GATO-CLUSTER

QUILT is a part of the GATO (Global Atmospheric Observations) cluster of the European Commission. GATO is a cluster of five European Commission projects and a number of nationally funded projects that further our understanding of the atmospheric chemistry processes which affect ozone depletion. The projects are in support of the Montreal and Kyoto Protocols. The main objective of the research in this cluster is to link together scientists involved in making atmospheric chemistry measurements to obtain accurate broad European or global coverage of ozone and related species.
http://www.ozone-sec.ch.cam.ac.uk/clusters/Gato_Website/GATO_index.htm

The VINTERSOL campaign

Validation of INTER-national Satellites and study of Ozone Loss (VINTERSOL) is a major European field campaign studying stratospheric ozone. VINTERSOL ("Winter sun" in the Scandinavian languages) will take place from late 2002 until mid 2004. It is the latest major European field campaign to study ozone loss. There have been three previous European campaigns: EASOE, SESAME, and THESEO. Like them, VINTERSOL relies jointly on support from national funding agencies and from the Environment and Sustainable Development programme of EC DG Research. QUILT is one of several projects that constitute the VINTERSOL campaign. More information on VINTERSOL can be found at http://www.ozone-sec.ch.cam.ac.uk

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CNRS-SA: Service d'Aéronomie, CNRS, Paris, France

UNI-HEIDELBERG: University of Heidelberg, Germany

UNI-LEEDS: University of Leeds, School of the Environment, United Kingdom

NERC-BAS: NERC-British Antarctic Survey, Cambridge, UK

INTA: National Institute of Aerospace Technology, Torrejón de Ardoz, Spain

SRON: National Institute for Space Research, Utrecht, The Netherlands

CNR-ISAC: Institute of Atmospheric Sciences and Climate, Bologna, Italy

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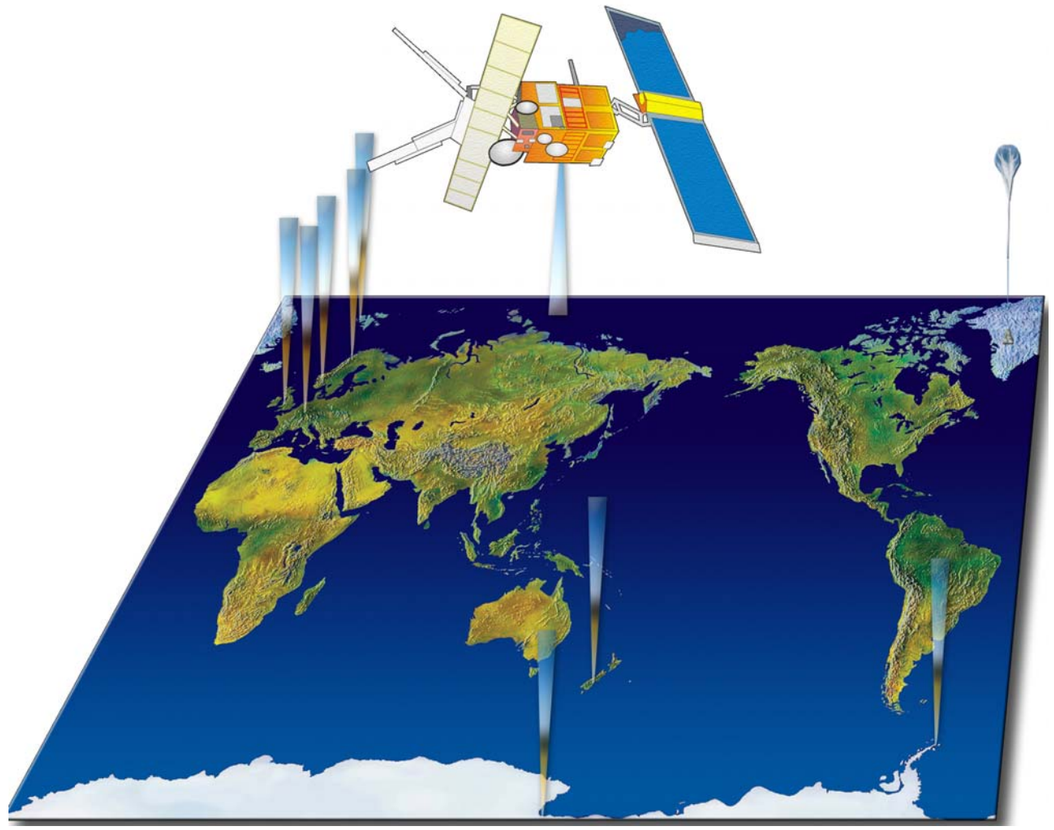
NADIR.NILU.NO/QUILT/

April 2004

QUILT

Quantification and Interpretation of Long-Term UV-Visible Observations of the Stratosphere



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Project Duration: (01.01.2001 - 30.06.2004)

http://nadir.nilu.no/quilt/

Observations

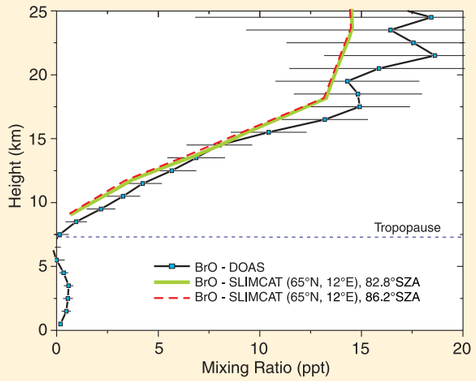
This work involves the creation of a homogeneous, quality controlled data set from the existing O_3, NO_2, BrO, and OClO data from ground-based zenith-sky, balloon and GOME satellite measurements.

Ground-based Network

The existing UV-Vis data products from ca. 30 NDSC and other measurement sites are undergoing re-evaluation with updated analysis procedures. The global distribution of the measurement sites provides a pole-to-pole coverage spanning more than a decade in many cases. Main data products include: total columns of ozone and NO_2, NO_2 profiles, and slant column BrO, OClO and IO. The analysis of off-axis DOAS data assists in the delineation of tropospheric and stratospheric contributions in the total column data.

Balloon Data

Balloon-borne measurements are a necessary complement to ground-based and satellite data sets by providing information on the vertical distribution of the measured constituents. Balloon-borne DOAS/SAOZ data from over 100 balloon flights representing different geophysical conditions (latitudes and seasons) will be analysed and eventually reprocessed. The main focus is on the consolidation of existing series of balloon measurements of O_3, NO_2, BrO and OClO vertical profiles. This information provides very useful input both for chemical transport models (CTMs) and radiative transfer models (RTMs) and for the interpretation of the ground-based and satellite data. The figure to the left shows an example of an intercomparison of a measured and modelled BrO profiles.



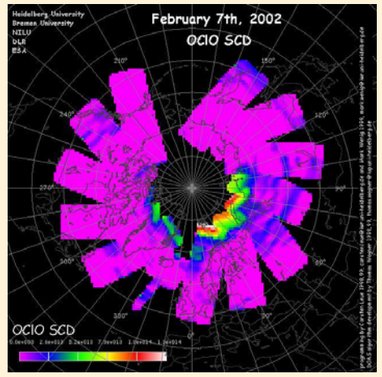
Balloon-borne DOAS flight in Kiruna, on February 18, 2000. (University of Heidelberg, University of Leeds).

GOME on ERS-2

To achieve a more comprehensive global coverage of atmospheric components, much emphasis has been put on the utilisation of satellite-borne instrumentation. The Global Ozone Monitoring Experiment (GOME) on the second European Remote Sensing Satellite (ERS-2) was the first instrument capable of providing information on the global distribution of halogen species and NO_2. Optimised spectral analysis methods, developed in QUILT for GOME, will lead to better understanding of atmospheric trends, and set the course for analysis methods needed for future related space-borne systems such as SCIAMACHY onboard ENVISAT.

NRT GOME/Ground-based Data

Near real-time (NRT) data will be presented via the project web sites. NRT data are produced for three consecutive winter periods to the scientific community to assist short-term logistical planning and post-campaign data interpretation. GOME NRT maps of total column ozone, NO_2, BrO, HCHO, SO_2, ozone profiles, slant column OClO and meteorological data are presently available. A maximum of 14 daily GOME orbits as well as ground-based data from stations in the Arctic are made available through the Quilt web site. Below, an example of NRT slant column OClO from GOME on 7 February 2002 is shown.



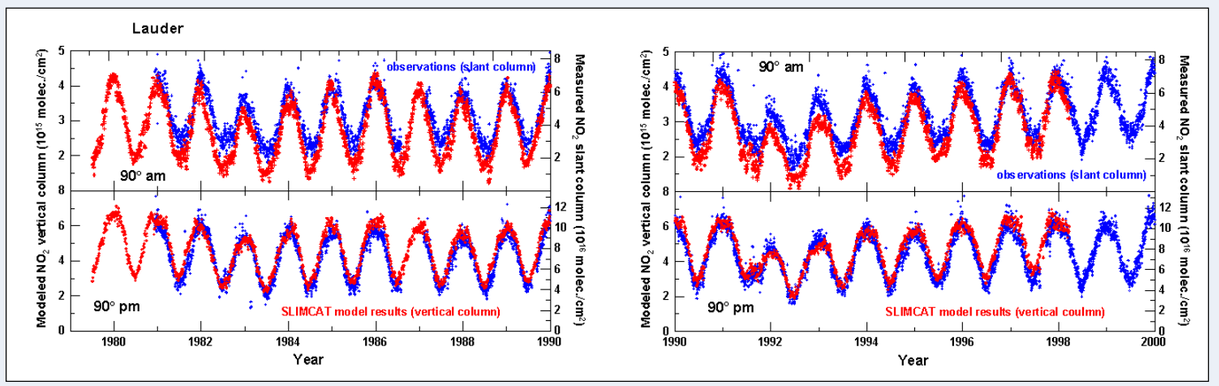
NRT slant column OClO from GOME for 7 February 2002.

Modelling

The aim of the modelling work is to gain a better understanding of potentially important processes that can then be applied in models for longer-term studies.

3-D Chemical Transfer Models

The main objective is to use the established measurement data set for the validation and optimisation of 3-D atmospheric models for the study of seasonal variations and trends of ozone and related species in the stratosphere. Three CTMs (SLIMCAT, REPROBUS and TM5) participate in QUILT. Improved data sets will be made available for the validation of these CTMs. Special focus is put on nitrogen and halogen chemistry in the lower stratosphere both in polar regions and on the global scale. Both short- and long-term studies will be conducted to test current theory of ozone loss. Active interaction with 3-D CT modelling groups within the project ensures a thorough assessment of current knowledge within the field. In the figure below, the 20-year record of slant column NO_2 above Lauder, New Zealand is plotted together with a model simulation from SLIMCAT. Such work is central to the understanding of long-term trends of stratospheric species. In addition, much effort has also been put into the development of radiative transfer models. This leads to a greatly improved method of comparing model results to measurements.



Radiative Transport Models

The development, comparison and optimisation of radiative transfer (RT) models is of central importance in order to facilitate proper comparison between column measurements and CTM results. A central goal is the development of validated software tools that enable conversion of slant to total column amounts that are based on realistic atmospheric profiles. In QUILT, the participation of six RT models ensure a best possible validation of CT models and a high quality assessment of trends of relevant stratospheric species. New developments entail the inclusion of chemical box model output which simulate diurnal variations of BrO, NO_2 and OClO. This greatly enhances the applicability of radiative transfer models for chemically active species. The result will be the definition of an optimised differential slant column density (DSCD) model interface that can be coupled to project 3-D CTMs.