

Information from the German SCIAMACHY Validation

Environmental Research at 32 km altitude

German scientists on ESA balloon campaign in Northern Sweden

From February, 26th to April, 4th 2003, a balloon campaign dedicated to the validation of instruments of the ENVironmental SATellite ENVISAT and coordinated by the European Space Agency (ESA) took place from Esrange close to Kiruna in Northern Sweden. ENVISAT was successfully launched by an Ariane-5 rocket at the beginning of March 2002. On-board, 10 ultra-modern sensors are installed. Two of them are the atmospheric instruments SCIAMACHY (Scanning Imaging absorption Spectrometer for Atmospheric Chartography) and MIPAS (Atmospheric Sounder passive Middle Infrared). With these optical sensors worldwide phenomena like the stratospheric ozone hole and the emission of greenhouse gases into the atmosphere can be investigated from space. Also the extent of air pollution through human and natural processes like emissions from industry and traffic, by forest fires, volcano eruptions, and lightnings will be examined .

At this validation campaign also German researchers of the University of Heidelberg, Bremen and Frankfurt as well as scientists of the research centers in Karlsruhe and Jülich were involved.

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The first German balloon flight during the campaign in Northern Sweden took place on the March, 6th 2003. With the so-called TRIPLE payload scientists of Jülich, Frankfurt, Bremen and Heidelberg were able to measure different trace gases of the atmosphere.



Preparation of the Ballon with the TRIPLE payload

The TRIPLE payload consists of four instruments for the measurement of atmospheric trace gases: a Cryogenic whole Air Sampler of the University of Frankfurt, for long living tracers like CH_4 , N_2O and chlorofluorocarbons; a Lyman alpha hygrometer (FISH) to determine water vapour (FZ Jülich); an instrument to investigate ClO/BrO and a Tunable Diode laser (TDL), which can measure water vapour and methane (Universities of Heidelberg and Bremen).

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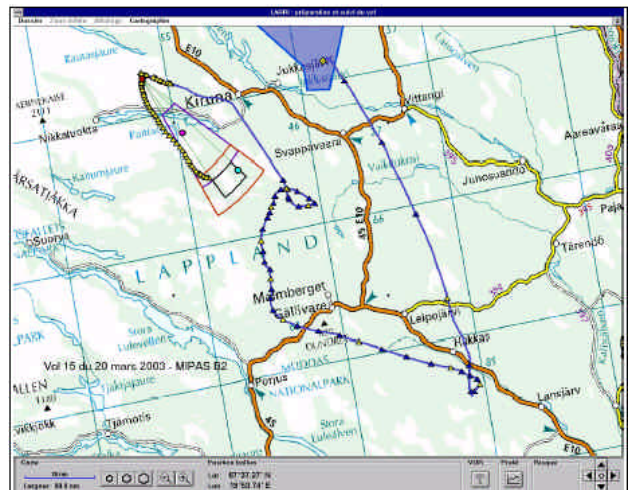
Another balloon belonging to the Institute for Meteorology and Climate Research (IMK) at the Karlsruhe Research Center was launched from Esrange on the March, 20th 2003.



With a Michelson Interferometer for passive Atmospheric Sounding – Balloon version (MIPAS-B) a number of trace gases, like NO₂, methane and water vapour were determined. The flight duration was 15 hours and the ceiling altitude was about 32 km.

MIPAS-B gondola ready for launch

MIPAS-B utilizes the same technology as MIPAS on-board ENVISAT and is able to determine a number of trace gases through the thermal radiation of molecules.



MIPAS-B flight track on 20-21 March 2003

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Since 1996, scientists of the Institute for Environmental Physics (IUP) have a German-French cooperation with the Laboratoire de Physique Moléculaire et Application of the University of Paris VI (Paris/France). Both institutes launch large balloons from various sites into the stratosphere.

The balloon experiment in Kiruna consisted of a 570 kg gondola carried by a 150,000 m³ balloon up to an altitude of about 32 km. The payload of this balloon started on March the 23th 2003, consisted of a Limb Profile Monitor of the Atmosphere (LPMA) from Paris, a Differential Optical Absorption Spectrometer (DOAS) operated by Heidelberg and a Cryogenic Atmospheric Emission Spectro-Radiometer (CAESR) of the University of Denver.



Start des Ballons in Kiruna am 23.3.2003

Bremen scientists used this experiment to do a radiometric calibration of the LPMA and DOAS instruments to validate the sun measurements of SCIAMACHY.

Numerous traces gases, like O₃, NO₂, HNO₃, CO, CH₄, N₂O, BrO could be measured and after detailed analysis they will be available for the validation of SCIAMACHY.

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The campaign was completed by measurements of air-borne instruments onboard the German research aircraft Falcon (DLR) and the international platform Geophysica. The scientific payload of the Falcon comprises passive remote sensing instrumentation operating in the UV visible (AMAXDOAS), and the microwave (ASUR) spectral regions, as well as an advanced LIDAR system (OLEX). Onboard the Geophysica, besides a Lidar system, a set of in-situ instruments analysis directly the ambient air.

Preparation
of the joint
flight:
Falcon (in
front, right
side),
Geophysika
(back, left
side)



The German participation in this campaign is a German contribution to the validation of SCIAMACHY and EnviSat. In total this German research programme comprises 23 projects with more than 60 scientists. This work is supported by German Aerospace Center (DLR) and German Federal Ministry of Education and Research (BMBF). Further information can be found under:

<http://www.iup.physik.uni-bremen.de/gcvos>.