

Name of research institute or organization:

**Air Pollution Laboratory, Swiss Federal Institute of Technology,
EPFL**

Title of project:

LIDAR project

Project leader and team:

Prof. Bertrand Calpini, project leader

Ph.D. Ioan Balin, Ph.D. Gilles Larchevêque, Dr. Valentin Simeonov, Ph.D. Remo Nessler, lidar team

Project description:

The EPFL lidar system was operated systematically (each odd week) during the year 2001 in order to take measurements of aerosols and water vapor in the upper troposphere-lower stratosphere region. Algorithms and software protocols were made and tested within the EARLINET [4] community for data base treatment in order to obtain the aerosols optical properties (backscatter and extinction coefficients at 355, 532 and 1064 nm) with a vertical resolution of 100-200m up to the lower stratosphere (10-12km ASL) [1, 5]. The EPFL lidar signal was compared to the Neuchatel Observatory lidar signal (at 532nm) during an inter-comparison campaign (7-12.05.2001 at Jungfraujoch) and the results were in very good agreement. Water vapor mixing ratio profiles (1-2h time average, 75-150m vertical resolution, detection limit $\sim 1E-2$ g/kg) were regularly measured at nighttime based on 387nm for N_2 and 408nm for H_2O Raman backscattered signals and compared to the Payerne radiosondes measurements [2,3]. The ability of this system for studying clouds/contrails or observing Saharan/volcanic "dust" events was also proven [4]. A detailed study of the aerosols microphysical properties is on going. Future developments such as temperature profiles and tropospheric/stratospheric ozone are planned.

Key words

multi-wavelength lidar system, Raman, aerosols, vertical profiles, troposphere, water-vapor mixing ratio, backscatter and extinction coefficients, Jungfraujoch site, EPFL

Collaborating partners/networks:

PSI Institute: concerning the link between "in situ" and lidar aerosols measurements

ISM: Payerne station for H_2O radiosondes measurements and Jungfraujoch station for the local meteorological parameters

Institute of Mathematics, Potsdam Univ., for algorithms calculation of aerosols size/volume distribution based on lidar signals inversion.

EARLINET project: EPFL lidar at Jungfraujoch is part of the European Aerosols Lidar Network since May 2000

GAME: H_2O network measurements: French, Swiss (IAP Bern), Italian, German, etc institutions (submitted to the European Union, Sept'2001)

NDSC: Network for Detecting Stratospheric Changes (candidature application in preparation)

Scientific publications 2001:

[1] Gilles Larchevêque, Ioan Balin, Remo Nessler, Philippe Quaglia, Valentin Simeonov, Hubert van den Bergh, and Bertrand Calpini, “**Development of a multiwavelength aerosol and water vapor lidar at the Jungfraujoch Alpine Station (3580m ASL) in Switzerland**”, Submitted to *Applied Optics*, October 2001.

[2] B. Lazzarotto, M. Frioud, G. Larchevêque, V. Mitev, P. Quaglia, V. Simeonov, A. Thompson, H. van den Bergh, and B. Calpini, “**Raman-DIAL O3 and H2O measurements in the planetary boundary layer**”; *Applied optics*, 40, 18, pp.2985-2997, 2001

[3] Ioan Balin, Gilles Larchevêque, Philippe Quaglia, Valentin Simeonov, Hubert van den Bergh, and Bertrand Calpini, “**Water vapor vertical profile by Raman lidar in the free troposphere from the Jungfraujoch Alpine Station**”, In press: *Advances in global change research*, Kluwer Academic Publishers, Dordrecht (The Netherlands) and Boston (USA), vol.9, 2001.

[4] A. Papayannis and EARLINET community, “**First continental-scale vertical profile measurements of free tropospheric Saharan dust particles performed by a coordinated ground-based European lidar network (EARLINET Project)**”, submitted to *Journal of Geophysical Research* (Nov 2001) .

[5] Gilles Larchevêque, “**Development of the Jungfraujoch multi-wavelength lidar system for continuous observations of the aerosol optical properties in the free troposphere**”, *Ph.D Thesis* to be submitted in February 2002).

[6] Francois Jeanneret, Frank Kirchner, Alain Clappier, Hubert van den Bergh, and Bertrand Calpini. **Total VOC Reactivity in the Planetary Boundary Layer, Part One: Estimation by a Pump and Probe OH Experiment**; *J. Geophys. Res.*, 106, pp. 3083-3094, 2001.

Public outreach 2001:

Guided Visits: ENVINET (April'2001), students (e.g. Uni.Bern, EPFL-DGR, etc), associations/clubs (CALISTA), and many lidar related scientists over the world (USA, Japon, etc)

TV/Radio: TSR, Tele24, Fr3, etc

Professional Photos/Videos, Clips (mpg) of lidar system at Jungfraujoch

Contribution to the “Brochure Jungfraujoch” (in preparation)

WEB dedicated site: <http://dgrwww.epfl.ch/PAS/lidar/Jungfrau.html>

Video Cassette EPFL and Lidar at Jungfraujoch (French)

Video Cassette EPFL and Lidar at Jungfraujoch (English)

CD EPFL and Lidar at Jungfraujoch (French and English, mpg clips)

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