

Name of research institute or organization:

FREETEX 2001 (see below for individual organisations)

Title of project:

Free Troposphere Experiment 2001 – studying the photochemical processes controlling ozone lifetime and production rates in the free troposphere.

Project leader and team:

University of East Anglia:

Dr. Timothy Green, project leader, Dr. Graham Mills, Dr. Neil Brough, Prof. Stuart Penkett

University of Leicester: Dr. Andrew Rickard, Dr Paul Monks

University of York: Dr. Lucy Carpenter

University of Leeds: Dr. Alastair Lewis, Ruth Purvis, Dr. Jim McQuaid

University of Bern: Dr. Prodromos Zanis, Dr Evi Schuepbach

Project description:

FREETEX 2001 – The Free Troposphere EXperiment, builds on two successful earlier FREETEX experiments run at the Jungfraujoch Observatory in 1996 and 1998, this latest experiment being conducted as part of TROTREP.

The goals of FREETEX 2001 are to map out the chemical changes in the free troposphere as the atmosphere transitions from winter to spring. It is hoped to begin to understand the chemical conditions that influence the lifetime of ozone and understand more about the productivity of this region of the atmosphere with respect to in-situ production of ozone. How the free troposphere responds to changing levels of pollution could be critical to the development of future abatement strategies.

We added to the suite of chemical instrumentation deployed in the previous experiments, the most significant enhancement being a comprehensive suite of hydrocarbon measurements provided by the University of Leeds and a Spectral Radiometer provided by the University of Leicester.

Another opportunity presented by the experiment was to use the free-tropospheric location of the Jungfraujoch to test an improved, free radical instrument (a Peroxy Radical Chemical Amplifier or Perca) being developed jointly by the University of East Anglia and the University of Leicester. The ability to sample free tropospheric air for long periods of time, combined with the project teams' past experience in making peroxy radical measurements with the Perca technique at the Jungfraujoch, made the site a logical location for such tests.

The experiment was slightly detrimentally affected by particularly unseasonal, warm weather, but the long duration of the experiment meant that in spite of that we had periods of clear sky, free-tropospheric conditions which are crucial to getting useful photochemical data.

The main progress in 2001 has been the establishment of a comprehensive database of the experimental data which will allow all the institutions involved to begin detailed analysis of the data.

Key words

Photochemistry, ozone, peroxy radicals, free troposphere.

Collaborating partners/networks:

Project members (TROTREP)

Scientific publications and public outreach 2001:

Schuepbach E., T.K. Friedli, P. Zanis, P.S. Monks, and S.A. Penkett. State space analysis of trends and seasonalities of lower free tropospheric ozone (1988-1997) at the high elevation site at Jungfraujoch; *Journal of Geophysical Research*, 106(D17), 20,413-20,427, 2001.

Schuepbach E., S.S. Liebermann, D. Schneiter, P. Zanis, P. Jeannet, P.S. Monks, and S.A. Penkett. Establishing the transport history of trace gases measured in the Alps. *Atmospheric Environment*, submitted, 2001.

P. Zanis, P. S. Monks, E. Schuepbach, L. J. Carpenter, T. Green, G. Mills, and S. A. Penkett, Photochemical control of ozone on a seasonal basis at the Jungfraujoch based on observations and model calculations, in *Proceedings "A Changing Atmosphere"-8th European Symposium on the Physico-Chemical Behaviour of Atmospheric Pollutants*, Torino, Italy, 17-20 September 2001, in press, 2001.

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