Atmospheric composition monitoring at ISSJ

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1. Project description

1.1 UV-Vis observations

Since it started its monitoring activity at the Jungfraujoch in summer 1991, BIRA-IASB has operated ground-based UV-visible remote-sensing instruments complementing the Fourier Transform Infrared spectrometers of the University of Liège. The primary focus is to monitor the long-term evolution of stratospheric ozone and nitrogen dioxide (NO2) (De Mazière et al., 1998; Hendrick et al., 2012). From 1990 until 2011, measurements were conducted using a SAOZ (Système d'Analyse par Observations Zénithales). In 2010, we added a MAX-DOAS instrument allowing to extend our atmospheric composition monitoring to the free-troposphere (Franco et al., 2015). Such data have been regularly used as fiducial reference measurements for the validation of satellite missions (e;g. Verhoelst et al., 2021; Pinardi et al., 2020).

NO_2 and O_3 column amounts were continuously monitoring until May 2016, when an instrumental breakdown forced us to interrupt the time-series. Due to lack of human resources and various problems culminating with Covid-19, the refurbishment of the UV-Vis measurement system had to be postponed until March 2022, when a new zenith-sky instrument was finally brought to the station. Since then, our ozone and NO_2 column monitoring was restarted and used to fill the NDACC data base. As part of our contribution to the ACTRIS European Research Infrastructure we also plan to upgrade our MAX-DOAS instrument. This will be done in the course of 2023.

1.2 International coordination activities

European ACTRIS Research Infrastructure (www.actris.eu), BIRA-IASB is responsible for the Reactive Trace Gases Remote Sensing (RTGRS) component, in particular for the CREGARS (Centre for Reactive Trace Gases Remote Sensing) Central Facility.

Together with the University of Liège and the University of Bremen, it manages the CREGARS-FTIR Unit. Likewise, it also manages the CREGARS-UVVIS unit in collaboration with CNRS, LATMOS, the University of Innsbruck and KNMI. The implementation of CREGARS-FTIR and CREGARS-UVVIS are ongoing.

BIRA-IASB coordinates the Belgian federal project ACTRIS-BE that supports the implementation of ACTRIS at the Belgian federal level (2018-2022). The FTIR instrument operated by the University of Liège together with the BIRA-IASB UV-Vis spectrometers at Jungfraujoch have been proposed as ACTRIS RTGRS National Facility (NF) supported by Belgium. As such they will receive operational support from CREGARS. Once CREGARS becomes operational and the Jungfraujoch RTGRS NF has been labelled as an ACTRIS NF,ACTRIS target data recorded at the Jungfraujoch will also become available from the ACTRIS data portal.

As in previous years, BIRA-IASB remains in charge of the CAMS2-27 contract, which aims at providing a rapid-delivery and quality-controlled NDACC data stream to CAMS. These data including the Jungfraujoch Zenith-sky, MAX-DOAS and FTIR data are used for the validation of products from the Copernicus Atmospheric Monitoring Service (CAMS), led by ECMWF.

Similarly, BIRA-IASB is in charge of the Sentinel-5 Precursor (S5P) operational validation service (VDAF) within the ESA Atmospheric S5P Mission Performance Center (ATM-MPC). In this context, BIRA-IASB coordinates the validation of the S5P products using NDACC data, including the Jungfraujoch FTIR and UVVIS data.

Finally, 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_4 time series in the Climate Data Store (CDS; https://cds.climate.copernicus.eu/). Long-term Jungfraujoch FTIR and UVVIS ozone time series should be available soon in the CDS; Jungfraujoch FTIR CO and CH_4 data will follow as part of the ongoing extension of the service.

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Internet data bases

http://www.ndacc.org/ (data archival in NDACC data base)
https://evdc.esa.int/ (data archival in ESA CAL/VAL EVDC database at NILU)

Notes:

- 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

Dr. E. Mahieu, Université de Liège, Liège, Belgium
Dr. M. Chipperfield, University of Leeds, Leeds, UK
Dr. A. Pazmino, LATMOS, GuyaFrance, France
Prof. P. Coheur, Université Libre de Bruxelles, Brussels, Belgium
International Network for the Detection of Atmospheric Composition Changes (NDACC)
OMI, TROPOMI (S5P), and Metop GOME-2 and IASI satellite communities
KNMI and S&T for the CAMS and S5P MPC Validation Server
CNR (Italy) and ECMWF for the delivery of NDACC data to C3S
ACTRIS: Strong responsibilities at European and Belgian level

Scientific publications and public outreach 2022

Refereed journal articles and their internet access

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