Scientific Application Using GOSAT DATA – Calibration

Japan Aerospace Exploration Agency
Kei Shiomi

Workshop on Data Utilization of GOSAT “IBUKI”, Toranomon Pastral Hotel, 5 November, 2008
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 CO$_2$ 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

*Dr. Suto’s research proposal*
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

Dr. Suto’s research proposal
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

*Dr. Matsunaga’s research proposal*
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

Dr. Matsunaga's research proposal
GOSAT infrared FTS validation and CO$_2$ retrievals (1/2)

- **Purposes**
  - Radiometric and spectral calibration using ECMWF and sonde data
  - CO$_2$ retrieval from TANSO-FTS TIR by the application of AIRS and IASI method
  - Cross validation of CO$_2$ of GOSAT and AIRS or IASI

- Currently, TIR CO$_2$ 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

Dr. Strow’s research proposal
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

Dr. Tobin’s (for Knuteson) research proposal
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.

*Dr. Tobin’s (for Knuteson) research proposal*
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
- CO$_2$ 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