

GHG_CCI QSR Oct-Dec 2010

1. Project initiation, schedule

The GHG-CCI project has been kicked-off on 1. Sept. 2010. Therefore, this is the first Quarterly Report of the GHG-CCI project with certain activities having already taken place before kick-off such as the GHG-CCI project presentation (by M. Buchwitz) at ESA's Living Planet Symposium, 28th June – 2nd July 2010, Bergen, Norway, which was well received.

A first Progress Meeting (PM1) has been held on 4-5 Nov. 2010 at IUP, Bremen. All aspects of relevance for GHG-CCI have been intensively discussed. This includes the latest status of the CO₂ and CH₄ retrievals using various satellite instruments, most notably SCIAMACHY/ENVISAT and TANSO/GOSAT, but also MIPAS, AIRS, IASI and ACE-FTS, inter-comparisons, validation (using primarily TCCON but also NDACC; discussions on how to best use the highly accurate long-term in-situ observations of the WMO and AGAGE networks), calibration (priorities for SCIAMACHY Level 1 improvements), and user aspects (focus: status of CH₄ inverse modelling of surface fluxes using SCIAMACHY and GOSAT; status of CO₂ modelling and initial comparisons with GOSAT). Several action items have been identified. For example, it has been pointed out by ESA that the selection procedure for the final algorithms to be used for ECV generation need to be defined already early in the project. A corresponding document is in preparation.

During the reporting period significant progress has been made especially concerning the retrievals of dry air column-averaged mole fraction of CO₂ and CH₄, i.e., XCO₂ and XCH₄, using SCIAMACHY and TANSO, which are the core ECV data products.

The GOSAT project team in Japan has been contacted concerning issues related to showing GOSAT results generated within GHG-CCI in the public. The GOSAT project team has responded that GOSAT results obtained within GHG-CCI can be shown in the public without asking for permission. However, the GOSAT team would like to be informed about what has been shown.

No major problems have been encountered. It has however been identified that there are issues related to the download of GOSAT data from ESA's GOSAT Third Party Mission (TPM) archive. This has been communicated to ESA. ESA is working on a solution using feedback from the GHG-CCI project team.

2. Outcome of CCI collocation for project

Several GHG-CCI team members participated at the first CCI Collocation Meeting, which took place at ESA/ESRIN, Frascati, Italy, 15-17 Sep. 2010, and have contributed to various discussion topics, working groups, and documents. The inputs received will be considered within GHG-CCI.

3. User Requirements Gathering

Initial user requirements for the GHG_cci project have been formulated for the regional CO₂ and CH₄ surface flux applications. The user requirements are based on peer-

reviewed publications, other documents where user requirements have been formulated and user consultation focusing on users which are involved in the European MACC project. A close cooperation between GHG-CCI and MACC/GHG has been established for this purpose.

A first draft of the User Requirements Document (URD) has been compiled and circulated on 30. Nov. 2010 to all GHG-CCI team members and ESA. Feedbacks will be used to generate an updated version of the URD. This draft will be made publicly available on the GHG-CCI project web site. All comments will be used to generate the final version of Version 1 of the URD (URDv1) which will be publicly available end of Feb. 2011.

4. Data Requirements Definition

Two existing satellite sensors will be used as the main data sources for the generation of key CO₂ and CH₄ ECV products: SCIAMACHY on ENVISAT and TANSO on GOSAT. Additional datasets of mid/upper tropospheric and stratospheric CO₂ and CH₄ from IASI, AIRS, MIPAS, ACE-FTS and SCIAMACHY occultation are also included in this project.

All required input data have been specified in the CCI EO Satellite Data Requirements documents and they will be more detailed in the Data Access Requirements Document, which is currently being generated by GHG-CCI.

5. Key issues on Algorithms, validation, uncertainties, confrontation with models

No key issues have been identified and the priorities as given in the proposal are still valid. Access to all relevant validation data is assured as the relevant European PIs are project partner and delivery of non-European data is assured via Letters of Support. Independent validation is assured by the independent Validation Team (VALT). Selection criteria for Round Robin are in the process of definition (a document is in preparation). Uncertainties will be characterized by various means such as simulations and comparison with well characterized independent reference data (mainly ground-based FTS TCCON retrievals). Detailed comparisons with models have been conducted (see publications given below) and more comparisons will be done in the future. The GHG-CCI Climate Research Group (CRD) has given important feedback. For example, the latest SCIAMACHY methane data set has been successfully used for inverse modeling (the results are being displayed at the MACC website).

6. Involvement of international partners and projects

A strong link has been established with the EU project MACC (Monitoring Atmospheric Composition and Climate) and further strengthened during the reporting period. MACC is considered to be one of the key users for the GHG data set to be generated within GHG-CCI. Several GHG-CCI team members have participated at the MACC 2nd General Assembly at Météo-France, Toulouse, 18-22 October 2010, and have given presentations during the MACC/GHG splinter meeting and the MACC plenary meeting. Key GHG-CCI team members also participate in the proposal writing for MACC-II.

Cooperation with many other international projects and partners have also been further strengthened during the reporting period. Examples are projects such as EU FP7 CityZen

and ESA Alanis/Methane, and partners such as NASA and NOAA. For example, a close cooperation exists with the NASA ACOS team focussing on GOSAT retrievals and with NOAA where a detailed discussion with Pieter Tans on early manuscripts of the Schneising et al., 2010, publication took place and with E. J. Dlugokencky during the preparation of the Frankenberg et al., 2010, publication.

7. Project Outreach (scientific and public)

Several manuscripts of GHG_cci team members have been submitted to peer-reviewed journals:

- Reuter, M., H. Bovensmann, M. Buchwitz, J. P. Burrows, B. J. Connor, N. M. Deutscher, D. W. T. Griffith, J. Heymann, G. Keppel-Aleks, J. Messerschmidt, J. Notholt, C. Petri, J. Robinson, O. Schneising, V. Sherlock, V. Velazco, T. Warneke, P. O. Wennberg, and D. Wunch, Retrieval of atmospheric CO₂ with enhanced accuracy and precision from SCIAMACHY: Validation with FTS measurements and comparison with model results, *J. Geophys. Res.* (in press), 2010.
- Schneising, O., Buchwitz, M., Reuter, M., Heymann, J., Bovensmann, H., and Burrows, J. P., Long-term analysis of carbon dioxide and methane column-averaged mole fractions retrieved from SCIAMACHY, *Atmos. Chem. Phys. Discuss.*10, 27479-27522, 2010.
- Butz, A., O.P. Hasekamp, C. Frankenberg, J. Vidot, and I. Aben, CH₄ retrievals from space-based solar backscatter measurements: performance evaluation against simulated aerosol and cirrus loaded scenes, *J. Geophys. Res.* (in press), doi:10.1029/2010JD014514, 2010.
- Frankenberg, C., I. Aben, P. Bergamaschi, E. J. Dlugokencky, R. van Hees, S. Houweling, P. van der Meer, R. Snel, and P. Tol, Global column-averaged methane mixing ratios from 2003-2009 as derived from SCIAMACHY: Trends and variability, *J. Geophys. Res.* (in press), 2010.

GHG-CCI team members have also given presentations on the 2nd “Carbon from Space” workshop, which took place 6-8 Sep. 2010, at Worcester College, Oxford, UK. The GHG-CCI project has also been presented at the ACC-6 meeting, chaired by C. Zehner, ESA/ESRIN, 9. Sep. 2010, which also took place at Worcester College.

A presentation has also been given at the ESA-iLEAPS-EGU – Earth Observation for Land-Atmosphere Interaction Science Conference 3-5 Nov 2010, ESRIN, Italy.

For the GEO-VII Plenary and Beijing Ministerial, held from 3-5 November 2010 in Beijing, China, a video has been produced by JAXA using inputs from various sources. For this video, which is available from ftp://ftp.earthobservations.org/EXCHANGE/2010_Ministerial_Videos/, inputs have been provided by the GHG-CCI project team, e.g., animations showing global CO₂ and CH₄ as retrieved from SCIAMACHY during 2003-2009.

GHG/CCI project team members have also been involved in the CarbonSat mission proposal submitted in response to the ESA call for proposal for Earth Explorer 8. CarbonSat has been selected together with FLEX during the 23/24 Nov. 2010 meeting of

the ESA Program Board for Earth Observation out of 31 full proposals which had been submitted.

A first Newsletter of the GHG-CCI project has been prepared and sent to ESA. Printed versions will be circulated by ESA, e.g., at the ESA booth at the 2010 UN Climate Change Conference in Cancun, Mexico. The Newsletter will also be made available via the GHG-CCI project website.

Preparations to establish a project website have been undertaken during the reporting period. The ESA recommended content management system has been installed and new hardware has been ordered as required to circumvent issues related to the IUP firewall. It is expected that the GHG-CCI website (<http://www.esa-ghg-cci.org>) will be launched mid/end of December 2010.

8. Main activities and project deliverables for next quarter (to 6 months)

During January – March 2011, i.e., month 5 – 7 of the GHG-CCI project, focus will be on further improving the GHG-CCI retrieval algorithms, data processing, and analysis of the resulting data products. According to current planning, the first improvement phase shall be finalized in month 8. During month 9, data processing shall take place, followed by a detailed analysis of the resulting data products including detailed comparisons of the data products generated with the various competing retrieval algorithms. The results of this first improvement-processing-comparison cycle will be available end of month 11.

Several documents are due end of month 6, e.g., URDv1, DARDv1 and PSDv1. Work on several other documents, due after month 6, will also be carried out during the first 3 months of 2011, e.g., PVP, ATBDv0, and AIECARv0 (Algorithm Intercomparison and Error Characterization and Analysis Report).

The so-called Data Base Task 2 (DBT2) will be compiled which will contain a data base of validation data (due month 9). Available satellite retrievals will be part of the Round Robin Data Package (RRDP) (month 6-12 (initial version), to be continued after month 12).

Abstracts on GHG_cci will be submitted to the EGU 2011 conference in Vienna and the International Workshop on Greenhouse Gas Measurements from Space (IWGGMS-7) in Edinburgh.