Contribution to the Paris Agreement using space-based GHG monitoring

GOSAT to Detect Global & Regional Anthropogenic CH₄ Emissions

- CH₄ enhancements (ΔXCH₄) due to anthropogenic emission have been calculated from Inventory (EDGAR) and compared with the data derived from GOSAT.
- Inventory may overestimate CH₄ emission in East Asia by 30%, and underestimate CH₄ emission in North America by 30%.
- The results are consistent with some of recent peer-reviewed papers.

GOSAT to Detect Global & Regional Anthropogenic CO₂ Emissions

- Large volumes of GOSAT XCO₂ data were analyzed for concentration enhancements (ΔXCO₂) due to anthropogenic CO₂ emissions from the globe and the regions.
- Simulated XCO₂ enhancements agree with the observed regions across the globe and North America. But over East Asia, GOSAT ΔXCO₂ is larger than Inventory ΔXCO₂.
- By increasing the number of observations around emission sources, GOSAT can provide a tool for detecting biases in reported emission inventories.

(Janardanan et al., 2017)
Global GHG Observation from Space

GOSAT (Jan. 2009 - )

Greenhouse gases Observing SATellite GOSAT, the world’s first spacecraft specifically designed for measurements of the concentrations of carbon dioxide and methane from space. It was launched successfully in January, 2009, and has been continuing observation after completing its five-year nominal operation. The Fourier Transform Spectrometer (FTS) and the Cloud and Aerosol Imager (CAI) are onboard the spacecraft.

GOSAT-2, the successor of GOSAT is scheduled to be launched in FY 2018. The GOSAT Projects are a joint efforts of the Ministry of the Environment (MOE), the Japan Aerospace Exploration Agency (JAXA) and the National Institute for Environmental Studies (NIES).

Requirements for the spacecrafts

- **Launch year and lifetime**
  - GOSAT: 2009, 5 years
  - GOSAT-2: 2018, 5 years

- **Orbit**
  - Sun Synchronous, 666 km, 3 days, 13:00
  - Sun Synchronous, 613 km, 6 days, 13:00

- **Targets**
  - CO₂, CH₄, O₂, O₃, H₂O
  - CO₂, CH₄, O₂, O₃, H₂O, CO, Black carbon, PM2.5

GOSAT Chronology

GOSAT Observation and Climate Change

- Whole-atmosphere mean CO₂ and CH₄ concentrations are calculated from GOSAT FTS SWIR Level 2 products with a model-based correction.
- CO₂ and CH₄ monthly data show the increasing trends with seasonal variations since 2009.
- These growth rates can be partially explained by ENSO events.

New Features of FTS-2

- Automatic search function for cloud-free areas (intelligent pointing) using a FTS-2 FOV camera
- Fully programmable (target mode) observation
- Extended range of AT pointing angle, and improved signal-to-noise ratio for sunglint, high latitude and dark target observations

Satellite Observation Center, National Institute for Environmental Studies, Japan (Oct. 2017)