

Summary of the Final Report of Research Results

1) Title of the proposed research

Comparison of GOSAT retrievals of the CO₂ and CH₄ column mole fractions with in-situ data and estimates produced by the CarbonTracker data assimilation system

2) Principal Investigator (PI) and Co-Investigators (Co-Is)

PI:

Dr. Pieter Tans

Co-I:

Dr. Ken Masarie

Dr. Colm Sweeney

Dr. Andy Jacobson

Dr. Ed Dlugokencky

Dr. Tom Conway

Dr. Arlyn Andrews

Dr. Lori Bruhwiler

Dr. John Miller

3) PI's affiliation

NOAA Earth System Research Laboratory

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We aimed to make comparisons of the satellite retrievals to aircraft based and ground based in-situ data, which contribute to the successful interpretation of satellite data and their integration into the global observing system. We started with direct comparisons of GOSAT FTS-SWIR column retrievals of CO₂ and CH₄ with aircraft based and ground based in-situ data, without involving a transport model. The next step, now ongoing, is to compare GOSAT retrievals with CarbonTracker. The latter can be considered as an extrapolation of CO₂ fields to the entire atmosphere that is consistent with observed in-situ CO₂ and atmospheric transport. If these comparisons are satisfactory, we are to develop an approach to use satellite and in-situ data together for determining sources/sinks of CO₂.

Outcomes of the first step were published in the 4 papers listed below, while results from the latter step are now compiled in preparation for publication.

5) List of publications relating to the proposed research

Kulawik, S., et al.: Consistent evaluation of GOSAT, SCIAMACHY, and CarbonTracker through comparisons to TCCON, in preparation.

Inoue, M., Morino, I., Uchino, O., Miyamoto, Y., Saeki, T., Yoshida, Y., Yokota, T., Sweeney, C., Tans, P. P., Biraud, S. C., Machida, T., Pittman, J. V., Kort, E. A., Tanaka, T., Kawakami, S., Sawa, Y., Tsuboi, K., and Matsueda, H.: Validation of XCH₄ derived from SWIR spectra of GOSAT TANSO-FTS with aircraft measurement data, *Atmos. Meas. Tech.*, 7, 2987-3005, doi:10.5194/amt-7-2987-2014, 2014.

Inoue, M., Morino, I., Uchino, O., Miyamoto, Y., Yoshida, Y., Yokota, T., Machida, T., Sawa, Y., Matsueda, H., Sweeney, C., Tans, P. P., Andrews, A. E., Biraud, S. C., Tanaka, T., Kawakami, S., and Patra, P. K.: Validation of XCO₂ derived from SWIR spectra of GOSAT TANSO-FTS with aircraft measurement data, *Atmos. Chem. Phys.*, 13, 9771-9788, doi:10.5194/acp-13-9771-2013, 2013.

Saeki, T., Maksyutov, S., Saito, M., Valsala, V., Oda, T., Andres, R. J., Belikov, D., Tans, P., Dlugokencky, E., Yoshida, Y., Morino, I., Uchino, O., and Yokota, T.: Inverse Modeling of CO₂ Fluxes Using GOSAT Data and Multi-Year Ground-Based Observations, *SOLA*, 9, 45-50, doi:10.2151/sola.2013-011, 2013.

Miyamoto, Y., Inoue, M., Morino, I., Uchino, O., Yokota, T., Machida, T., Sawa, Y., Matsueda, H., Sweeney, C., Tans, P. P., Andrews, A. E., and Patra, P. K.: Atmospheric column-averaged mole fractions of carbon dioxide at 53 aircraft measurement sites, *Atmos. Chem. Phys.*, 13, 5265-5275, doi:10.5194/acp-13-5265-2013, 2013.