



NDACC working group on water vapor: an operational H₂O lidar in MeteoSwiss

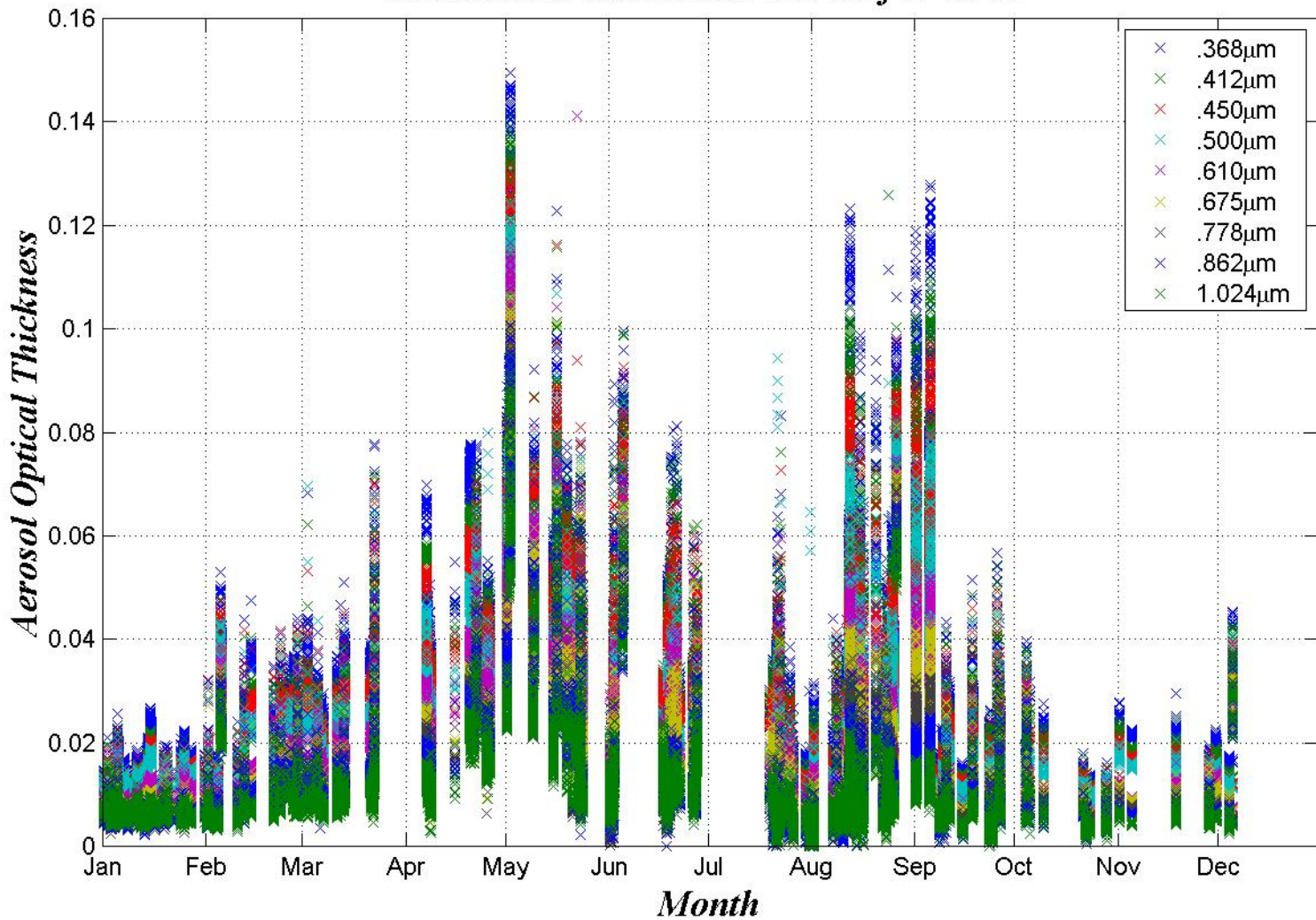
Bertrand Calpini





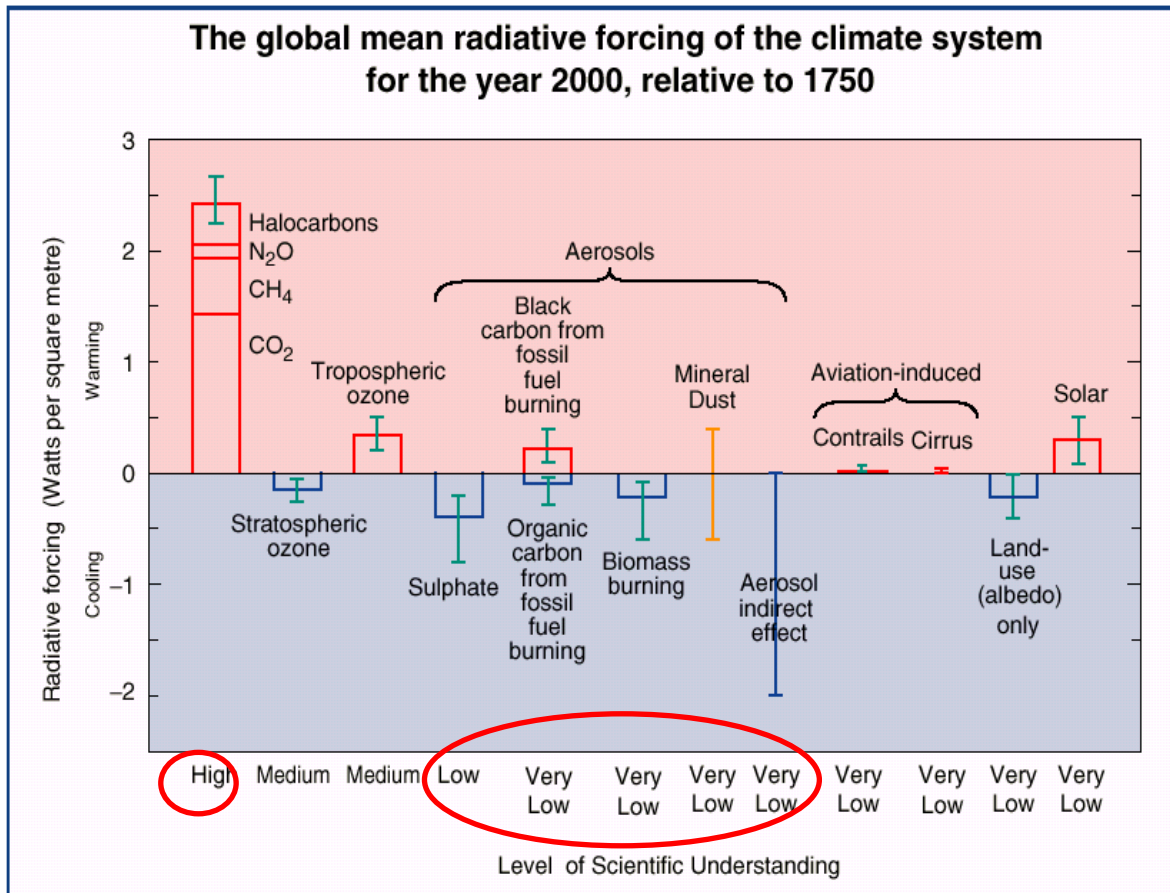


Total SunPhotometer Series for 2000





Radiative forcing

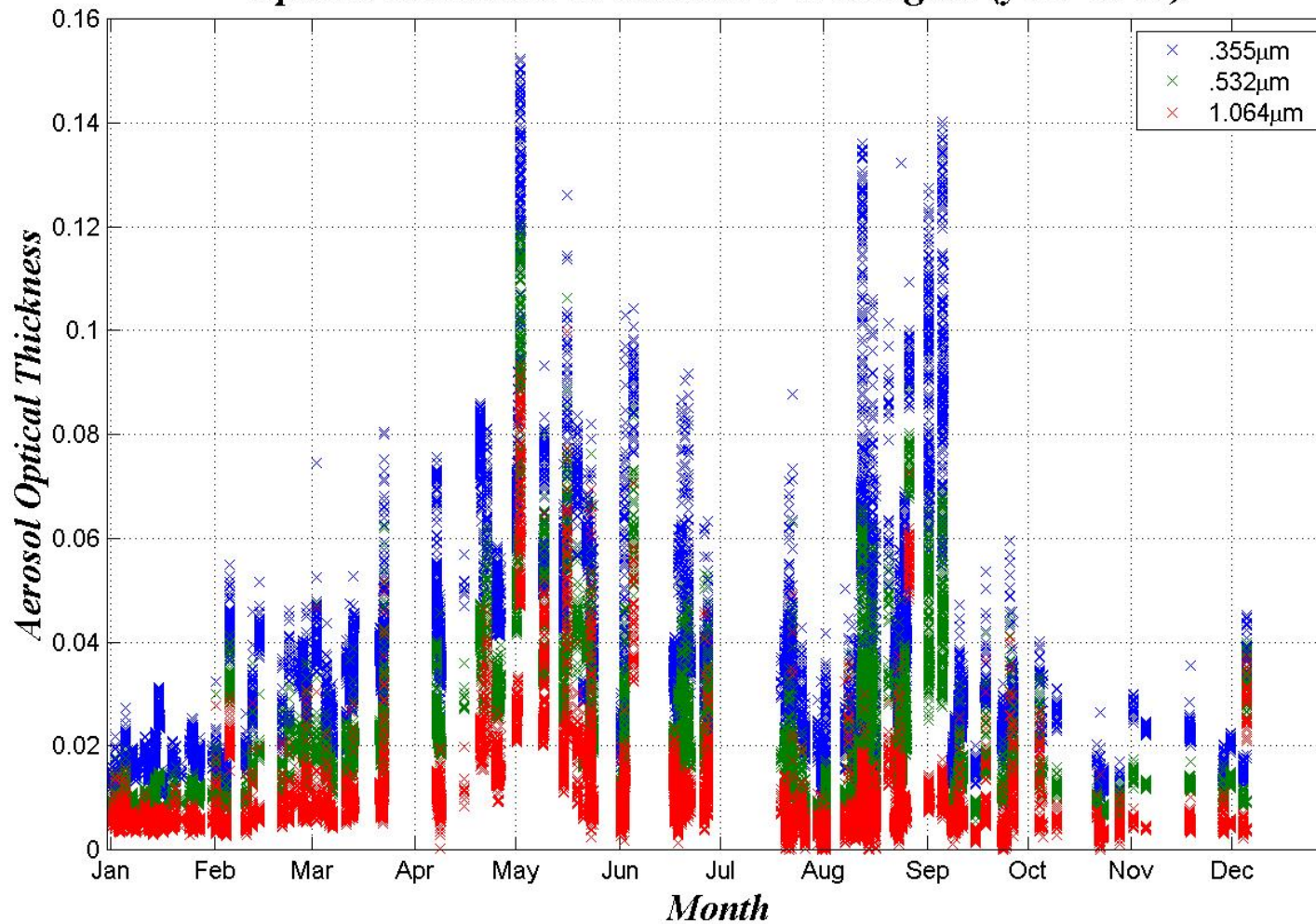


B. Calpini **Aerosol: the most uncertain external climate forcing agent**



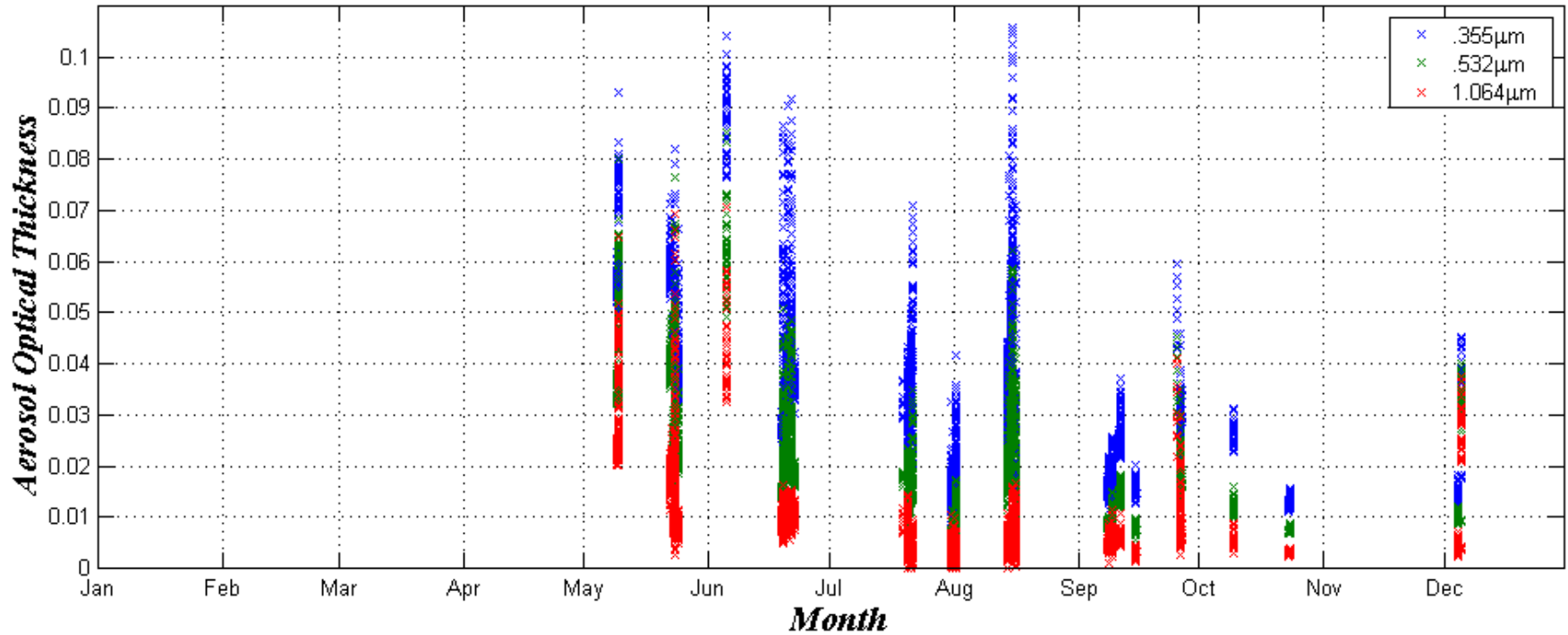


Optical Thickness at LIDAR Wavelengths (year 2000)



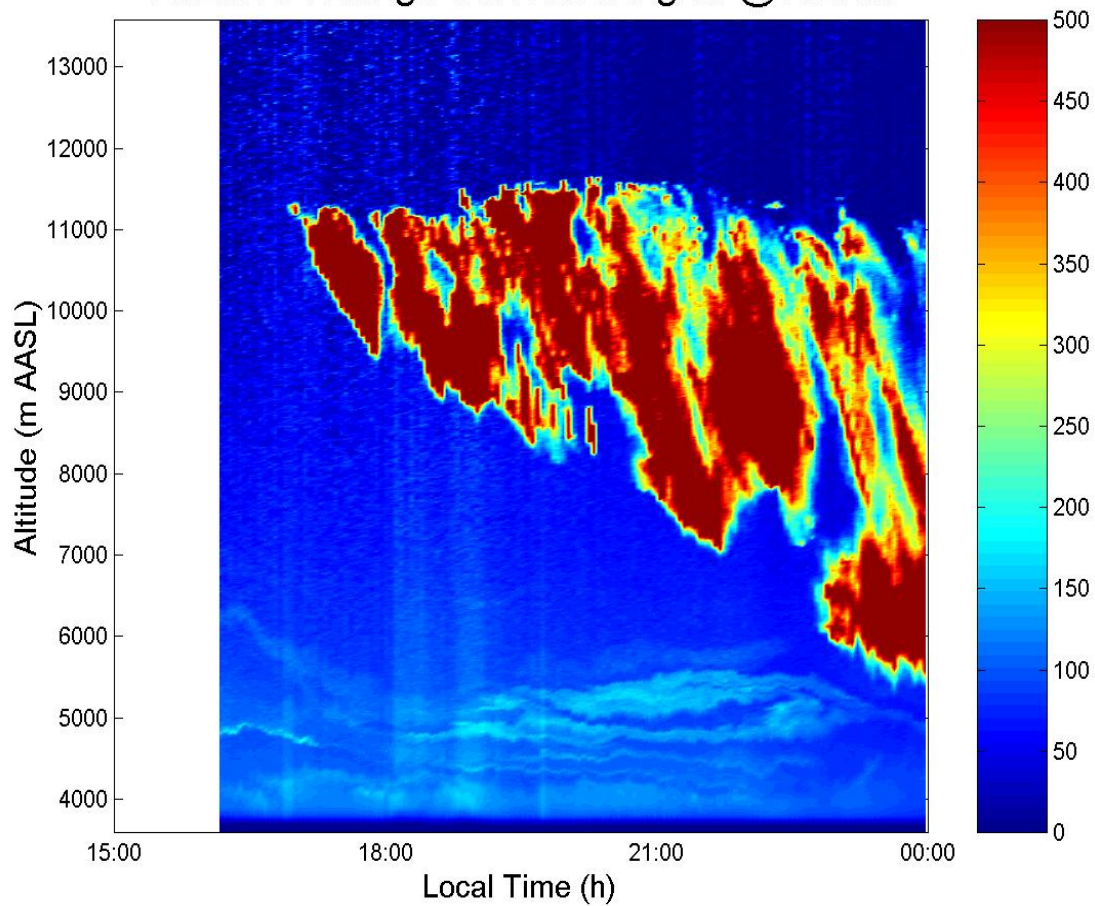


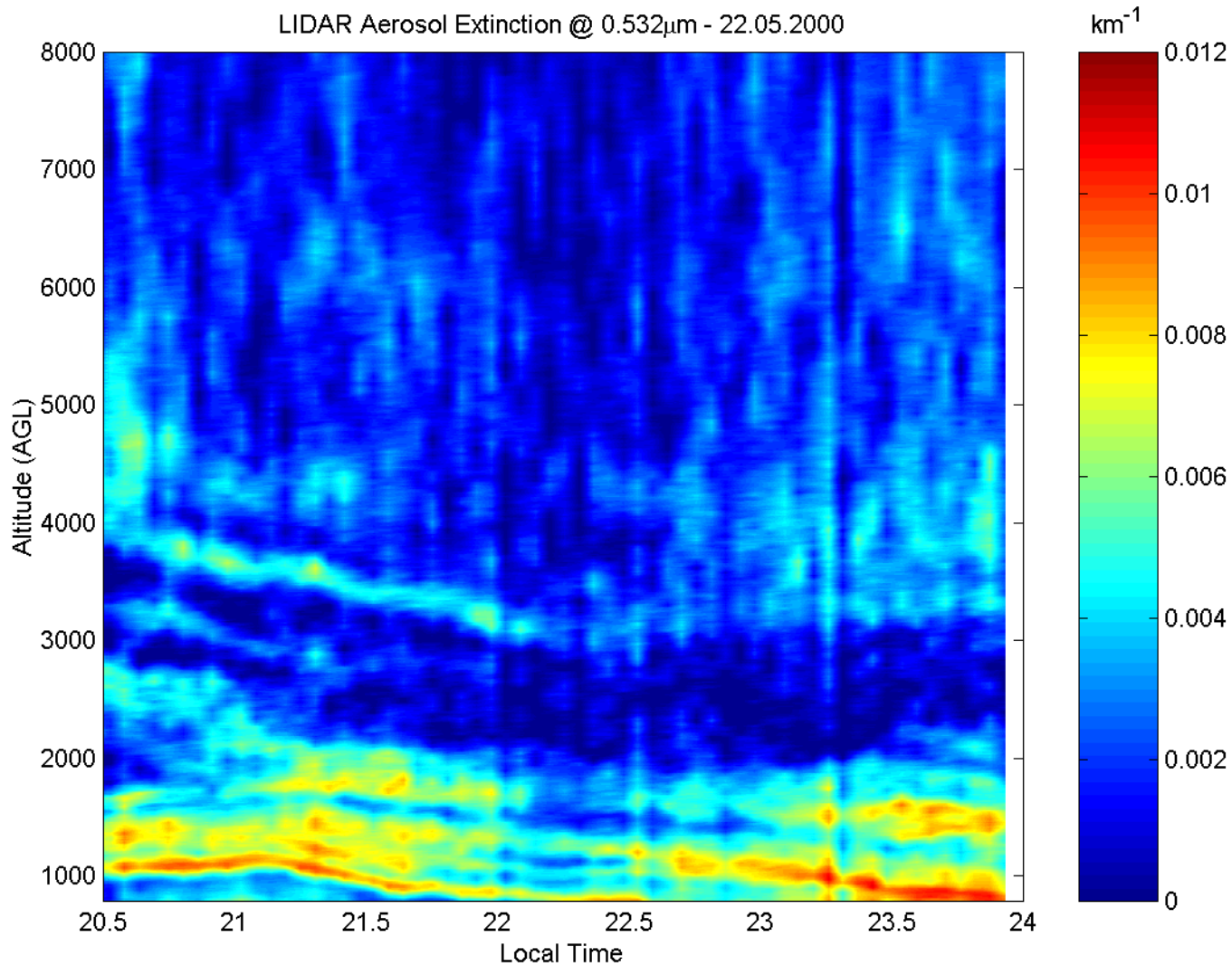
Optical Thickness at LIDAR Wavelengths during LIDAR campaign days (year 2000)





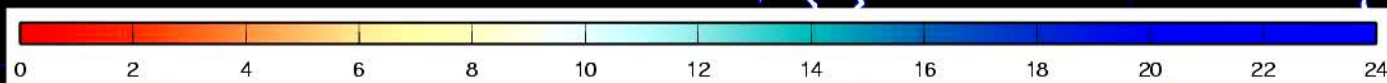
08/28/00 : Range Corrected Signal @532nm

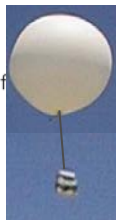




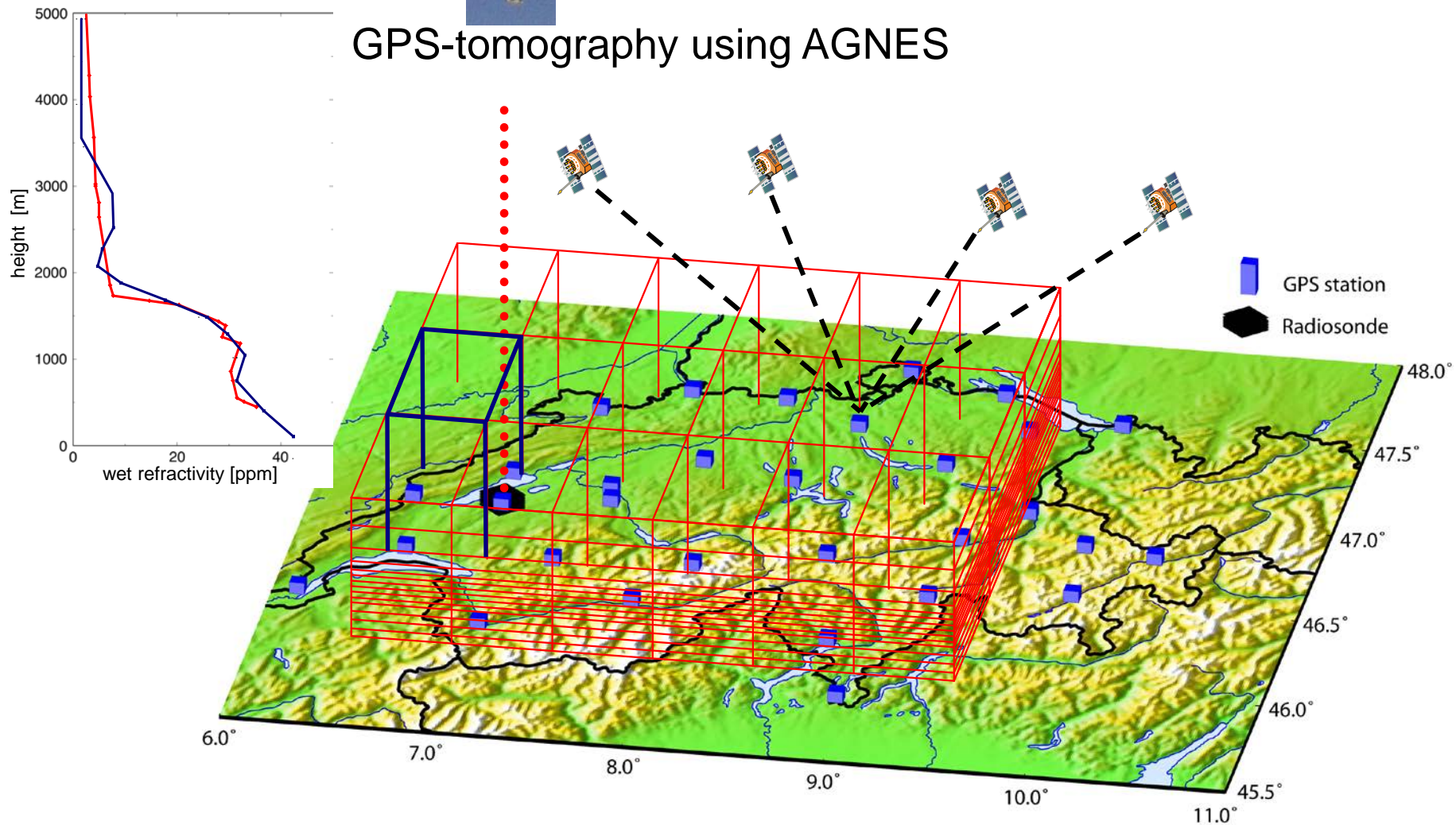
3. November 2002, 06 h

Wet Path Delay [cm]





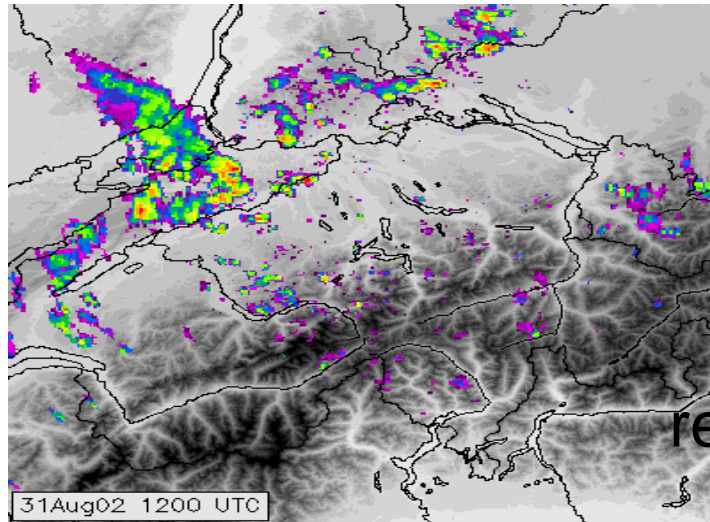
GPS-tomography using AGNES





Weather Radar

300 km

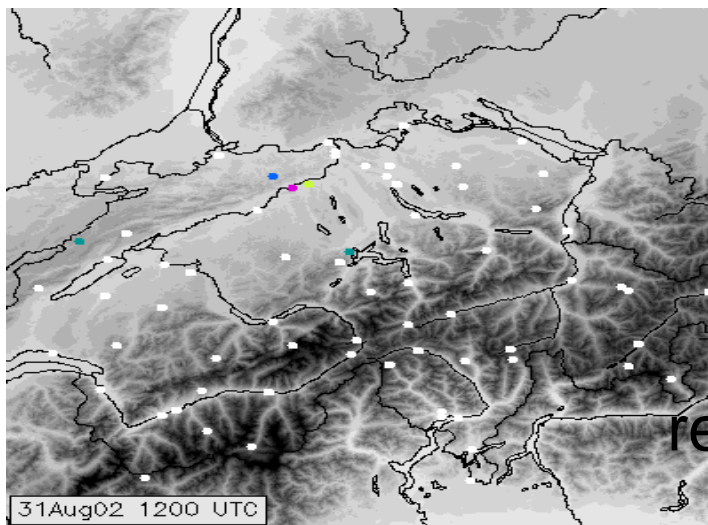


reddish colours
> 40mm/h

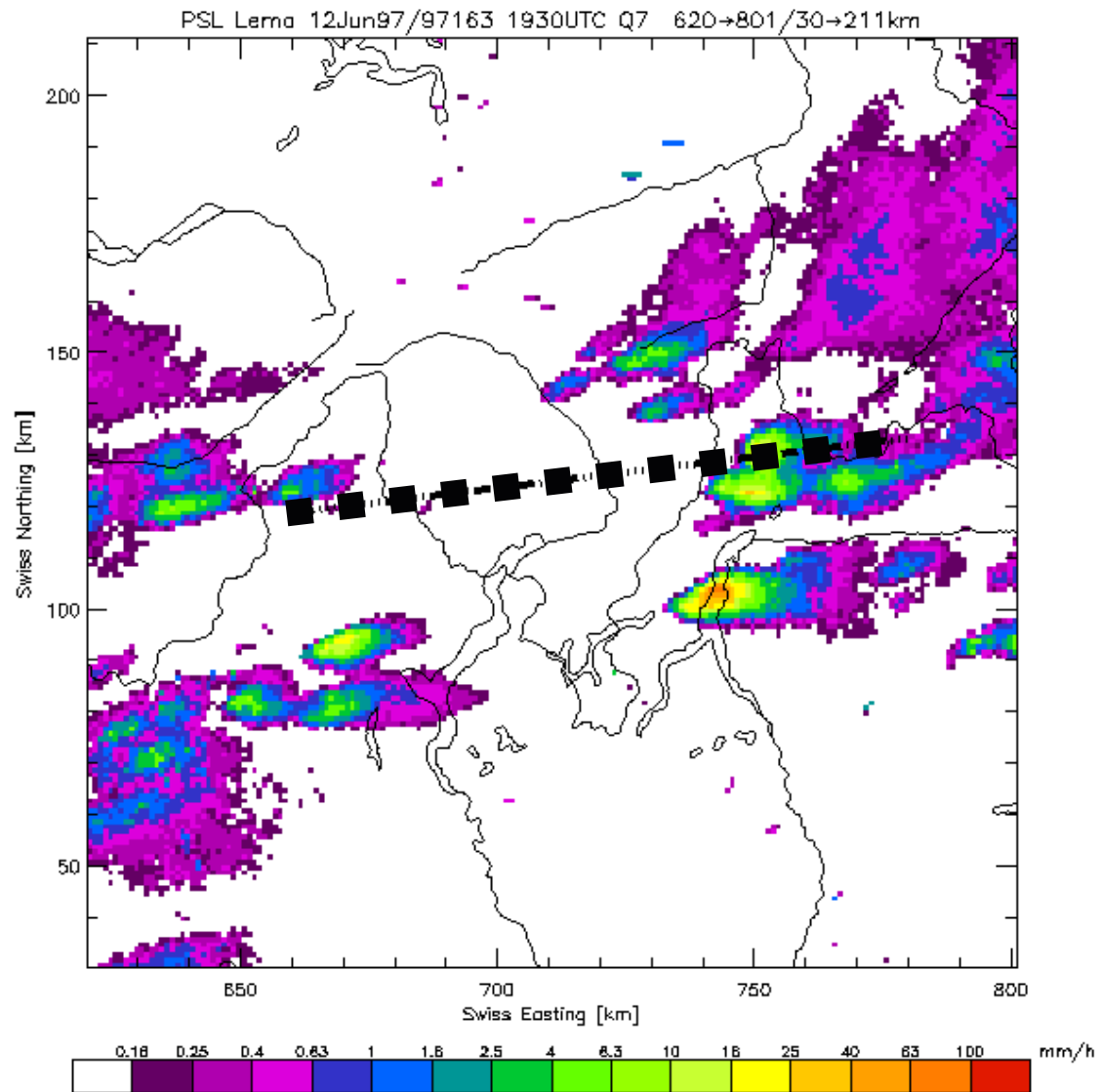


72 automatic gauges

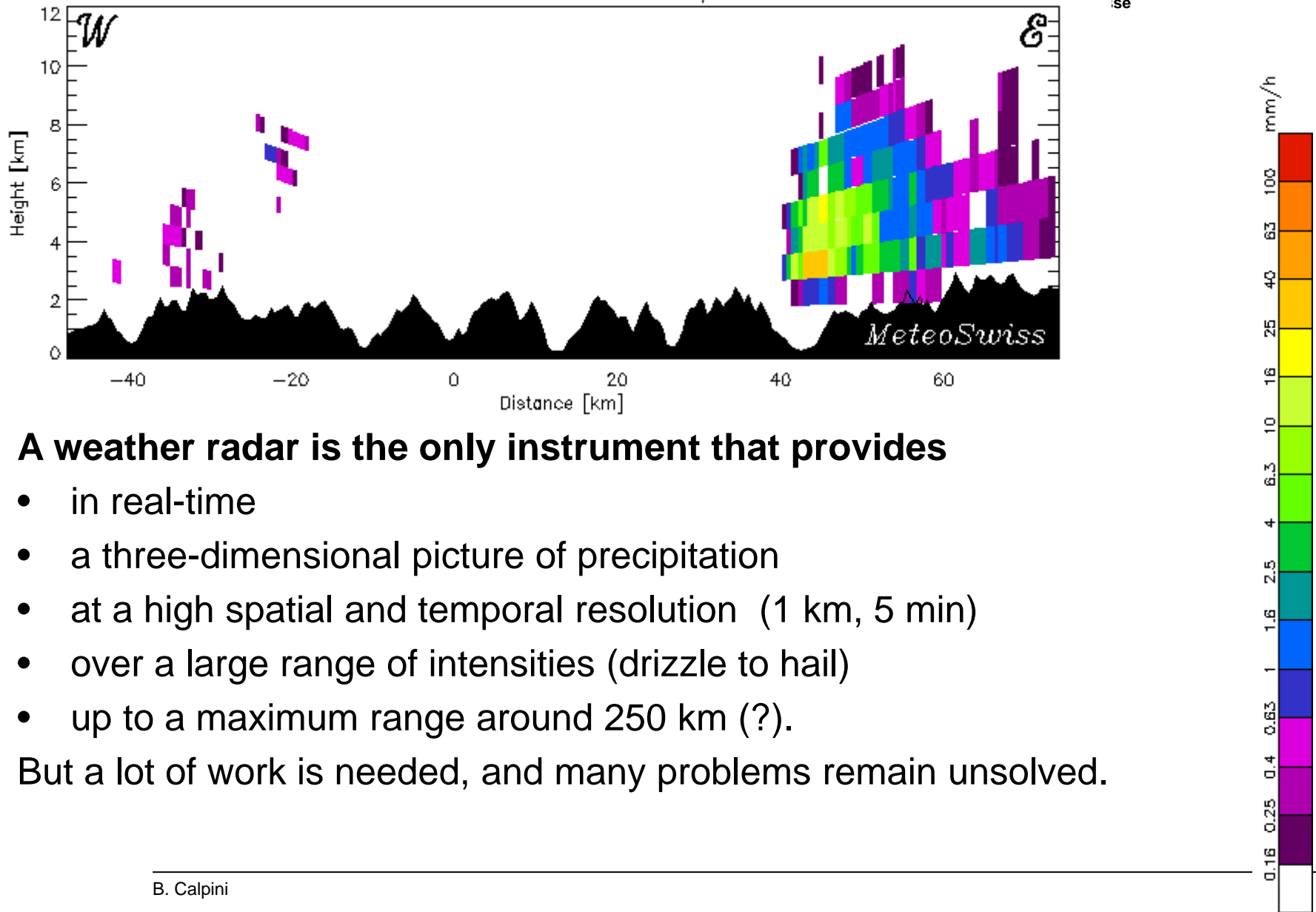
300 km



reddish colours
> 40mm/h



Radar Lema W-E Cross Section 12Jun97/97163 1927UTC



A weather radar is the only instrument that provides

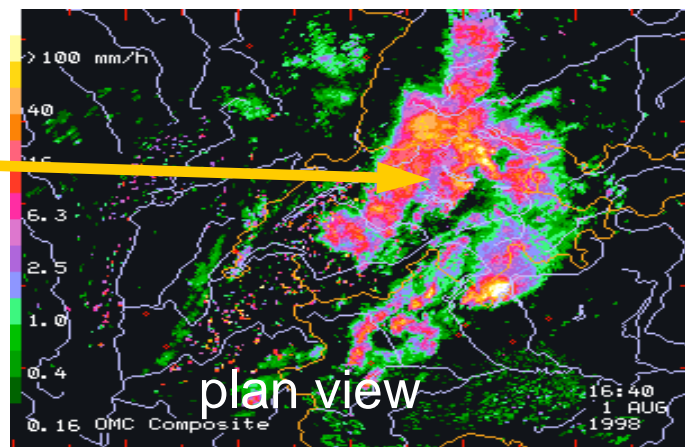
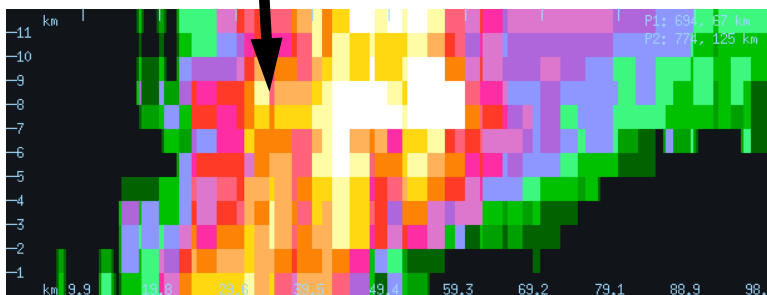
- in real-time
- a three-dimensional picture of precipitation
- at a high spatial and temporal resolution (1 km, 5 min)
- over a large range of intensities (drizzle to hail)
- up to a maximum range around 250 km (?).

But a lot of work is needed, and many problems remain unsolved.



Very strong echo (hail ?)

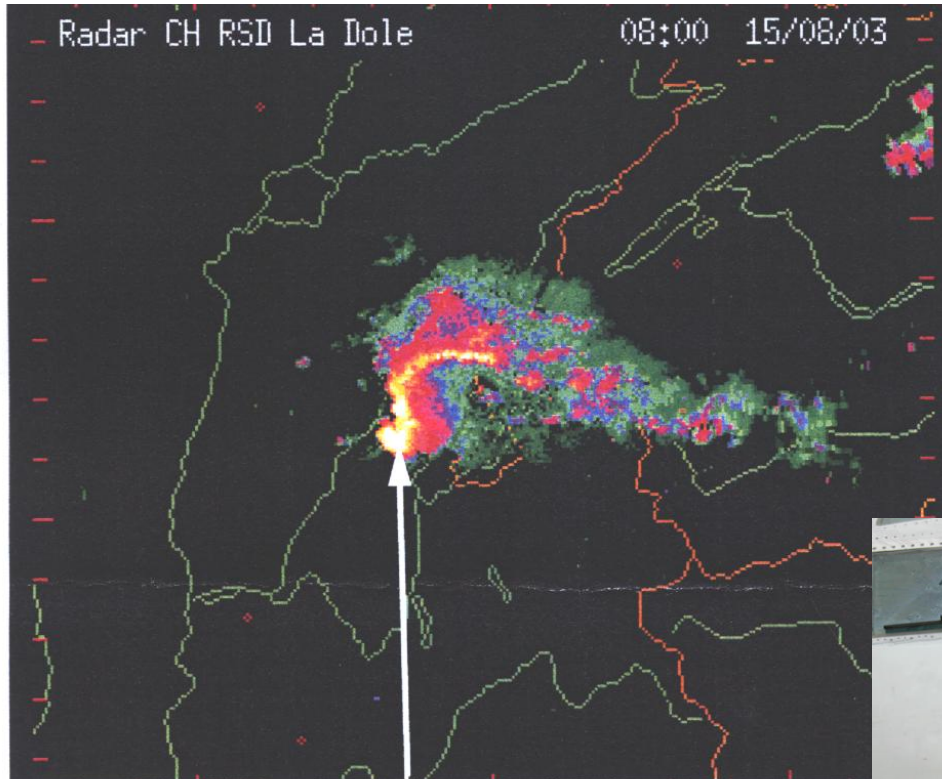
echoes above 55 dBZ,
possibly hail





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Département fédéral de l'intérieur DFI
Office fédéral de météorologie et de climatologie MétéoSuisse



hail !)

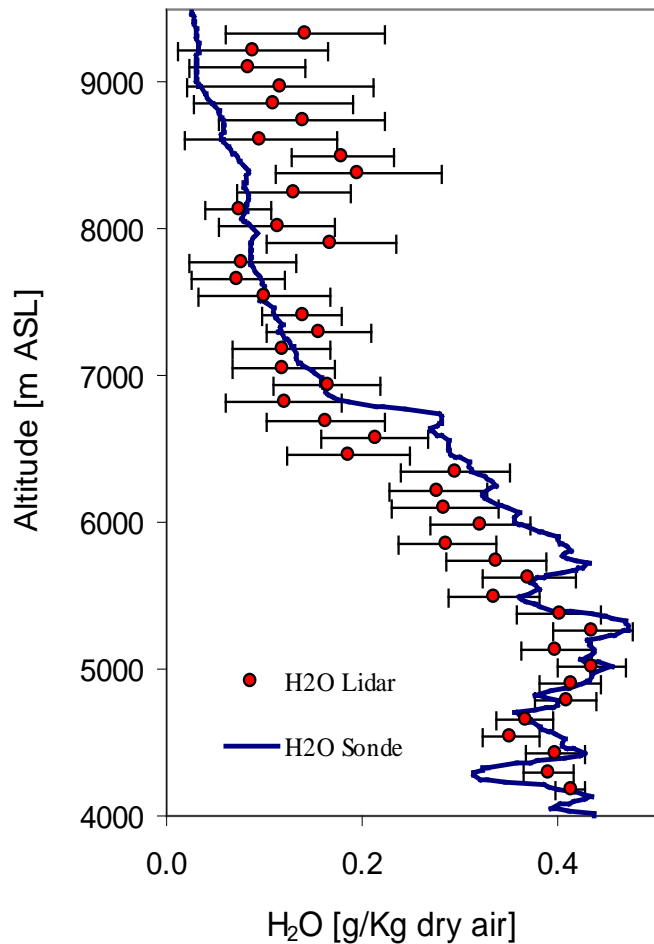


Echo de forte intensité
lié à la cellule orageuse

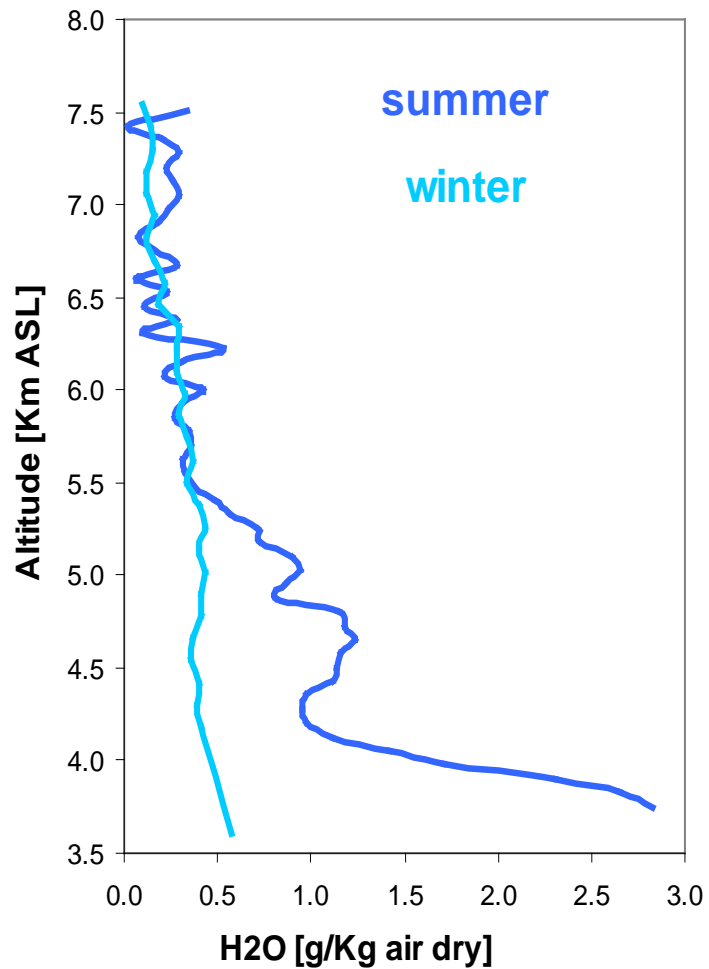




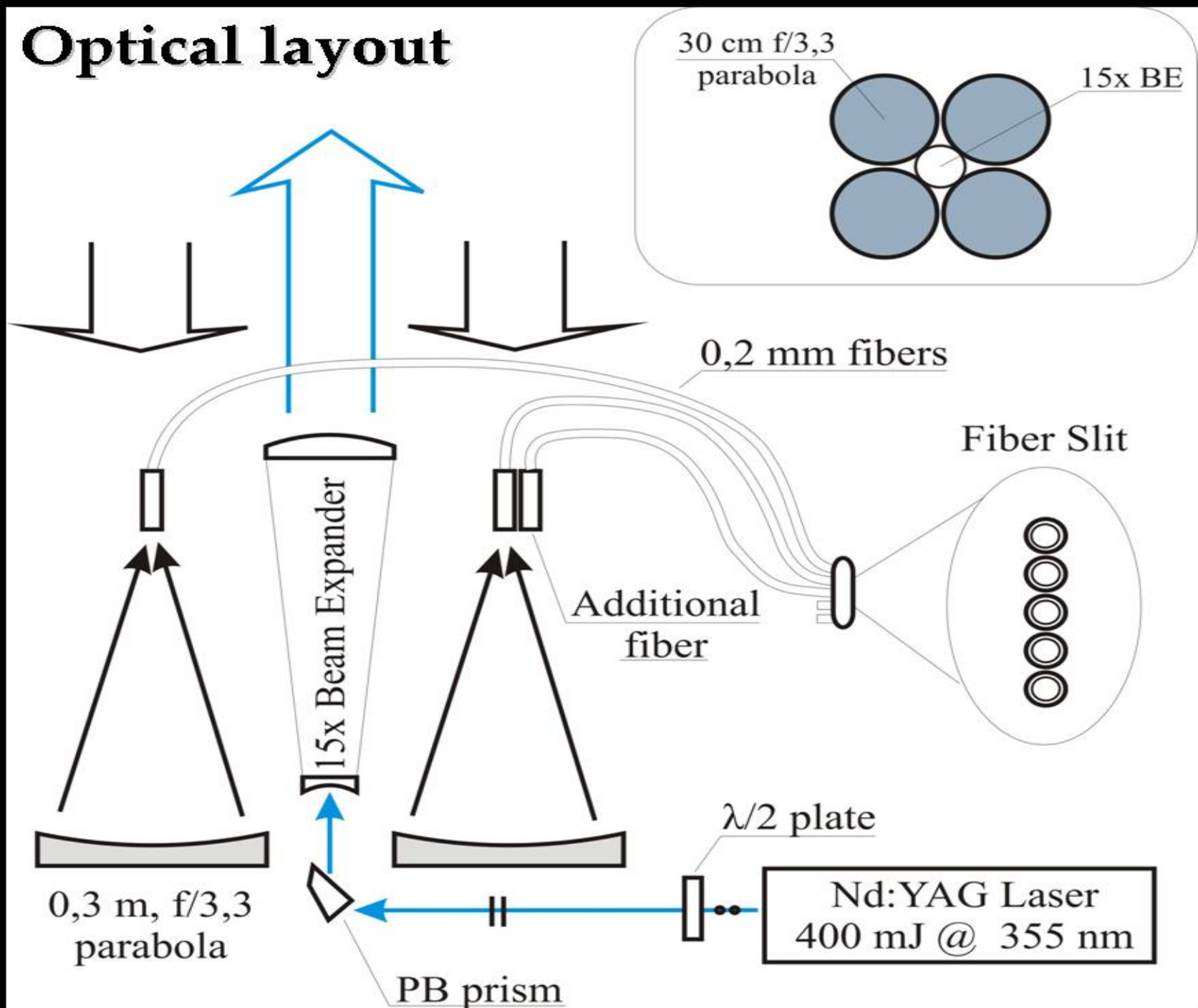
RAMAN LIDAR and « Snow White » radiosonde

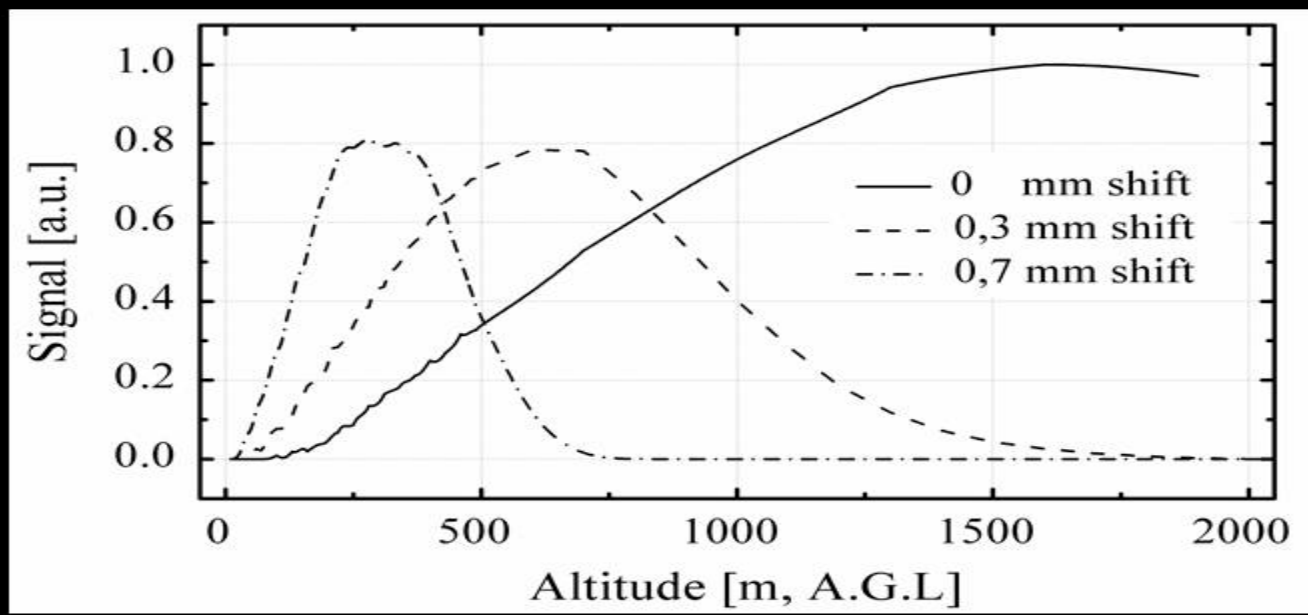
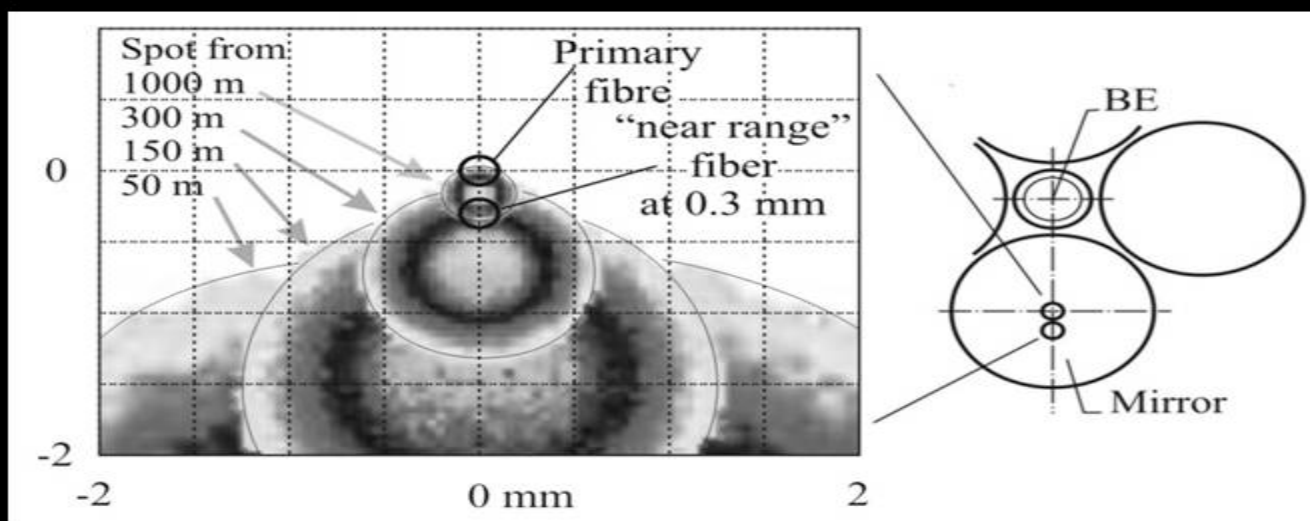


Typical water vapor profiles

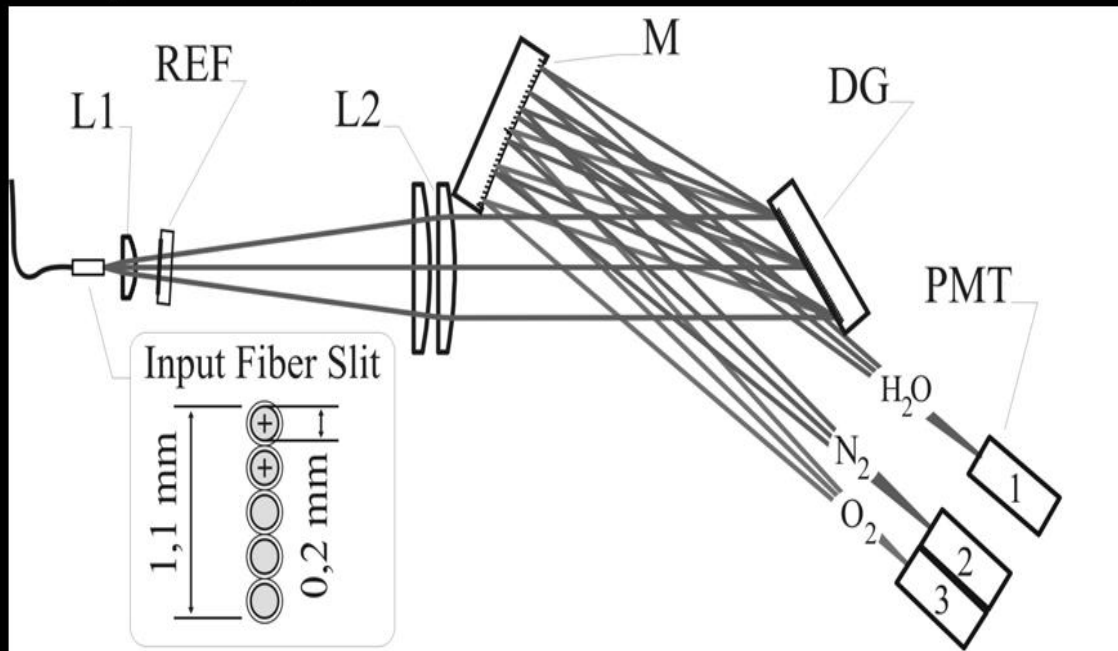


Optical layout





Polychromator Optical Layout

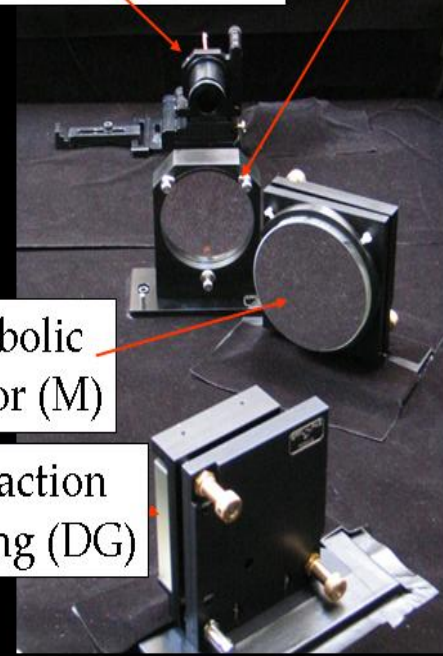


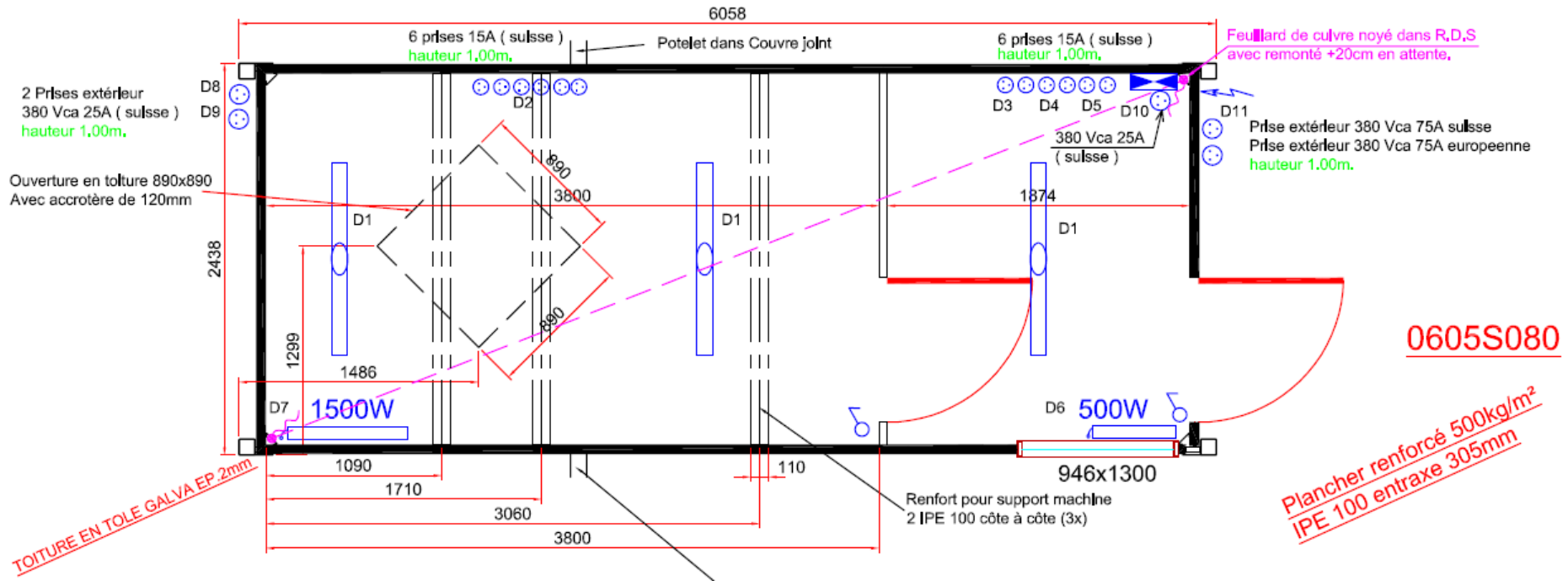
Fiber holder &
Pre-collimating lens
(L1)

Lens

Parabolic
mirror (M)

Diffraction
Grating (DG)





Dimensions 6058 x 2438 x 2620 LxWxH
Weight 2500 kg (empty)



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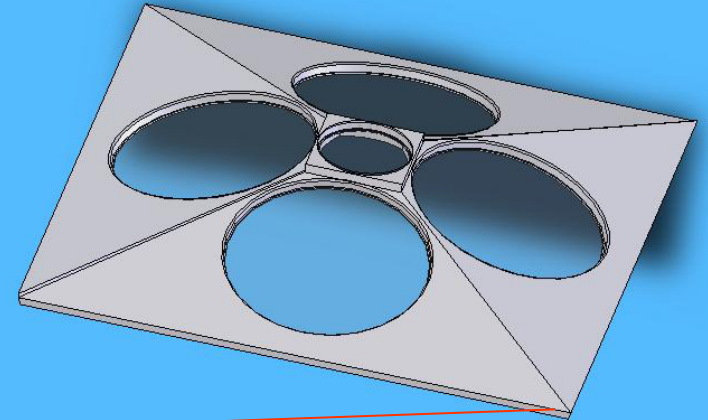
Département fédéral de
Office fédéral de météo

Housing





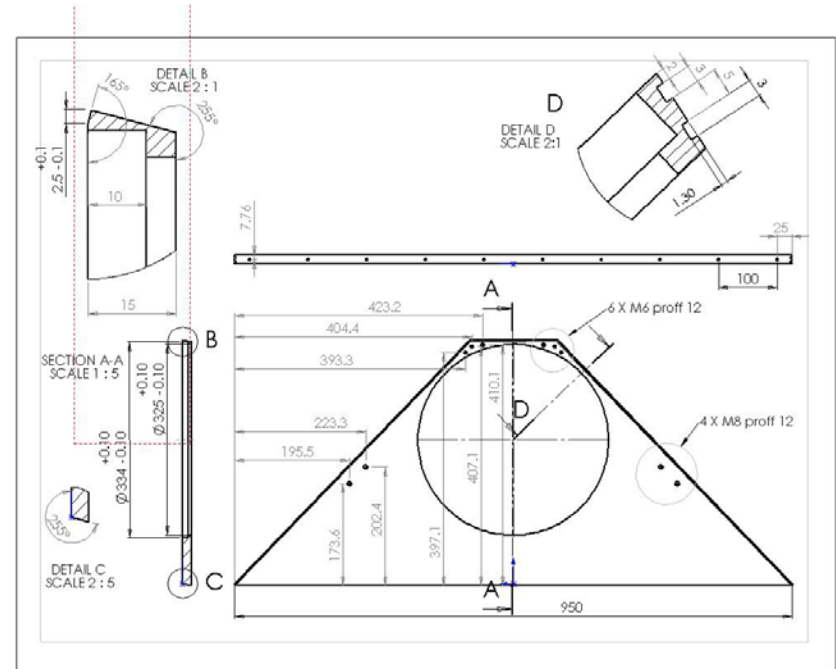
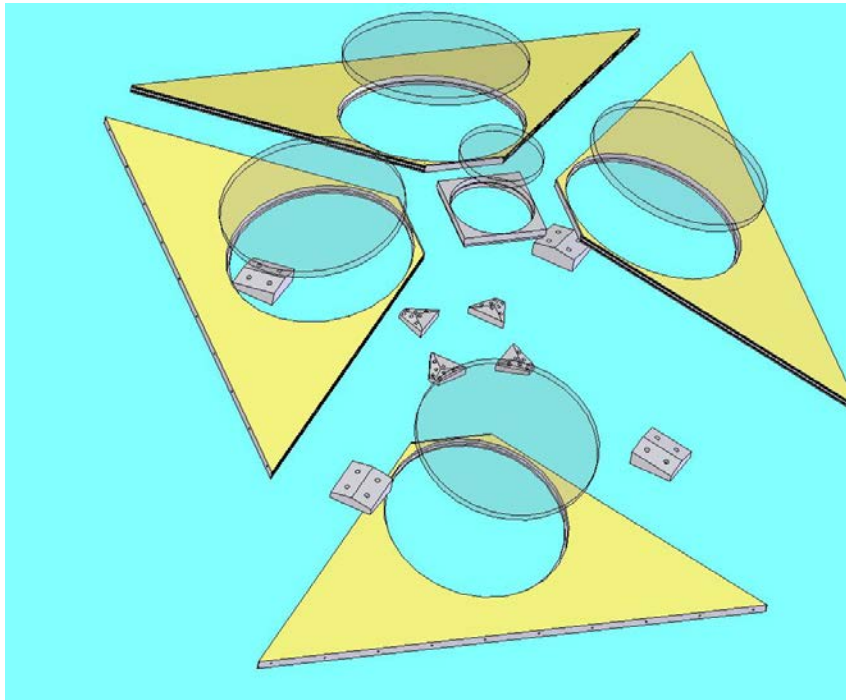
Lidar housing



Cooling unit B. Calpini

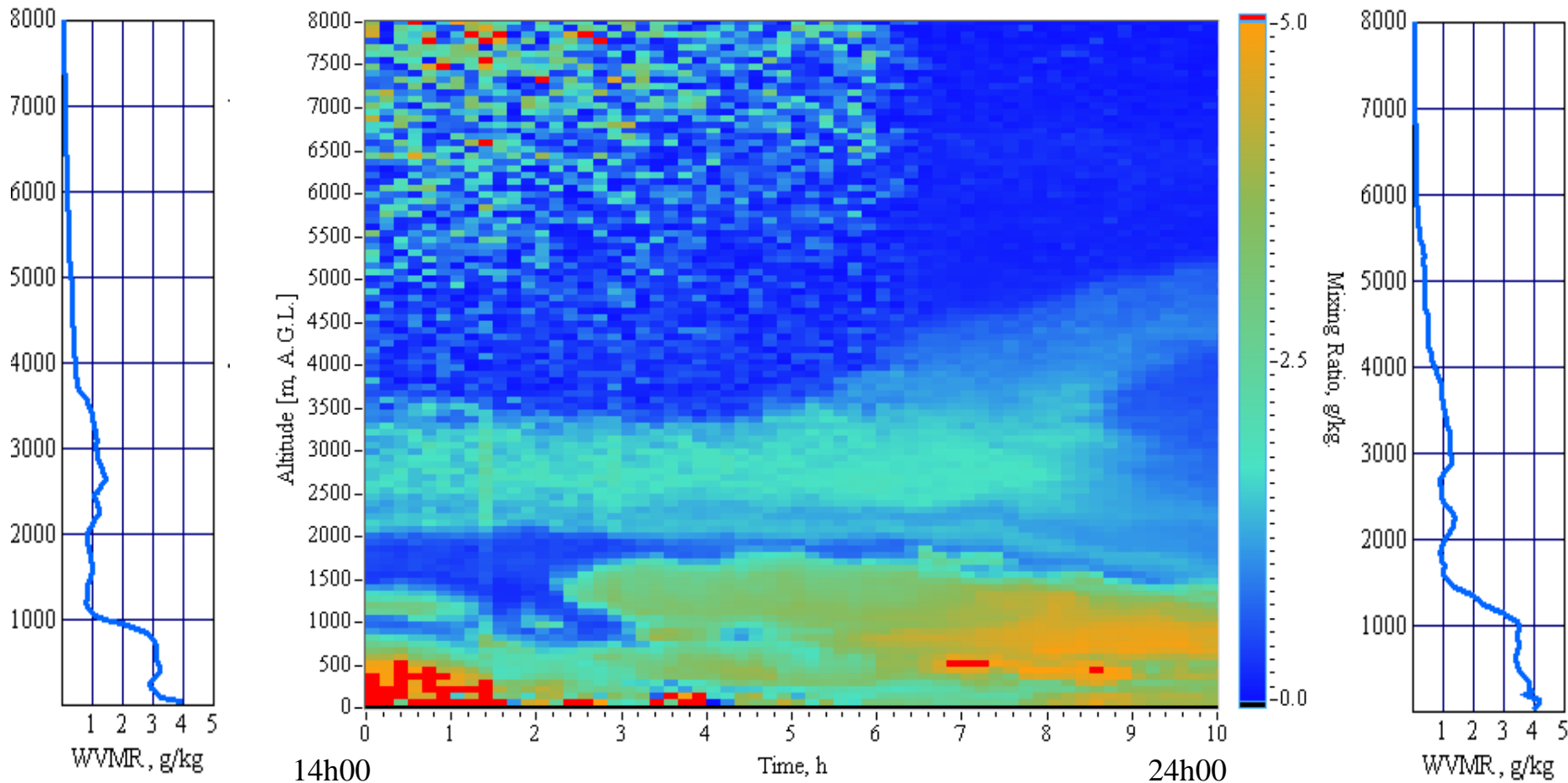


Windows assembly





First continuous time series

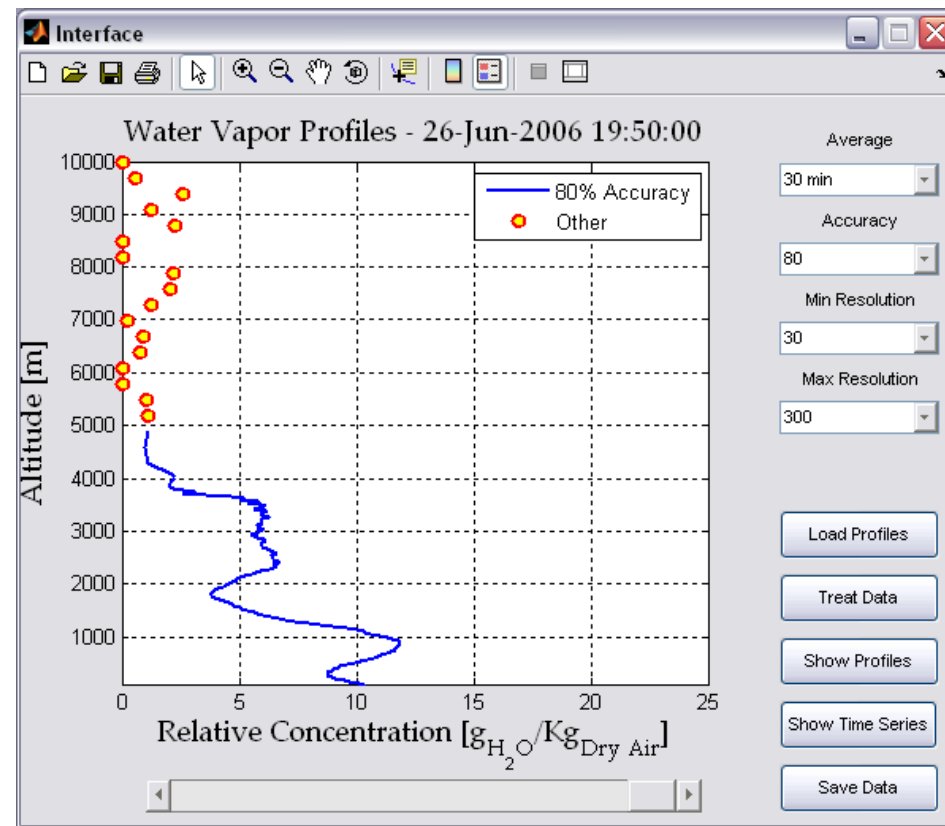
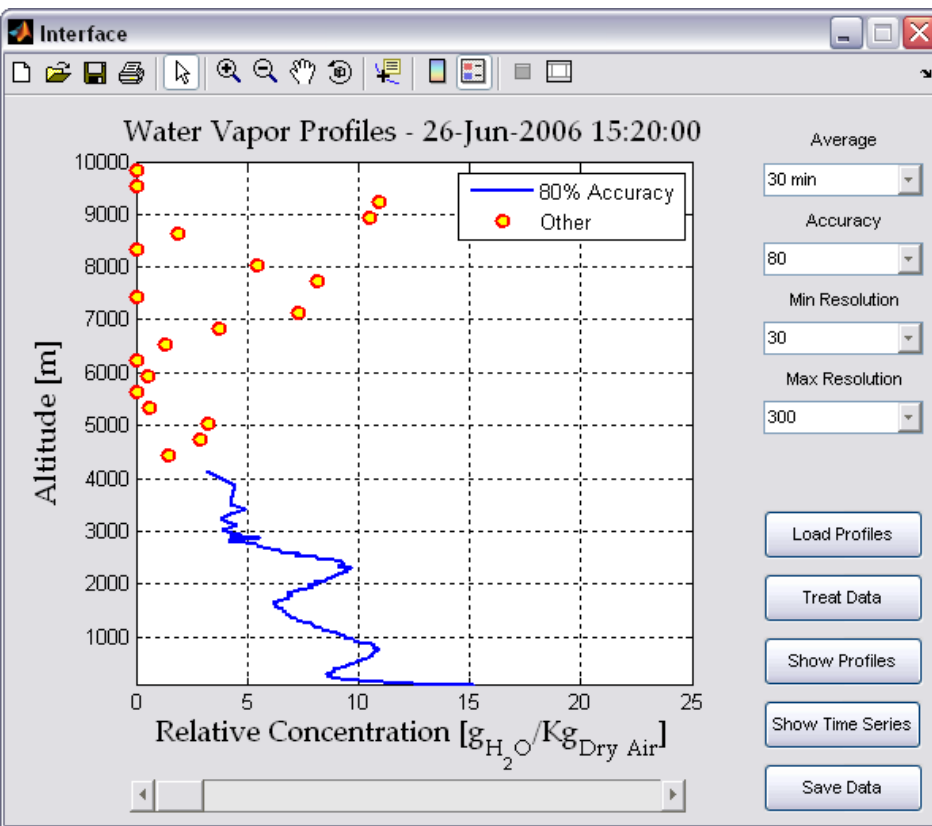


Payerne
12h00
Data acquired on 07/04/2006 (10 min averaging, 75 m vertical resolution)
Start 14 h 04 , End 24 h 09
Calibration constant acquired from GPS IWV,
molecular atmosphere for differential transmission (Payerne, T and P)

Payerne
00h00

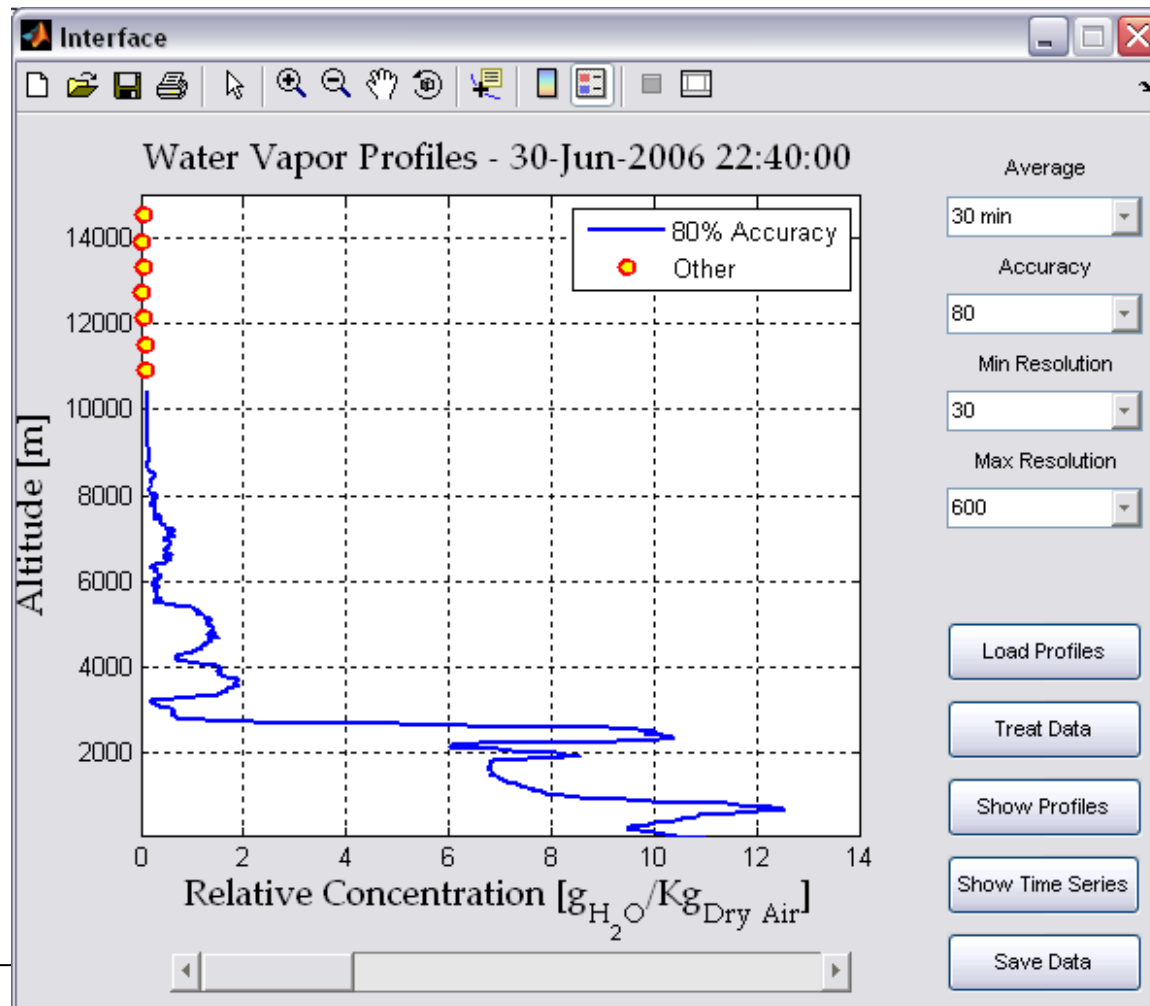


Day time profiles, 26.06.06



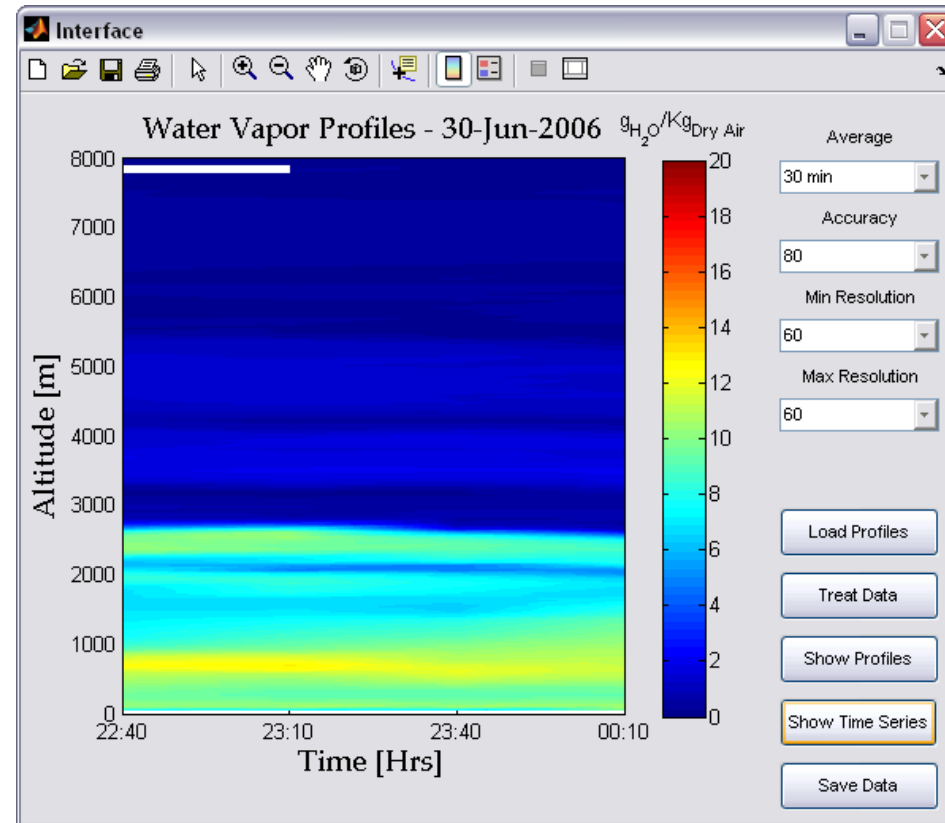
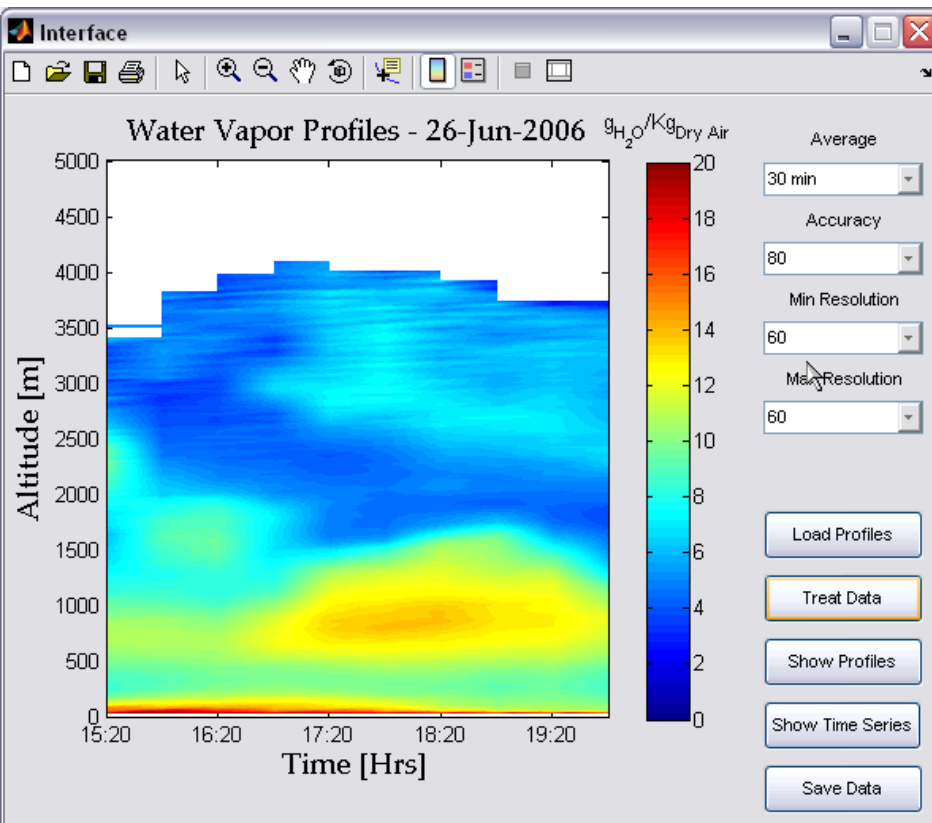


Night time profiles





Time series



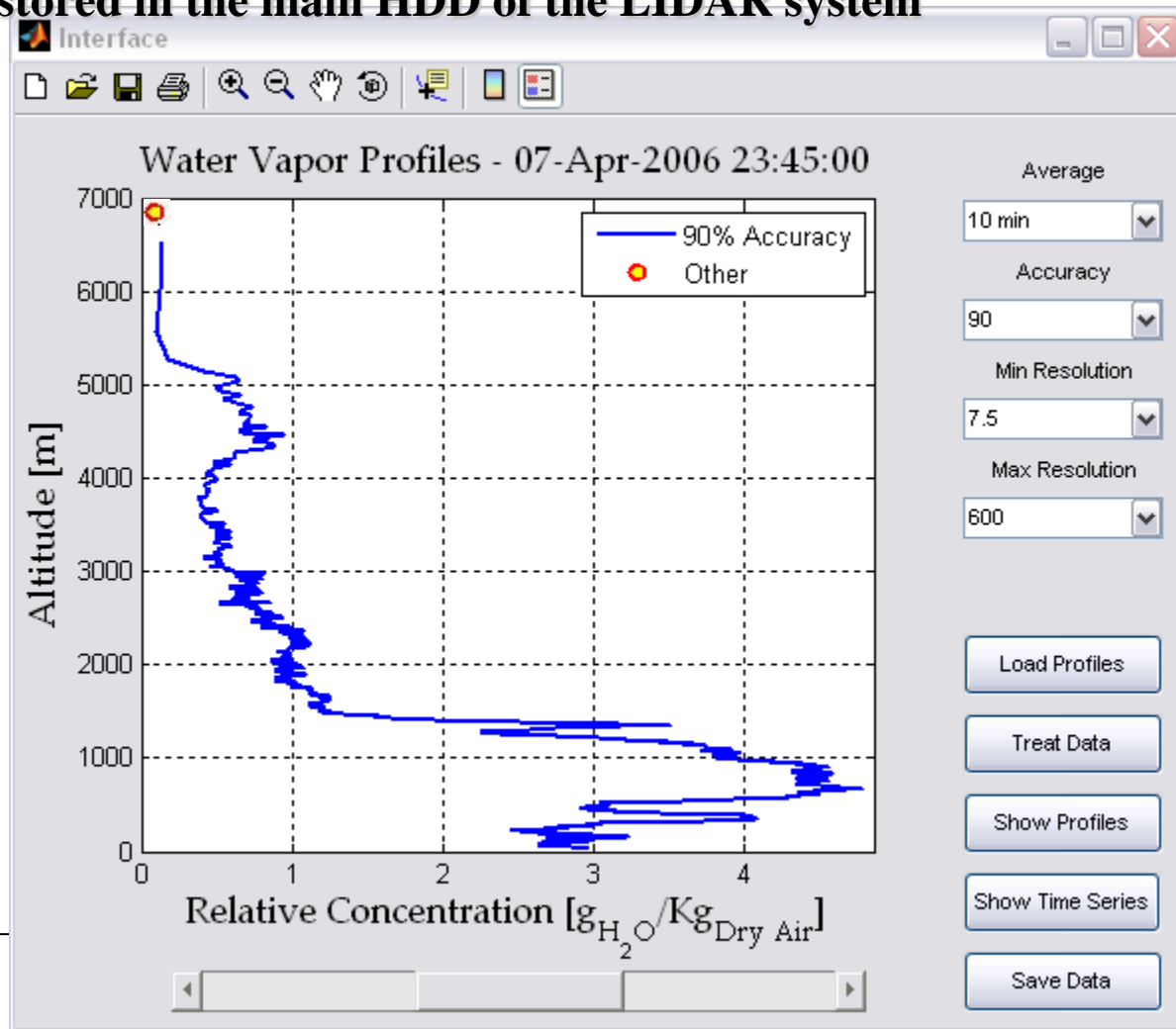


Signals treatment module

Treatment of the Lidar signals stored in the main HDD of the LIDAR system

Input parameters

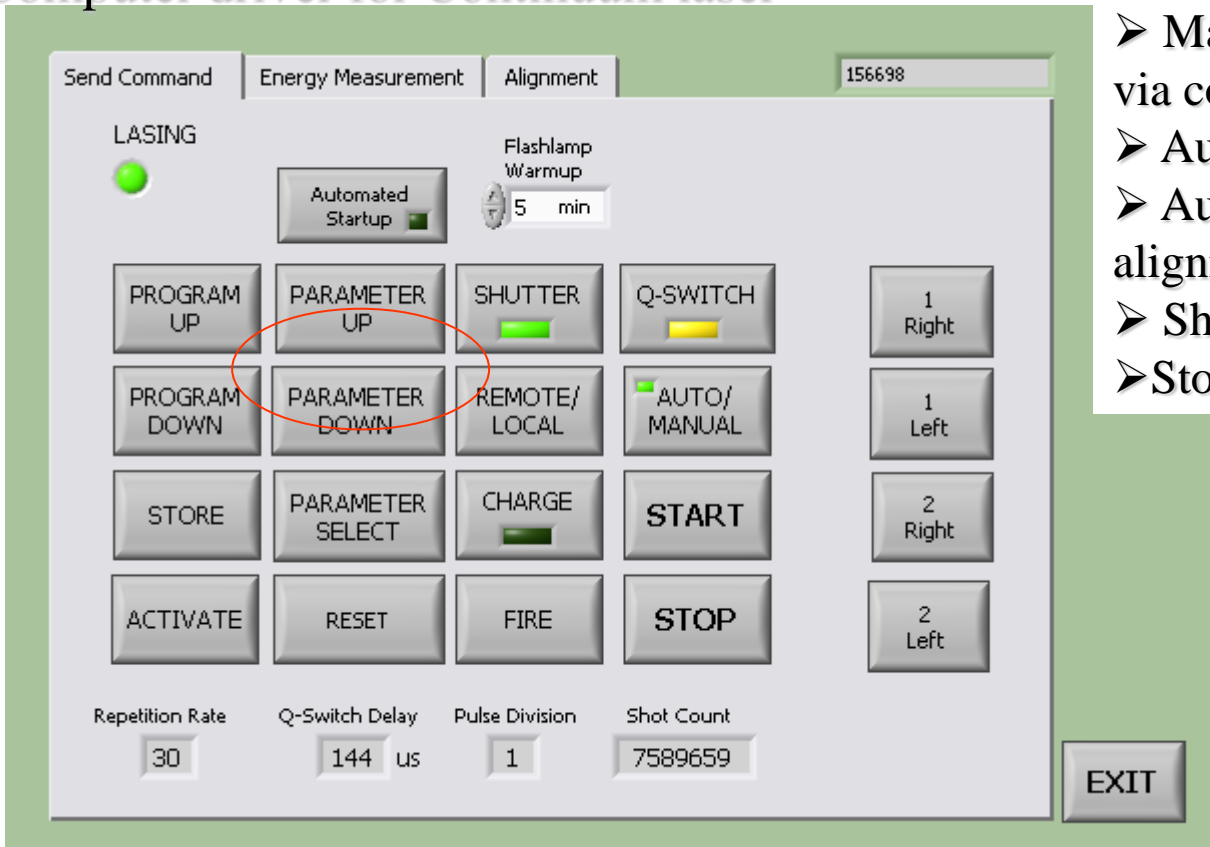
- Averaging time
- Accuracy
- Vertical resolution
- Calibration coefficient





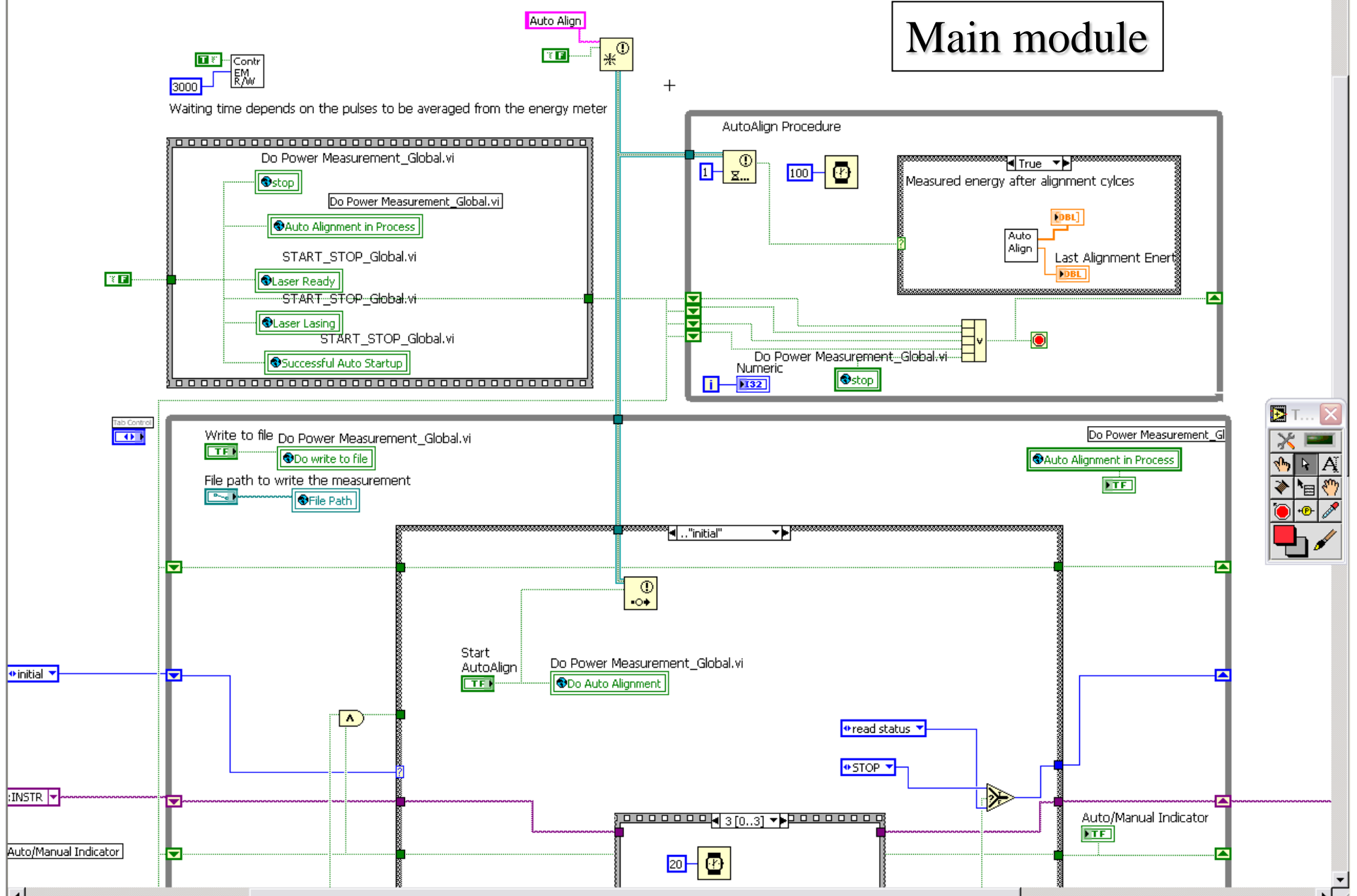
Front panel of “Laser Automat”

Computer driver for Continuum laser



- Manual control of Continuum via computer
- Automated startup of the laser
- Automated harmonic crystal alignment
- Shutdown of the laser
- Stop via external signal

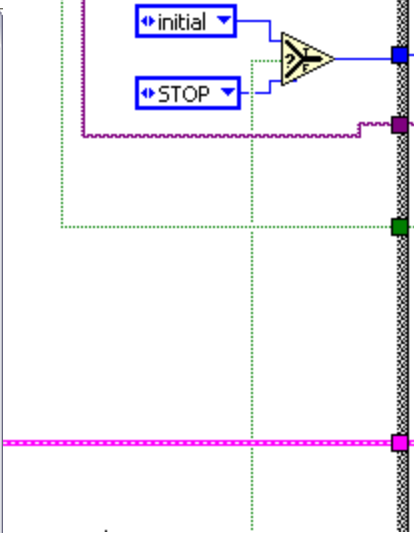
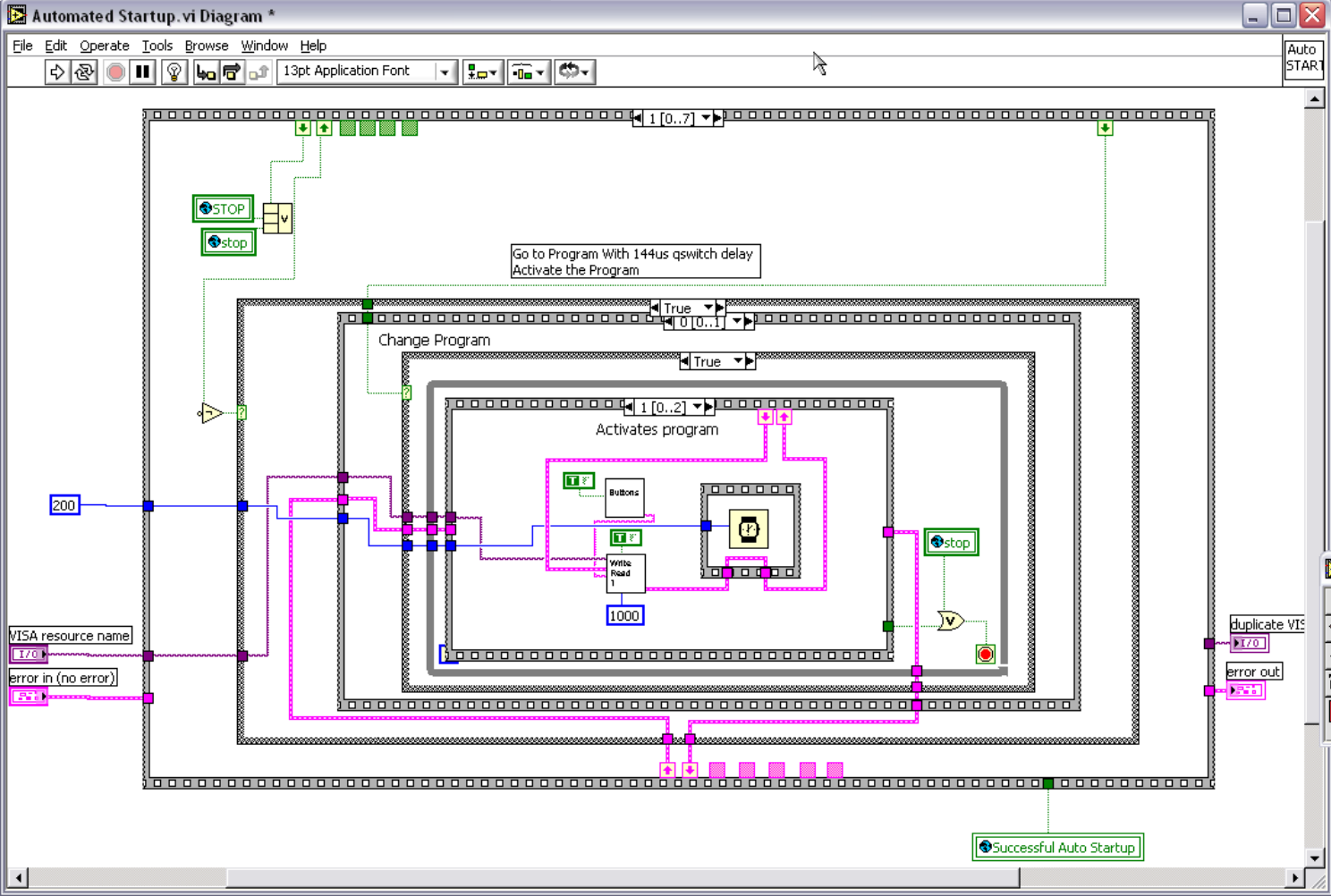
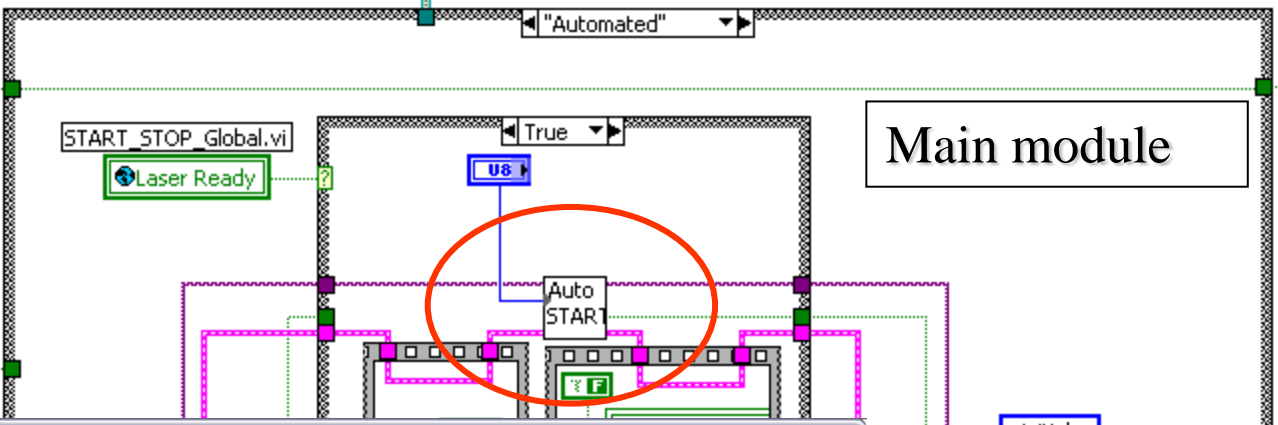
Main module





Main module

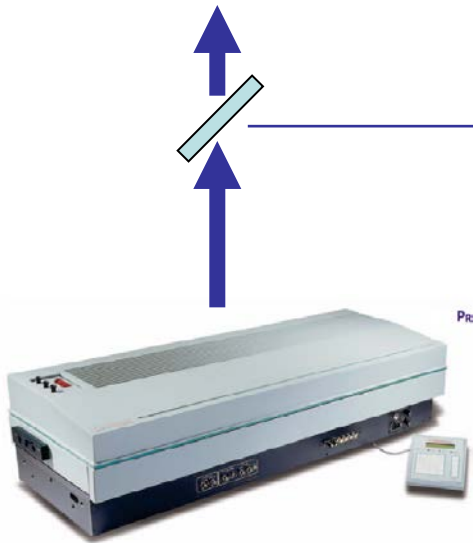
Automated Startup Sub-system



Laser Energy control via OPHIR USB interface

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Smart Head to USB Interface



- Laser energy measurement @ 355 nm
- Signal to Crystal alignment sub-system



B. Capini

Main module

Send Command Energy Measurement Alignment

Measured Energy

0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8

1.394 mJ

Do energy measurement

Write to file

Measure

Receive Energy

Time (min) between Energy Measurement

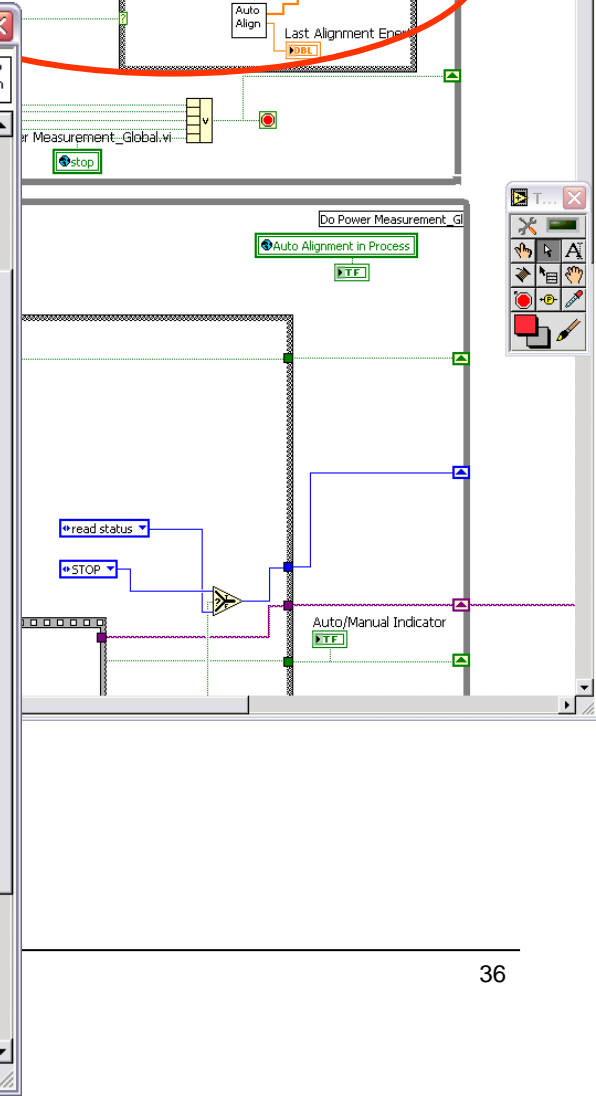
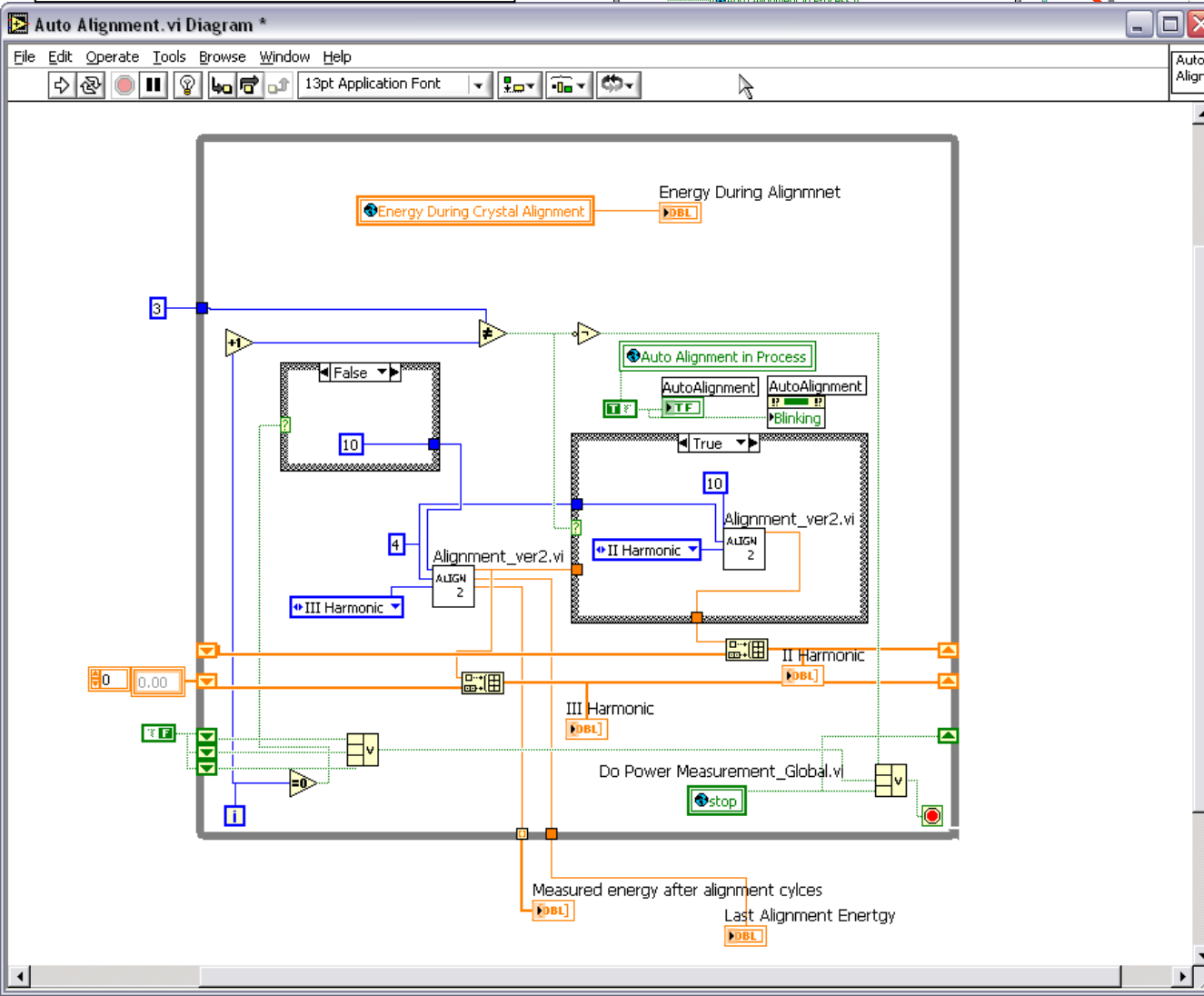
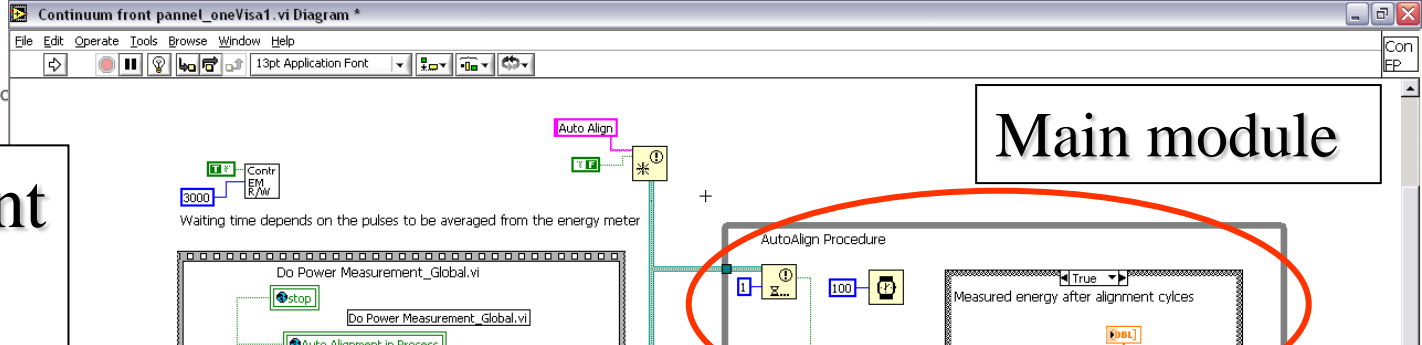
5.00

C:\Dinoev\

EXIT

Auto Alignment Sub-system

Main module





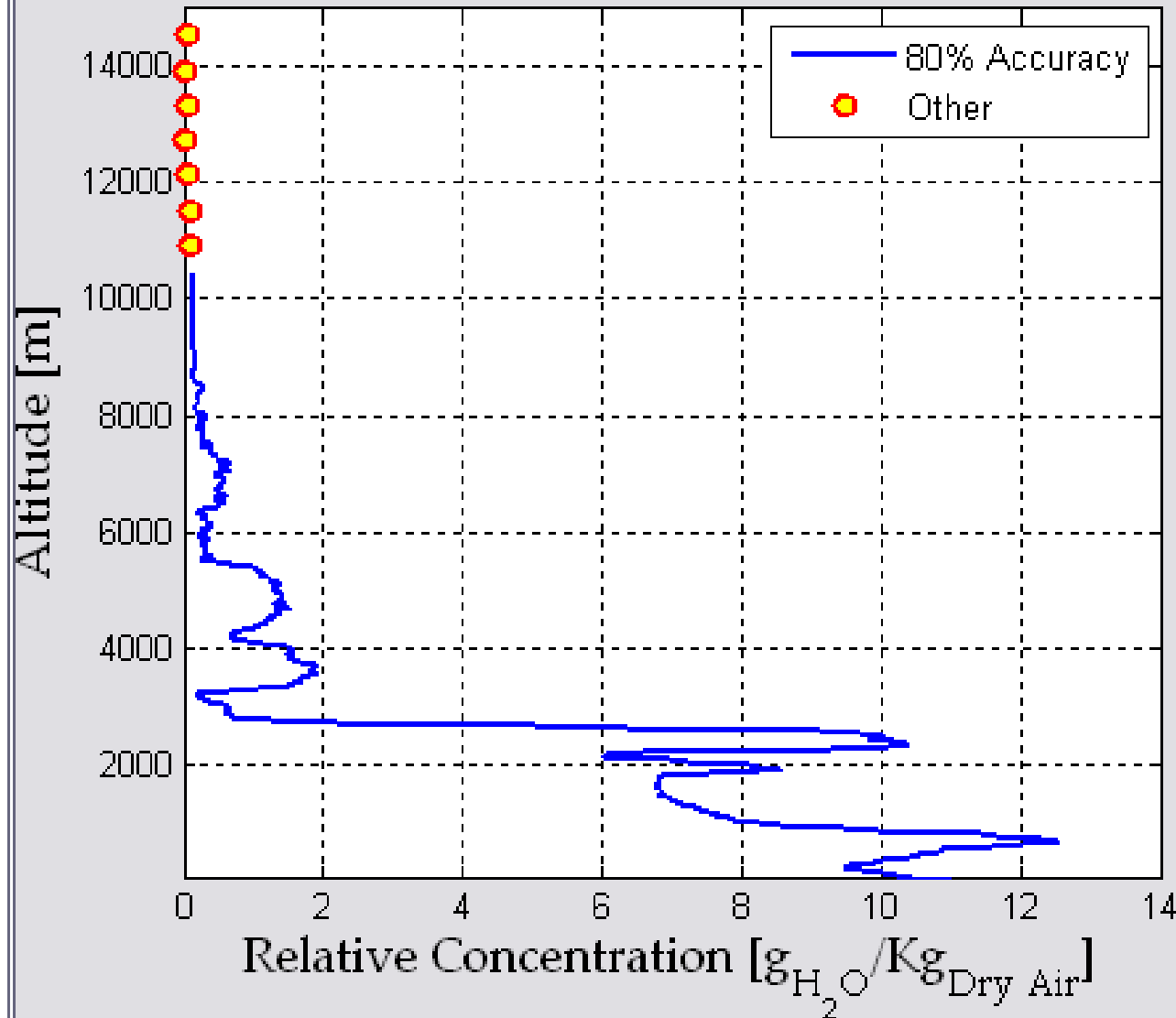
Calibration methods

$$M = k \frac{P_{H_2O}}{P_{N_2}} + C(P_{O_2}, P_{N_2}) \quad [\text{g/kg}]$$

- Free flying balloon
- Tethered balloon
- Column integrated water vapor [GPS]
- Absolute calibration



Water Vapor Profiles - 30-Jun-2006 22:40:00



Average

30 min

Accuracy

80

Min Resolution

30

Max Resolution

600

Load Profiles

Treat Data

Show Profiles

Show Time Series

Save Data