Fiducial Reference Measurement for Greenhouse Gases (FRM4GHG) for the validation of satellite missions

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Calibration (Cal) and validation (Val) form an integral part of a global integrated Earth observation data system for ensuring that it provides reliable information on the measured variable. The Quality Assurance Framework for Earth Observation (QA4EO) provides a set of principles, guidance, and specific tools to encourage provision of internationally consistent quality indicators on the delivered data. It requires Cal/Val of satellite data through an independent data set providing comparable observations. Therefore, the independent data itself and the associated

uncertainties must be fully characterized and documented in compliance with the QA4EO principles. This reference independent data is agreed by the community and ideally tied to the international system of units (SI), and are referred to as the Fiducial Reference Measurements (FRM).

In this context ESA initiated the FRM4GHG project in 2016 to create high quality reference measurements of greenhouse gases for supporting satellite validation. As part of this project several portable instruments were tested and their data products compared against a collocated reference TCCON data set and in-situ AirCore measurements. The multi-year campaign proved to be greatly beneficial for several of the tested instruments which have been improved significantly during the campaign, for some other instruments further improvements are still ongoing for bringing them to the level of FRM.

The goal is to bring the instruments capable of providing GHG data of FRM quality under the umbrella of the COllaborative Carbon Column Observing Network (COCCON). While the instrument modifications are performed by the operating institutes, COCCON’s central facility hosted by KIT is supporting the extension of the data processing software to ingest and analyze the measurements from various compact FTIR instruments and do centralized processing thereby avoiding processing related differences. In this presentation, we will show the results of the FRM4GHG project highlighting the benefits of the selected set of instruments joining the campaign, steps to be taken for the new compact FTIR operators to achieve FRM quality data and how such a suite of independent, fully characterized and traceable measurements can be used for the validation of greenhouse gases measured by traditional and new space satellite missions.
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IWGGMS-20 Workshop
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