

# Atmospheric physics and chemistry

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## 1. Project description

### UV-Vis observations (main results, significance of results, progress in 2019)

The update of the UV-Visible zenith-sky instrumentation (mini-SAOZ type) that was planned in 2019 had to be postponed again unfortunately. However, progress has been made and a working system is currently in test at BIRA-IASB, ready for installation at the Jungfraujoch in early Spring 2020. Similarly, the maintenance of the MAX-DOAS system could not be realized in 2019. However, measurements could be performed during the first 6 months of 2019 using the MAX-DOAS UV channel. On this basis, HCHO and tropospheric NO<sub>2</sub> measurements could be accumulated. With the start of the ACTRIS infrastructure project, and associated funding for instrumentation dedicated to the Jungfraujoch site, we are committed to reinitiate a regular UV-Visible monitoring programme at the station. In the ACTRIS framework, BIRA is responsible for the CREGARS topical center on trace-gas remote-sensing measurements. Within CREGARS, it is also responsible for the development of a central processing unit serving the overall MAX-DOAS community. In this context, the Jungfraujoch has been identified as one of the Belgian national facilities for trace gas remote sensing UV-Visible measurements of NO<sub>2</sub>, O<sub>3</sub> and HCHO, as well as other species measured by FTIR spectroscopy (see below).

### International coordination activities (main results, significance of results, progress in 2019)

As mentioned above, BIRA-IASB is responsible in the European ACTRIS Research Infrastructure for the Reactive Trace Gases Remote Sensing (RTGRS) component, and in particular for the Topical Center for this component, called CREGARS, for which currently it is the Lead.

Together with the University of Liège and the University of Bremen, it plans to manage the CREGARS-FTIR Unit. The implementation of CREGARS-FTIR is ongoing. The FTIR instrument that is operated by the University of Liège at Jungfraujoch (which will be an ACTRIS

Swiss-Belgian National Facility) will be a beneficiary of CREGARS. The processing of the Jungfraujoch FTIR data by the CREGARS FTIR central data processing facility has already been tested successfully for future implementation. BIRA-IASB is also coordinating a Belgian federally funded project ACTRIS-BE that supports the implementation of ACTRIS at the Belgian level, during the period Dec. 2018- Dec. 2022.

BIRA-IASB is also responsible for the use of NDACC data, including the Jungfraujoch SAOZ, MAXDOAS and FTIR data for the validation of various products of the Copernicus Atmospheric Monitoring Service (CAMS), led by ECMWF. The results are reported on quarterly basis in the validation reports that are available at <https://atmosphere.copernicus.eu/user-support/validation/verification-global-services>. Jungfraujoch NDACC data are included as soon as they are submitted to the NDACC database. In addition, BIRA-IASB is in charge of the CAMS-27 contract which aims at guaranteeing a continuous rapid-delivery and quality-controlled NDACC data stream to CAMS. Since 2017, it collaborated with the University of Liège to ensure that the Jungfraujoch FTIR data matches the quality requirements for CAMS model validation: uncertainty harmonization and retrieval settings for CO, CH<sub>4</sub> and O<sub>3</sub>. Similarly, BIRA-IASB is in charge of the Sentinel-5 Precursor (S5P) operational validation service (VDAF) within the ESA S5P Mission Performance Center (MPC). In this context, BIRA-IASB coordinates the validation of the S5P products using NDACC data, including the Jungfraujoch FTIR data (see Vigouroux et al., 2018; Vigouroux et al, 2019).

In the frame of the Copernicus Climate Change Service (C3S), BIRA-IASB is responsible for the ingestion of long-term NDACC ozone, CO and CH<sub>4</sub> time series in the Climate Data Store (CDS; <https://cds.climate.copernicus.eu/>). Long-term Jungfraujoch FTIR and UVVIS ozone time series will soon become available in the CDS; Jungfraujoch FTIR CO and CH<sub>4</sub> data will follow soon after.

A proposal in the framework of the Belgian FED-tWIN initiative that aims at a long-term collaboration between University of Liège and BIRA-IASB, is being submitted: in this proposal, the Jungfraujoch FTIR data play a central role.

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## Internet data bases

The data are archived in the NDACC database (<http://www.ndacc.org/>).

Data processed for validation purposes are also submitted to the ESA CAL/VAL EVDC database at NILU (<https://evdc.esa.int/>).

All the data sets submitted in these data bases are generated using HDF GEOMS formats.

The NDACC database is 'read' by the CAMS validation server on a daily basis, for using the data for the validation of the CAMS NRT and re-analysis

products. A similar facility has been implemented for the S5P-MPC VDAF system.

## Collaborating partners / networks

Collaborations with University of Liège and NDACC partners

Collaboration with M. Chipperfield of Univ. Leeds

Both the UV-Vis and FTIR observations contribute to the international Network for the Detection of Atmospheric Composition Changes (NDACC)  
Collaboration with F. Goutail, J.-P. Pommerau and A. Pazmino of LATMOS, France (SAOZ)

Collaboration with the OMI, TROPOMI (S5P), and MetOp GOME-2 and IASI satellite communities

Collaboration with Université Libre de Bruxelles for IASI FORLI data validation

Collaboration with KNMI and S&T for the CAMS and S5P MPC Validation Server

Collaboration with CNR (Italy) and ECMWF for the delivery of NDACC data to the Climate Data Store

Strong responsibilities in ACTRIS at European and Belgian level

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