

Name of research institute or organization:

Belgian Institute for Space Aeronomy (BIRA-IASB)

Title of project:

Atmospheric physics and chemistry

Project leader and team:

Dr. Martine De Mazière: project leader FTIR

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

Brice Barret, Caroline Fayt, François Hendrick, Christian Hermans, Jean-Christopher Lambert: team scientists

Pierre Gérard, José Granville: team support engineers

Project description:

UV-Vis (main results, significance of results, progress in 2001)

BIRA-IASB operates a zenith-sky looking UV-visible spectrometer installed on the Sphinx platform since June 1990. Of the French CNRS SAOZ (Système d'Analyse par Observations Zénithales) design, this instrument has been qualified for operation within the international NDSC (Network for the Detection of Stratospheric Changes). Twice daily at twilight, it provides measurements of the ozone and nitrogen dioxide total columns suitable for long-term climatological studies and for satellite validation. In 2001, the homogenised 1991-2000 time-series of NO₂ observations have been used to test results from the three-dimensional chemical transport model of the University of Leeds (SLIMCAT). The study shows that the model is able to simulate the daily and seasonal variations of the stratospheric NO₂ column as well as the impact of volcanic aerosols, but that it fails to correctly reproduce the observed long-term evolution of NO₂.

FTIR solar absorption spectrometry

BIRA-IASB participates in the observations of the atmospheric composition by Fourier transform infrared spectrometry coordinated by the University of Liege (see report by ULg). In 2001, BIRA has focused on the development and characterisation of vertical inversion techniques. It has been demonstrated for ozone that one can derive reliable profile information from the ground up to about 40 km altitude. The procedure is being extended for other species like N₂O, CH₄, CO... This shows that the FTIR spectrometry has a unique capability to derive tropospheric abundances for a number of species for which hardly any other experimental data exist at present. Long-term records will be re-analysed using the vertical inversion methods.

Key words

Ozone, nitrogen dioxide, atmospheric composition, long-term monitoring, optical remote sensing

Collaborating partners/networks:

Collaborations with University of Liège, and NDSC partners.

Both the UV-Vis and FTIR observations contribute to the NDSC, international Network for Detection of Stratospheric Change. The data are archived in the NDSC

database (<http://www.ndsc.ncep.noaa.gov/>) and in the NADIR/NILU database (<http://www.nilu.no/projects/nadir>).

Scientific publications and public outreach 2001:

De Mazière, M., Invited seminar at the Institut für Meteorologie und Klimaforschung, Forschungszentrum Karlsruhe, Trace gas measurements at the Jungfraujoch by Fourier transform infrared and UV-Visible spectrometry, Jan. 16, 2001.

Barret, B., M. De Mazière, E. Mahieu, and P. Demoulin, Characterisation of ozone profiles retrieved from solar infra red spectra at the jungfraujoch, poster presented at the EGS XXVI Assembly, Nice, March 25-30, 2001

Barret, B., M. De Mazière, P. Demoulin, Retrieval and characterisation of ozone profiles from solar infrared spectra at the Jungfraujoch, poster presented at the NDSC 2001 Symposium, Arcachon, Sept. 24-27, 2001.

Demoulin, P., E. Mahieu, R. Zander, B. Rognerud, I. Isaksen, and M. De Mazière, The NO_y budget above the Jungfraujoch: Long-term evolution, family partitioning and model comparison, poster presented at the NDSC 2001 Symposium, Arcachon, Sept. 24-27, 2001.

Barret, B., M. De Mazière, P. Demoulin, Retrieval and characterisation of ozone profiles from solar infrared spectra at the Jungfraujoch”, submitted to JGR, 2001.

Van Roozendael, M., F. Hendrick, M. De Mazière, D. Fonteyn, B.-M. Sinnhuber, and M. Chipperfield, Comparison between time-series of measurements and 3D model simulations of NO₂ slant columns at Jungfraujoch (46°N), Observatoire de Haute Provence (44°N) and Harestua (60°N), poster presented at the NO_x/NO_y workshop, Heidelberg, Germany, 19-22 March 2001.

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