FRM4GHG

Fiducial Reference Measurements for Greenhouse Gases

Deliverable D3 Phase 2

Measurements plan

Deliverable:	**3**
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1 Document change record

Issue	Date	Item	Comment
V0	2018-09-04	–	Initial version
V1	2018-09-19		Comments included from DW
V2	2018-10-04		Comments included from JN, RK, HC
V3	2018-11-12		Comments from FH, MS
V4	2018-12-20		Comment from DW
V5			

2 Access list

This document is a deliverable "D3: Measurement Plan first version" created for the project FRM4GHG and will be submitted to ESA. The document will be a publicly accessible document and can be downloaded from the project webpage http://frm4ghg.aeronomie.be.

3 Purpose

This document presents the updates of the deliverables for the measurement plan (D3)

This document presents the deliverable for the Measurements and Retrieval evolution. The deliverable produces a plan around the 2018 aircore fights and outlines the harmonisation activities for the mobile instruments.

The deliverable addresses WP Data Measurements and Retrieval evolution Tasks T2.3: Develop a plan for an optimal time distribution of AirCore flights, considering the activities of the EU project Ringo [R-6], and T2.4: Develop a measurement plan to produce a harmonised data set for all mobile instruments, including the non-mobile TCCON instrument.

4 Document structure

Section 5: Describes action on Tasks T2.3 and T2.4

5 Measurement Plan

The instruments and their respective retrieval methods are described in deliverable D2.3 from Phase 1

This technical note addresses two tasks identified for this deliverable, that is:

T2.3 Develop a plan for an optimal time distribution of AirCore flights, considering the activities of the EU project Ringo [R-6]

So far we have performed 9 AirCore flights, as of 30 Oct.
- RINGO: in total 10 flights and 23 AirCores during June 18-29, 2018.
- CoMet flight on May 28: AirCore was flown, also FTS measurements were performed.

T2.4 Develop a measurement plan to produce a harmonised data set for all mobile instruments, including the non-mobile TCCON instrument [R-7]

The measurement plan for phase 2 will follow the procedures and protocols developed in phase 1 (see deliverable D2.3 phase 1), and where departures exist from these practises, they are addressed with respect to each instrument.

Non mobile TCCON:

TCCON instrument alignment was performed prior to the start of the 2nd phase of the FRM4GHG campaign. InGaAs detector non-linearity effect was investigated and the effect was minimized by lowering the signal level entering on the sensor surface. For this we changed the aperture stop in the instrument entrance from 32 mm to 16 mm. After the changes the zero level offsets are significantly lower now, by the factor of 3. The offset is also much less dependent on the wavenumber and it stays rather constant through the whole wavenumber range. Otherwise, the instrument is being operated as during the first phases of the project in 2017.

EM27/SUN:

The measurements of CO2, CH4, and CO will be extended without introducing changes on the spectrometer. When the remotely-controlled shelter is in service (early September 2018), the spectrometer will be operated in the shelter until end of this observation period. Regular ILS are continued, so far no indication for a drift of instrumental characteristics has been noted (deduced from ILS measurements and XAIR).

Vertex70:

The measurements of CO_2 and CH_4 will continued as in phase 1. The optimal choice for the aperture and the parallel light beam has to be chosen, based on observations throughout the first weeks of measurements. The LN-automatic filling system will be installed for easier measurements with the InSb-detector. The InSb-detector will be used to measure in addition CH_2O.

IRCube:

As discussed in deliverable 2 phase 2, the IRCube operated with a 1mm aperture for the period 10 April through 12 June 2018. When an issue with the wider aperture was not able to be addressed with the primarily analysis tool for the IRCube, GFIT, a switch back to a 0.5mm aperture commenced 27 August. A transition period was introduced 14 June to 24 August, interweaving 1mm and 0.5mm aperture measurements.

Otherwise, the instrument is being managed as per 2017 in terms of automated data collection.

LHR:

The measurement plan for phase 2 is identical to that of phase 1 as far as the LHR is concerned. The differences with phase 1 are given below:

- Rather than taking 1 spectra of CO2/H2O every 30s, the LHR measures 1 spectra of CO2/H2O and 1 spectra of CH4/H2O/N2O(?) every minute.
- The start date of the campaign had to be deferred to the 28th April 2018 due to a large amount of hardware work required for installation of the second channel for CH4.
- We anticipate measuring until end of October 2018.
- A technical issue supposedly related to alignment drift on the CH4 channel was detected at the end of May 2018. A solution was attempted remotely unsuccessfully. A RAL scientist was sent for repair at the end of July and the problem addressed. Consequently, there is no LHR CH4 data for June and July 2018.
- In order to facilitate full remote operation, changes have been made to allow remote switch on and off. As a result, the only local support needed is to change a dry nitrogen cylinder approximately every 5 months.
- As a result of enabling full remote operation, the measurement plan is to measure as many sunny days as possible.

New features in the hardware will require a change of the L0 to L1 processor, which will likely delay the delivery of full dataset.

Applicable documents

6 Reference documents

Statement of Work: Fiducial Reference Measurements for Ground-Based FTIR Greenhouse Gas Observations (FRM4GHG) Prepared by: T. Fehr/B. Bojkov (EOP-GMQ), Reference: ESA-EOPG-MOM-SOW-0007

FRM4GHG deliverable D2.3: Description of measurement strategy to ensure comparable observations, made available via the project website **http://frm4ghg.aeronomie.be/index.php/outreach/deliverables**

FRM4GHG deliverable D2.5: Retrieval strategy & Intercomparison strategy and protocol, made available via the project website **http://frm4ghg.aeronomie.be/index.php/outreach/deliverables**

FRM4GHG deliverable D1 Phase 2: Campaign site and instrument definition, draft

FRM4GHG deliverable D2 Phase 2: Technical note: Measurements and Retrieval evolution, draft