

Name of research institute or organization:

Belgian Institute for Space Aeronomy (BIRA-IASB)

Title of project:

Atmospheric physics and chemistry

Part of this programme:

NDACC, NORS, ACTRIS, AGACC-II, GAIA-CLIM, QA4ECV, Sentinel-5 Precursor
CalVal AO

Project leader and team:

Dr. M. Van Roozendael: project leader UV-Vis

Dr. Martine De Mazière: project leader FTIR

Bart Dils, Bavo Langerock, Corinne Vigouroux, Caroline Fayt, Clio Gielen, François Hendrick, Christian Hermans, Gaia Pinardi: team scientists

Project description:

UV-Vis (main results, significance of results, progress in 2015):

Although the SAOZ instrument was damaged due to lightning in July 2014, and since then could not be reinitiated, the long-term monitoring of stratospheric NO₂ and ozone total columns has been continued throughout 2015 using the BIRA-IASB MAXDOAS instrument. In order to restore the continued zenith-sky measurements, it has however been decided to replace the old SAOZ system by a new mini-SAOZ system using a low-noise CCD-based Avantes spectrometer. This system is under development at BIRA and will be installed at the Jungfraujoch in the course of 2016. In addition to stratospheric NO₂ and ozone monitoring, MAXDOAS tropospheric trace gas measurements of NO₂, HCHO and aerosols have been performed continuously in 2015. An operational processing chain has been set up for these measurements allowing for rapid-delivery of the data within a few days after acquisition. The rapid delivery service of NO₂ profiles and ozone columns developed as part of the NORS project has also been continued in 2015, allowing for regular contribution to the Copernicus Atmospheric Monitoring Service (CAMS) validation programme. Finally the stratospheric NO₂ and ozone column measurements have been delivered to the NOAA NCEP data base as part of the BIRA contribution to the Network for the Detection of Atmospheric Composition Change (NDACC).

FTIR solar absorption spectrometry (main results, significance of results, progress in 2015):

BIRA-IASB has coordinated the analysis of ozone vertical profile trends using the NDACC FTIR data: the results have been published by Vigouroux et al. (2015) and have been reported in the WMO Scientific Assessment of Ozone Depletion 2014. The Institute is now coordinating the contribution of the NDACC FTIR ozone data to the Tropospheric Ozone Assessment Report (TOAR). This study should be published by the end of 2016. The Jungfraujoch FTIR ozone data delivered by University of Liège have been included in both studies.

UV-VIS and FTIR solar absorption spectrometry (main results, significance of results, progress in 2015):

Starting in March 2015, BIRA-IASB is involved in the H2020 GAIA-CLIM (Gap Analysis for Integrated Atmospheric ECV CLimate Monitoring) project which is aiming at improving our ability to use ground-based and sub-orbital observations to characterize satellite observations for a number of atmospheric Essential Climate Variables (ECVs). Work being undertaken by BIRA-IASB to establish fully traceable reference-quality measurements for

total ozone using ground-based UV-visible spectroscopy and for O₃ and H₂O profile measurements using ground-based FTIR solar absorption spectrometry will have an impact on such measurements being performed at the Jungfraujoch.

In the frame of the EU QA4ECV project (Quality Assurance for ECV products), BIRA-IASB is leading a task for characterizing and establishing MAXDOAS tropospheric NO₂ and H₂CO column measurements as well as NDACC and TCCON FTIR CO profile measurements as traceable reference data sets for satellite validation. The Institute is in contact with the University of Liège to include the Jungfraujoch NDACC FTIR CO data in this reference data set.

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 (MACC/CAMS). The results are reported on quarterly basis in the validation reports that are available at https://atmosphere.copernicus.eu/quarterly_validation_reports. Jungfraujoch NDACC data are included as soon as they are submitted to the NDACC database.

Key words:

Atmospheric composition, long-term monitoring, optical remote sensing, vertical inversion methods, satellite and model validation

Internet data bases:

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- The data are archived in the NDACC database (<http://www.ndacc.org/>), in the NADIR/NILU database (<http://www.nilu.no/projects/nadir>).
 - Data processed for ENVISAT validation purposes are also submitted to the ENVISAT CAL/VAL database (<http://nadir.nilu.no/calval>).
 - Revised HDF GEOMS formats for UV-Vis DOAS and FTIR data products have been implemented at the NDACC data base, as a contribution to the NORS and QA4ECV project.
 - In the framework of NORS, a Rapid-Delivery submission system has been implemented for several NDACC sites (among them Jungfraujoch), by which measurements are provided to the data base within 1 day to 1 month after data acquisition.

Collaborating partners/networks:

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- Collaborations with University of Liège and NDACC partners
 - Collaboration with European FTIR and UV-Vis teams and modelling teams in the frame of the EU project NORS
 - 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 B. Buchmann, D. Brunner, S. Henne, S. Reimann and M. Steinbacher of EMPA (NORS and ACTRIS projects)
 - Collaboration with F. Goutail, J.-P. Pommerau and A. Pazmino of LATMOS, France (SAOZ)
 - Collaboration with the OMI, TROPOMI, ACE and MetOp GOME-2 and IASI satellite communities
 - Collaboration with Université Libre de Bruxelles for IASI FORLI data validation
 - Collaboration with S&T for the NORS and QA4ECV Validation Server

Scientific publications and public outreach 2015:

Refereed journal articles and their internet access

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