Name of research institute or organization:

Institute of Applied Physics, University of Bern

Title of project:

Microwave remote sensing of the middle atmosphere

Project leader and team:

Prof. Niklaus Kämpfer, project leader
Dr. Dietrich Feist, Daniel Gerber, Vladimir Vasic

Project description:

The research topic of our group is to investigate middle atmospheric constituents by means of microwave radiometry. Depending on the tropospheric opacity in the microwave region it is possible to detect rotational transition lines from the ground, e.g. from sites at low altitude. Some molecular lines however are so weak that observations from high altitudes are required in order to avoid attenuation of the middle atmospheric signal by tropospheric water vapour.

Under favorable conditions it is possible to measure water vapor in the middle atmosphere in the microwave region from the Jungfraujoch site. Two microwave radiometers have been operated on Jungfraujoch in the past: AMSOS and EMCOR. AMSOS operates at a frequency of 183.31 GHz in order to measure the rotational line of watervapor, H_2O. It is an uncooled receiver in contrast to EMCOR which is cooled by liquid helium in order to operate a superconducting microwave mixer thus achieving a higher signal to noise ratio. EMCOR can be used in the frequency range of approx. 200 to 210 GHz and was originally aimed at observing the ClO line at 204 GHz. It has then been tuned to 203.41 GHz for the detection of the line of the watervapor isotope H_2O^{18}.

The AMSOS instrument has been moved to Bern for a major refurbishment in order to be operated adequately from aircraft. This is a rather complex work in the field of quasioptics and this work still is pursued. The EMCOR instrument suffered from several electrical and mechanical problems, particularly in the cryostat for the liquid Helium. This instrument has been operated in the frame of a dissertation and as the Ph.D. student has to finish his thesis and no successor is yet determined, work on EMCOR has been put to a hold. It is now planned that work on EMCOR is continued at the IAP in Bern in the frame of a diploma thesis. As a consequence EMCOR probably will not be put back on Jungfraujoch before the end of 2003.

Key words

Watervapor, microwave radiometry, remote sensing,

Collaborating partners/networks:

GAW (Global Atmosphere Watch), NDSC (Network for the Detection of Stratospheric Change), Université de Bordeaux

Scientific publications and public outreach 2002:

Conference papers

Gerber D., O. Lezeaux, N. Kämpfer, *"A profile of the isotopic abundance of (18)0 in stratospheric water vapour",* EGS 27th General Assembly, Nice, France, April 2002.

Gerber, D., O. Lezeaux, A. Siegenthaler, N. Kämpfer, and G. Nedoluha. "*First Ground-Based Microwave Profiling of the Isotopic Ratio (18)O:(16)O in Stratospheric Water Vapour"*, in preparation for ACP-EGS, 2003.

Vasic V., N.Kämpfer und D.G.Feist, "AMSOS - *Airborne Millimeter- and Submillimeter Observing System*", Second International Microwave Radiometer Calibration Workshop, Barcelona, Spain, October, 2002.

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