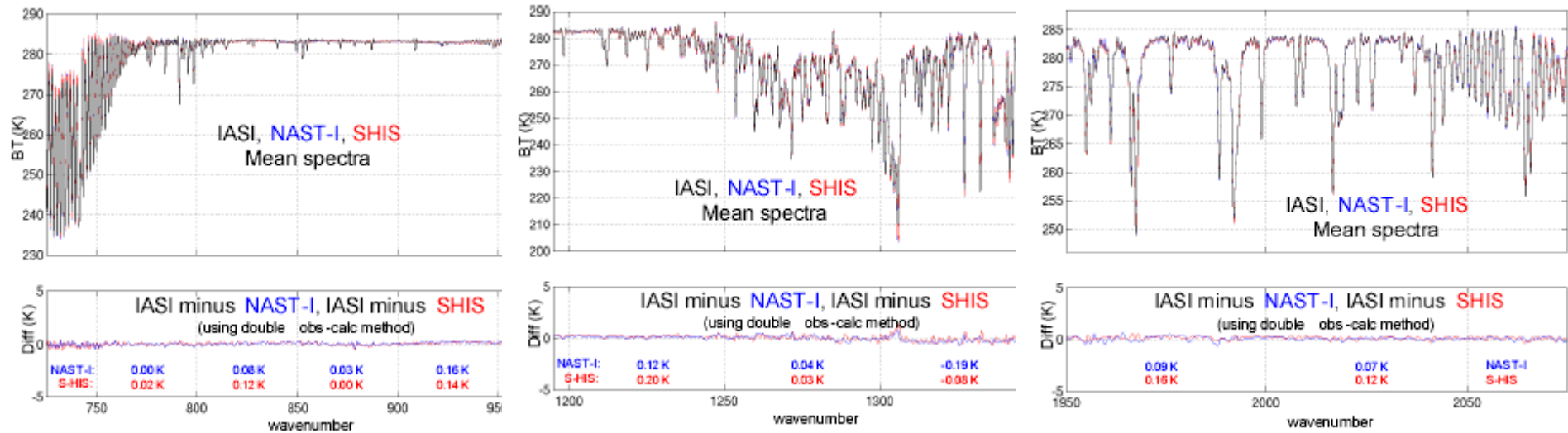
■ Purposes

- Evaluation of the onboard calibration performance for various scene types
- Validation of L1B radiances against forward model calculations at ground truth sites (ARM/ Lamont, Barrow, Darwin)
- Validation of the L1B radiances using aircraft (S-HIS) and/or satellite sensors (AIRS,IASI)
- Application of Univ. Wisconsin atmospheric state retrieval algorithms to the GOSAT FTS L1B radiances in order to translate calibration errors into sounding errors

■ ARM site

- AERI, sonde, and a lot of instruments for atmospheric parameters
- Fly of Scanning High-resolution Interferometer Sounder as possible

Radiometric and spectral assessment of GOSAT TIR observations (2/2)



- Validation of IASI spectral radiance observations using S-HIS and NAST-I data collected on 19 April 2007 over the Oklahoma ARM site.
- IASI has excellent absolute and spectral calibration accuracy relative to the Univ. Wisconsin S-HIS.

Summary

- GOSAT calibrations will be studied by
 - Micro-vibration effect investigation using ILS calibration
 - Lunar calibration using SELENE SP data
 - Radiance comparison between GOSAT TIR and IASI/AIRS
 - CO₂ retrieval comparison between GOSAT TIR and IASI or AIRS
 - Radiance comparison at ARM sites with sonde and airborne sensor S-HIS
 - Atmospheric retrieval comparison between GOSAT TIR and ARM site measurement