

# Atmospheric physics and chemistry

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## 1. Project description

### UV-Vis observations (main results, significance of results, progress in 2018)

Instrumentation updates that were planned in Spring 2018 had to be postponed to 2019, due to lack of resources. This concerns (1) the installation of a new compact zenith-sky system in replacement of the historical SAOZ system that has been discontinued in late 2014, and (2) the maintenance of the MAX-DOAS instrument. The latter has been operated throughout the year 2018, but measurements have been limited to the UV channel providing only HCHO and NO<sub>2</sub> data products. In order to restore the visible channel, a new spectrometer and a new CCD detector must be acquired. The detector has already been purchased and we intend to launch an order for the spectrometer in Spring 2019. On this basis, we plan for an installation campaign in summer 2019, addressing both the installation of the new mini-SAOZ zenith-sky system and the restauration of the MAX-DOAS system in its dual-channel configuration.

### International coordination activities (main results, significance of results, progress in 2018)

BIRA-IASB (C. Vigouroux) has coordinated the contribution of the NDACC FTIR ozone data, including the Jungfraujoch data delivered by University of Liège, to the Tropospheric Ozone Assessment Report (TOAR). This work has been documented in the TOAR publication by Gaudel et al., (2018) 'Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation' C. Vigouroux is also responsible for the NDACC FTIR ozone data, including Jungfraujoch, in the SPARC initiative LOTUS (Long-term Ozone Trends and Uncertainties in the Stratosphere), aiming at a better understanding of several key open issues identified by previous ozone trends assessments, most notably on the understanding of uncertainties in the trend analysis chain. The LOTUS report has been published as SPARC/IO3C/GAW Report on Long-term Ozone

Trends and Uncertainties in the Stratosphere (SPARC Report N°9, 2019).

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. C. Vigouroux has established a harmonized HCHO retrieval strategy that is adopted by all NDACC FTIR stations (Vigouroux et al., 2018).

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 next year.

BIRA-IASB is also strongly involved in the preparation of the European ACTRIS Research Infrastructure (<https://www.actris.eu/>), as coordinator of the Belgian ACTRIS consortium that includes BIRA-IASB and the University of Liège, and as representative of the European reactive trace gases remote sensing community. The Jungfraujoch station is proposed as a Swiss-Belgian National Facility

in ACTRIS including the BIRA-IASB UVVIS and ULiège FTIR monitoring activities. Belgium has committed to ACTRIS and is supporting this initiative.

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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

#### Scientific publications and public outreach 2018

##### Refereed journal articles and their internet access

De Mazière, M., A.M. Thompson, M.J. Kurylo, J.D. Wild, G. Bernhard, T. Blumenstock, G.O. Braathen, J.W. Hannigan, J.-C. Lambert, T. Leblanc, T.J. McGee, G. Nedoluha, I. Petropavlovskikh, G. Seckmeyer, P.C. Simon, W. Steinbrecht, and S.E. Strahan, The Network for the Detection of Atmospheric Composition Change (NDACC): history, status and perspectives, *Atmos. Chem. Phys.*, **18**, 4935-4964, doi: <https://doi.org/10.5194/acp-18-4935-2018>, 2018.

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##### Data books and reports

SPARC Report N°9 of The SPARC LOTUS Activity: SPARC/IO3C/GAW Report on Long-term Ozone Trends and Uncertainties in the Stratosphere, edited by I. Petropavlovskikh, S. Godin-Beekmann, D. Hubert, R. Damadeo, B. Hassler, and V. Sofieva, GAW Report No. 241, WCRP Report 17/2018, SPARC Report No. 9, doi: [10.17874/f899e57a20b](https://www.sparc-climate.org/publications/sparc-reports/sparc-report-no-9/), 2019. <https://www.sparc-climate.org/publications/sparc-reports/sparc-report-no-9/>

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