

Remote Sensing of Atmospheric Constituents from Space ACCENT-TROPOSAT-2 (AT2)

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Air Pollution, Satellites and AT2

The second half of the twentieth century was marked by the realisation that air pollution was indeed a global phenomenon and that detailed global information about the amounts and distributions of key atmospheric constituents and parameters is required to assess our current knowledge of the Earth-atmosphere system. Using remote sensing instrumentation on board orbiting satellites, it is now possible to obtain global information for tropospheric trace substances and air pollutants.

AT2 is an ACCENT integration task addressing the need for global information about trace atmospheric constituents. The principal objective of AT2 is the co-ordination and optimisation of the efforts of European scientists in the retrieval of the data products for tropospheric research from the measurements by instrumentation aboard orbiting satellite platforms.

The new launch of EUMETSAT Metop-1, having the instruments GOME-2 and IASI on board is providing a further impetus to European coordination, since these are providing further data on tropospheric trace constituents, which will need to be integrated with those already being obtained from ENVISAT.

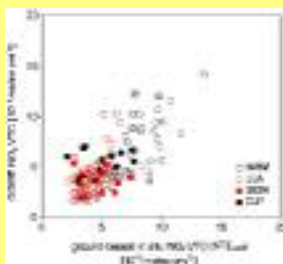
Remote Sensing of NO₂ from Space the AT2 e-learning Module



The module was constructed in response to a request from ACCENT Education and training. It is intended to introduce new research students to the fundamentals and practice of retrieving tropospheric compositions from satellite measurements. The module makes extensive use of static pages presenting the material and a variety of exercise types to allow the student to test his or her comprehension. The module can be viewed and tried out via a link on the AT2 web page and the ACCENT web portal.

Annette Lodstätter-Weißmayer, Andreas Richter, Maria Kanakidou, Richard Law and Peter Borrell

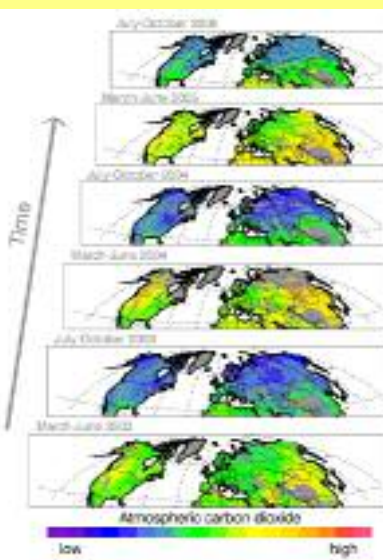
Validation of GOME results



Clear sky (pixel cloud fraction ≤ 0.1) direct comparison between GOME NO₂ and ground-based NO₂ VTCs showing the four seasons MAM, JJA, SON and DJF.

Daniel Schaub and Brigitte Buchmann
EMPA, CH. AT2 Task Group 3

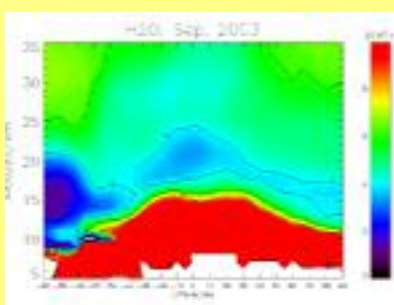
The Earth's Breath



A sequence of images from spring 2003 to autumn 2005 showing the variation of CO₂ in the northern hemisphere. The decrease in CO₂ in the growing seasons can readily be seen.

Images prepared by Michael Buchwitz (IUP, Bremen) from SCLAMACHY/ENVISAT data. AT2 Task group 1

Water vapour retrieval and modelling



Zonal mean distribution of water vapour mixing ratio (in ppm) for September 2003 as retrieved from the ENVISAT MIPAS measurements. White areas indicate regions where no measurements are available.

Mathias Milz, Karlsruhe AT2 Task Group 2

AT2 Task Groups

The scientific work of AT2 is divided between three task groups. Each group consists of a number of principal investigators who contribute to the scientific activities of the integration task.

TG1 The development and improvement of algorithms for the retrieval of tropospheric data. The task group is divided into three groups specialising in aerosols, infra-red measurements and UV/Visible measurements.
Leader: Thomas Wagner, Uni-Heidelberg; 35 PIs

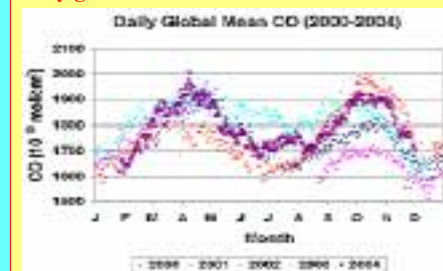
TG2 The synergistic use of models and observations to improve our understanding of tropospheric chemistry and dynamics.
Leader: Martin Dameris, DLR, Oberpfaffenhofen; 14 PIs

TG3 The development of validation strategies for tropospheric satellite data products using existing data.
Leader: Ankie Piters, KNMI, de Bilt; 13 PIs

E-learning

There is also a group which has developed an e-learning module to instruct Masters and Ph.D. students in the remote sensing of NO₂.
Leaders: Maria Kanakidou, ECPL-Uni-Crete, Annette Lodstätter-Weißmayer, Uni-Bremen

Daily global mean CO columns from MOPITT



The total CO columns show a double peak structure, one in April-May and the other in October-November. The first peak is primarily due to the seasonal maximum in the northern hemisphere; the second is attributed to the extensive biomass burning in the southern hemisphere. However there are considerable variations from year to year because of significant events that influence the global total. In particular, the winter and spring of 2002/2003 show anomalously high CO loadings resulting from fires in Russia.

Jim Drummond, Uni-Toronto AT2 Task group 1

AT2 Meetings and Workshops

Forthcoming meetings

- Sept 2007 Tropospheric NO₂ workshop, KNMI, de Bilt (AT2 supported)
- Nov. 2007 4th Barnsdale Meeting (CCAQ) (AT2 supported)
- Nov. 2007 H₂O retrieval workshop, Oberpfaffenhofen (AT2 supported)
- June 2008 7th AT2 workshop, Finland

Earlier Meetings

- Nov. 2005 Cloud retrieval workshop, Toulouse (AT2 supported)
- Mar. 2006 3rd Int. DOAS Meeting, Bremen (AT2 supported)
- April 2005 IGACO Data Assimilation, Geneva (AT2 supported)
- June 2006 5th AT2 workshop, Heraklion
- Sept. 2006 Dandelions follow-up campaign (AT2 supported)
- Nov. 2006 3rd Barnsdale Meeting (AVOC) (AT2 supported)
- Nov. 2006 IR retrievals, Paris (AT2 supported)
- June 2007 6th AT2 workshop, Bremen
- June 2007 Aerosol retrievals, Bremen (AT2 supported)

