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The Collaborative Carbon Column Observing Network (COCCON): Current status

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Precise measurements of atmospheric abundances of greenhouse gases (GHGs), especially carbon dioxide (CO_2) and methane (CH_4), are of utmost importance for the estimation of emission strengths and flux changes. Furthermore, these measurements offer the prospect of being usable for the evaluation of emission reductions as specified by international treaties, e.g. the Paris COP21 agreement.

The existing Total Carbon Column Observing Network (TCCON) measures column-averaged dry air mole fractions of CO_2 (XCO_2) and CH_4 (XCH_4) with reference quality. However, the instruments used by this network are rather expensive and need large infrastructure to be set up as well as expert maintenance, which has to be performed on site. Therefore TCCON stations have sparse global coverage, especially in Africa, South America and large parts of Asia. Current satellites like the Orbiting Carbon Observatory-2 (OCO-2) and the Greenhouse Gases Observing Satellite (GOSAT) on the other hand offer global coverage. Nonetheless, they suffer from coarse temporal resolution and limited single measurement precision.

The Collaborative Carbon Column Observing Network (COCCON) is intended to offer a framework for operating the EM27/SUN Fourier transform infrared spectrometer. Currently, about 18 working groups are contributing to these GHG observations. We expect that COCCON will become an important supplement to TCCCON and will increase the global density of column-averaged greenhouse gas observations and due to the fact that the spectrometers are portable will especially contribute to the quantification of local sources. Therefore, the COCCON results can be used for the validation of satellite data as well (e.g. for ESAs Sentinel-5 precursor satellite, which carries the Tropospheric Monitoring Instrument TROPOMI).

For achieving an optimal network performance, as well as for traceability and accessibility of data, common standards for instrumental calibration, quality checks for new spectrometers before deployment, and finally a centralized processing and data storage facility are desirable. This framework will be provided by COCCON. Within the ongoing ESA supported project COCCON-PROCEEDS a common preprocessing tool and a centralized data handling facility (CPDHF) demonstrator is under construction. We present the already operational components of COCCON (quality checks of new spectrometers, instrumental calibration of all devices) and the current status of COCCON-PROCEEDS.