Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement des Innern EDI
Bundesamt für Meteorologie und Klimatologie MeteoSchweiz

MeteoSwiss Payerne:

Surface and Upper Air Developments

Bertrand Calpini

Lindenberg 27.02.2008
GRUAN meeting

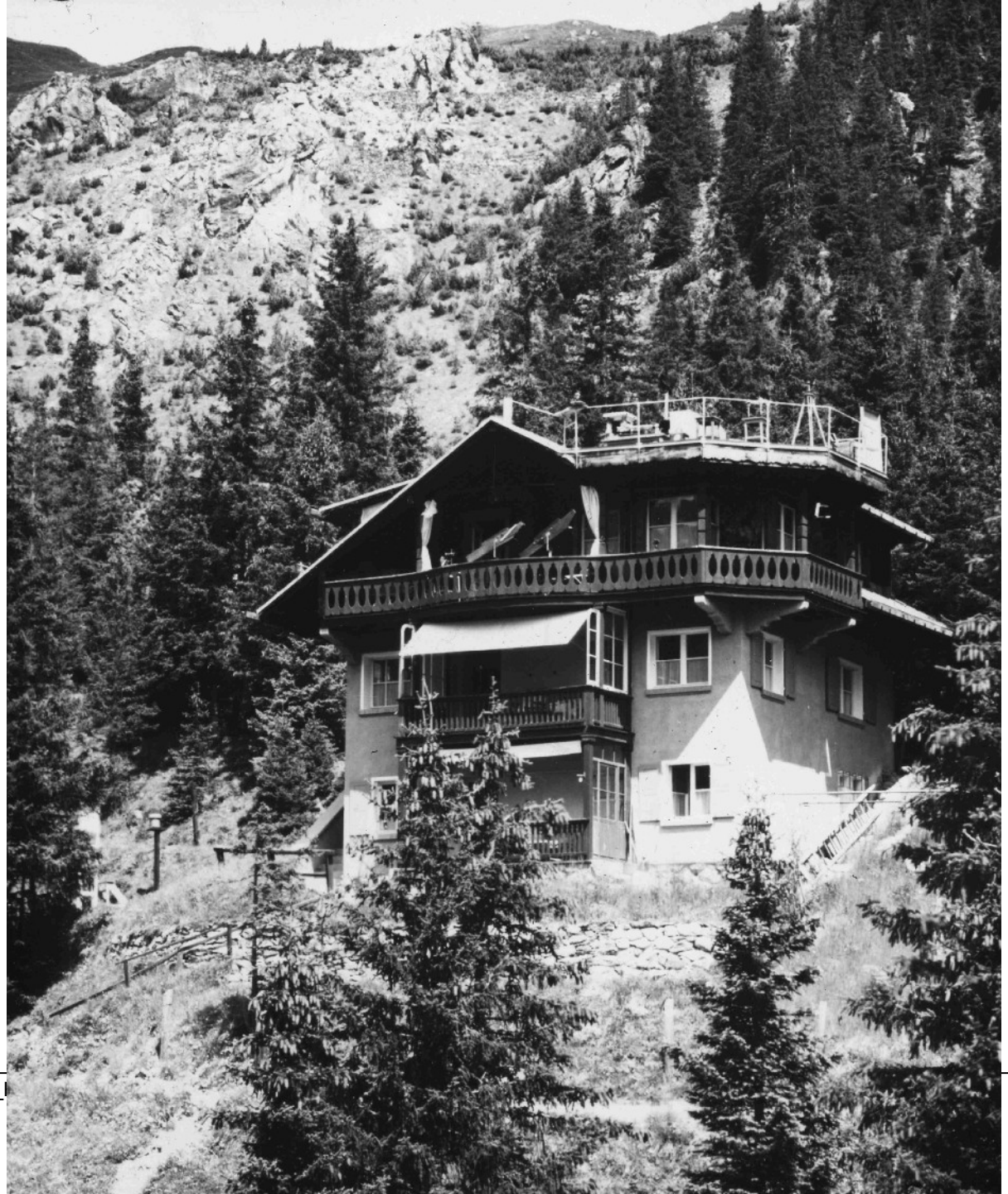
GCOS Reference Upper Air Network

- « …providing the foundation for **long-term datasets** used to reliably monitor and detect **emerging signals of global or regional climate change**… »

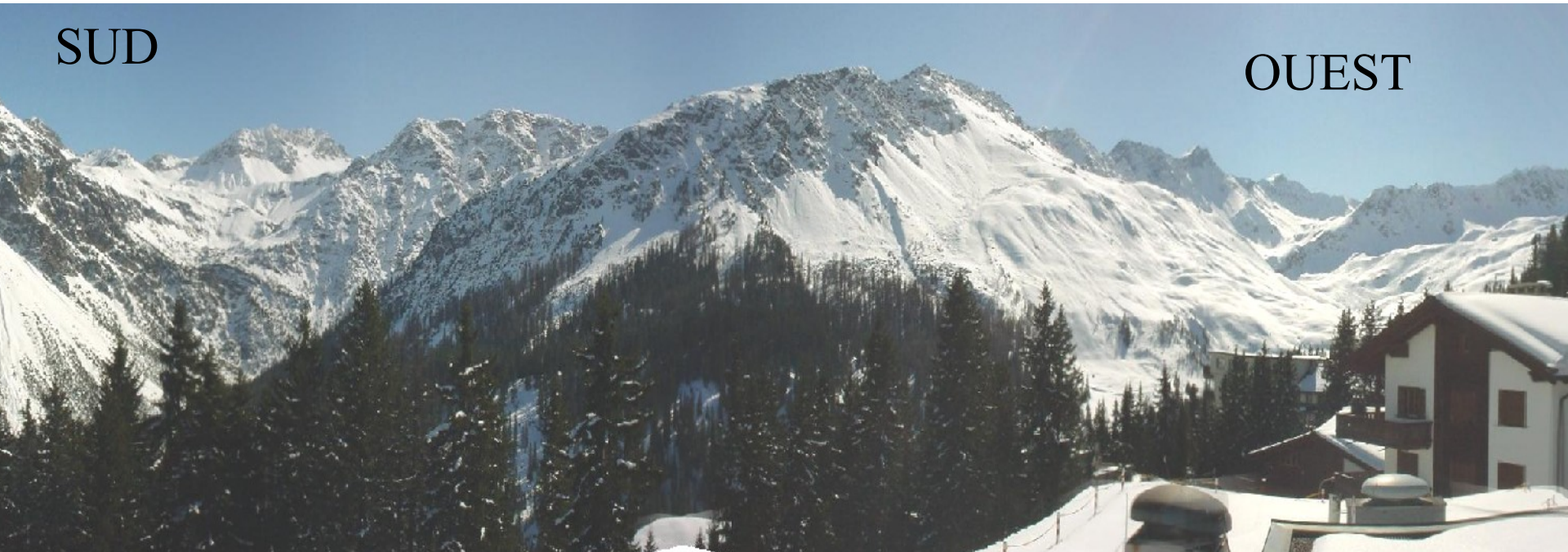
Some history around the MeteoSwiss time series available

1921: Observatory Arosa:

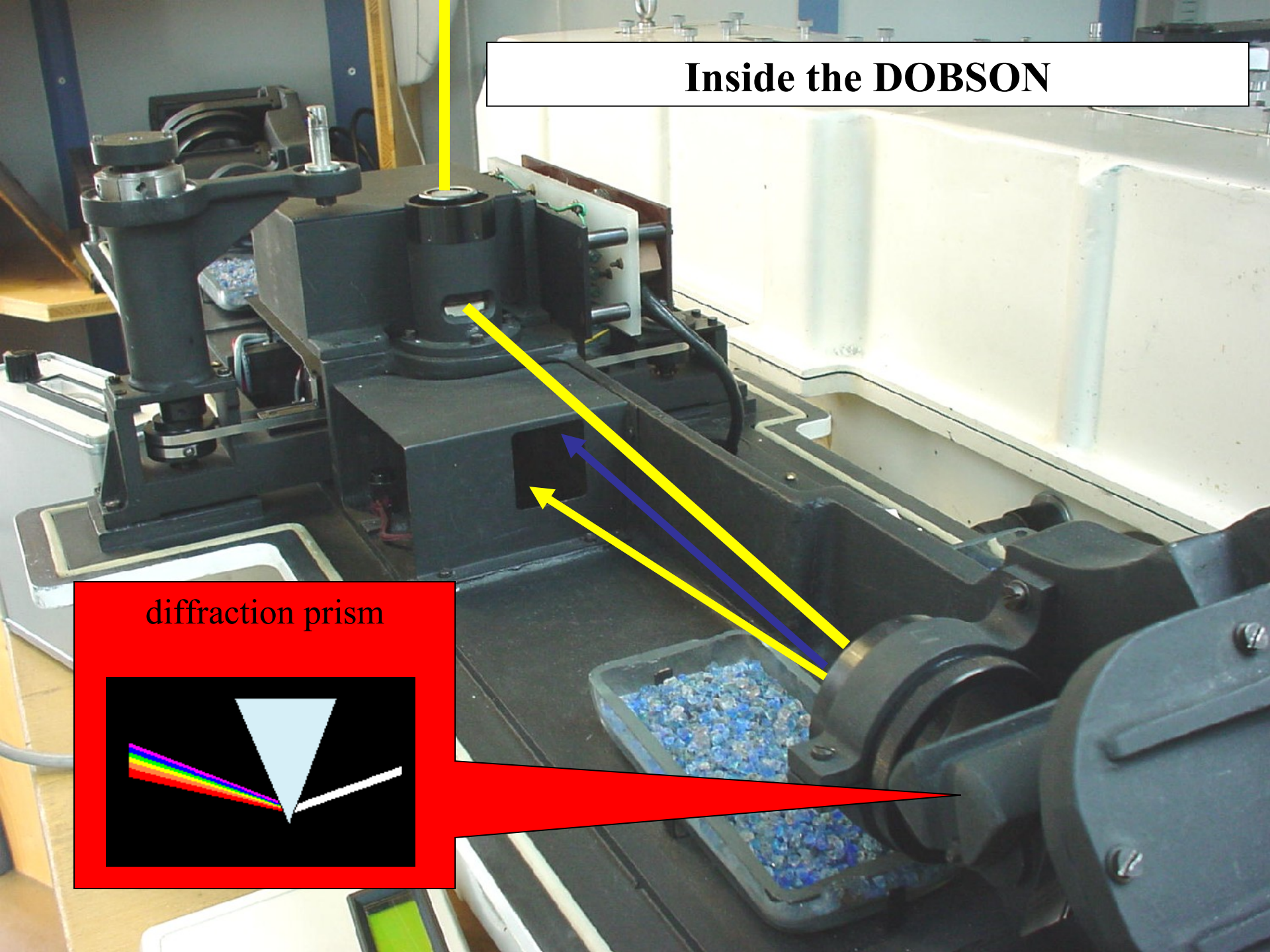
Ozone Layer time series…since then



AROSA panorama

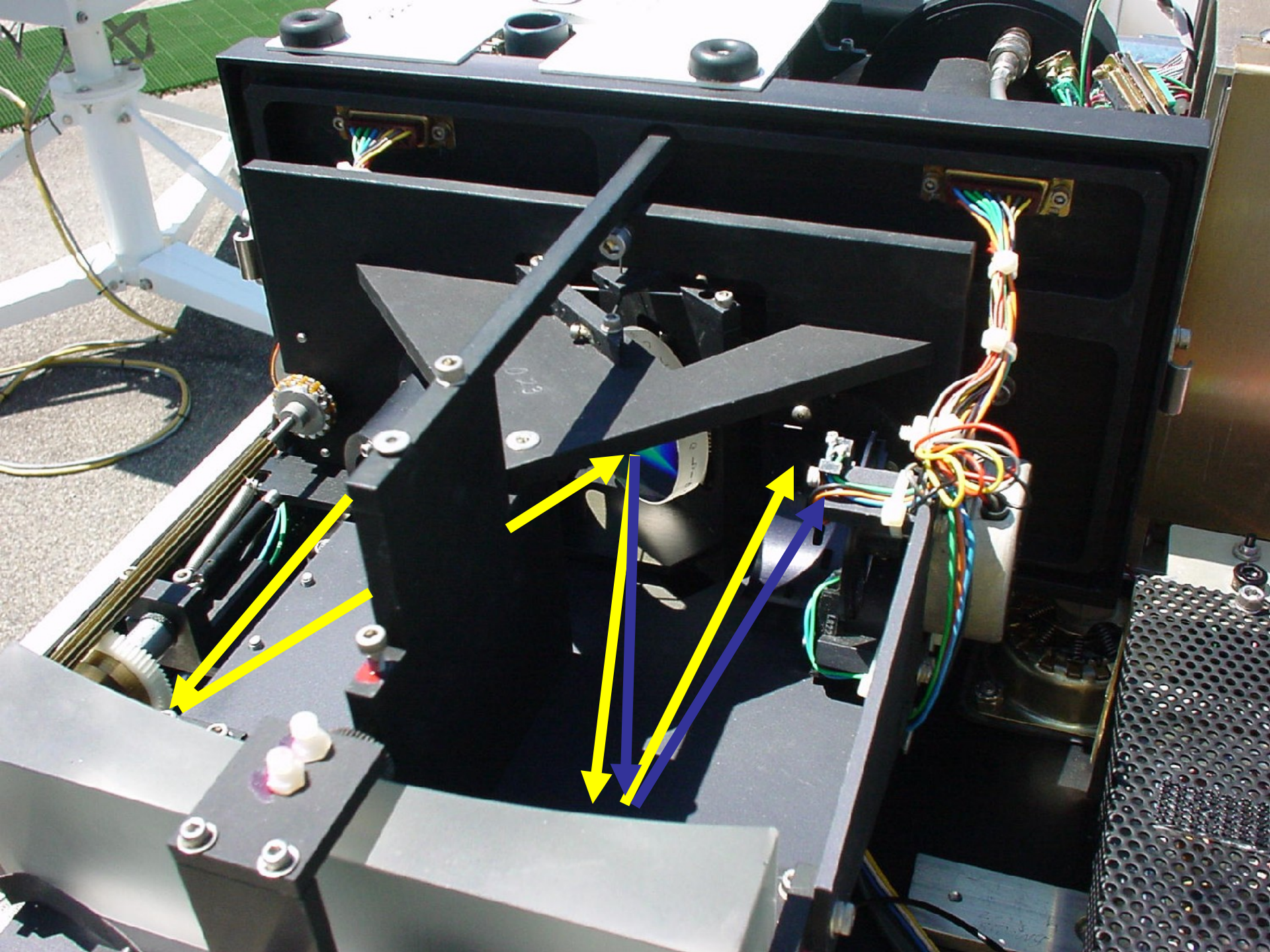


Inside the DOBSON

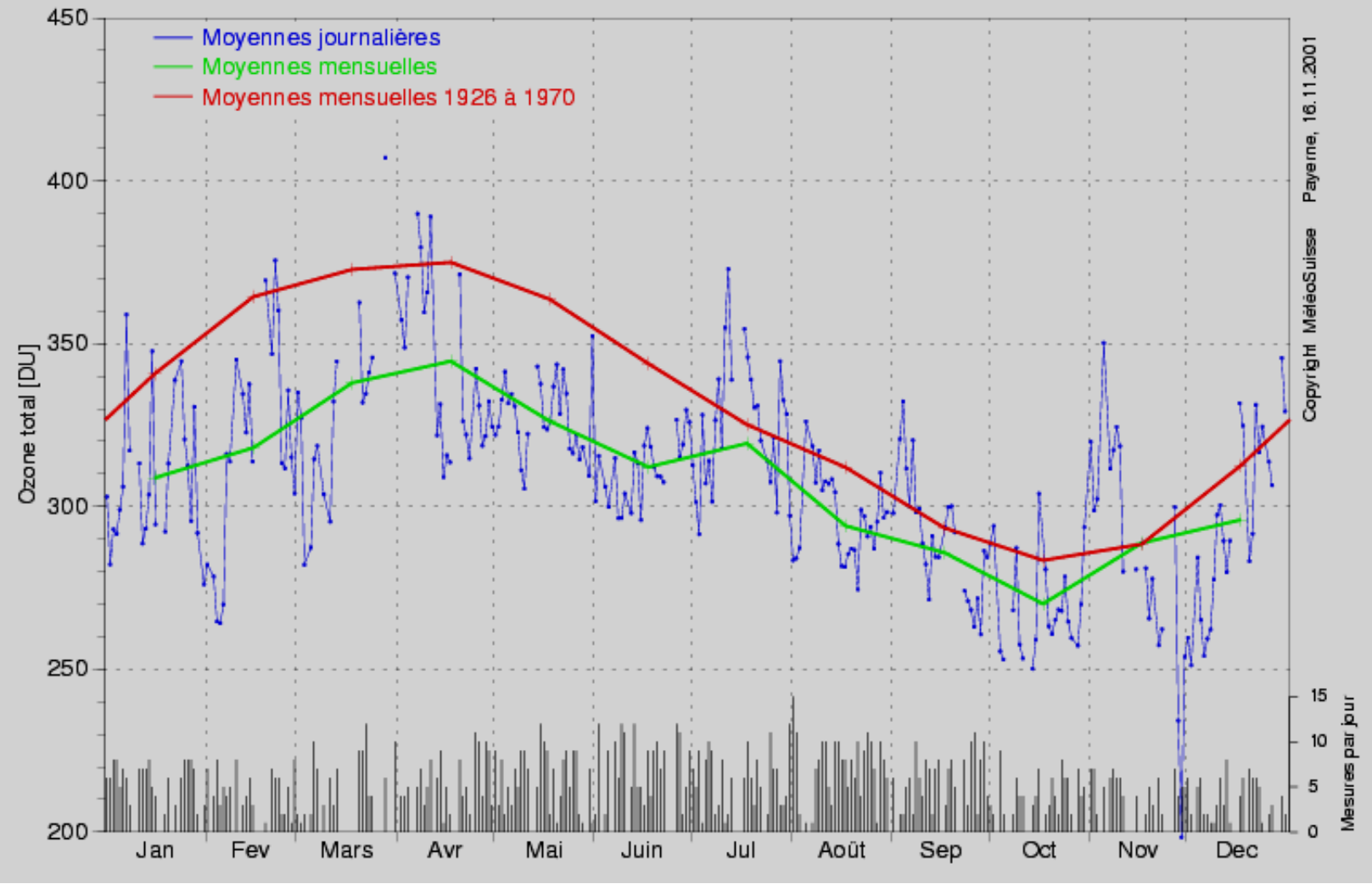



UV photomultiplier

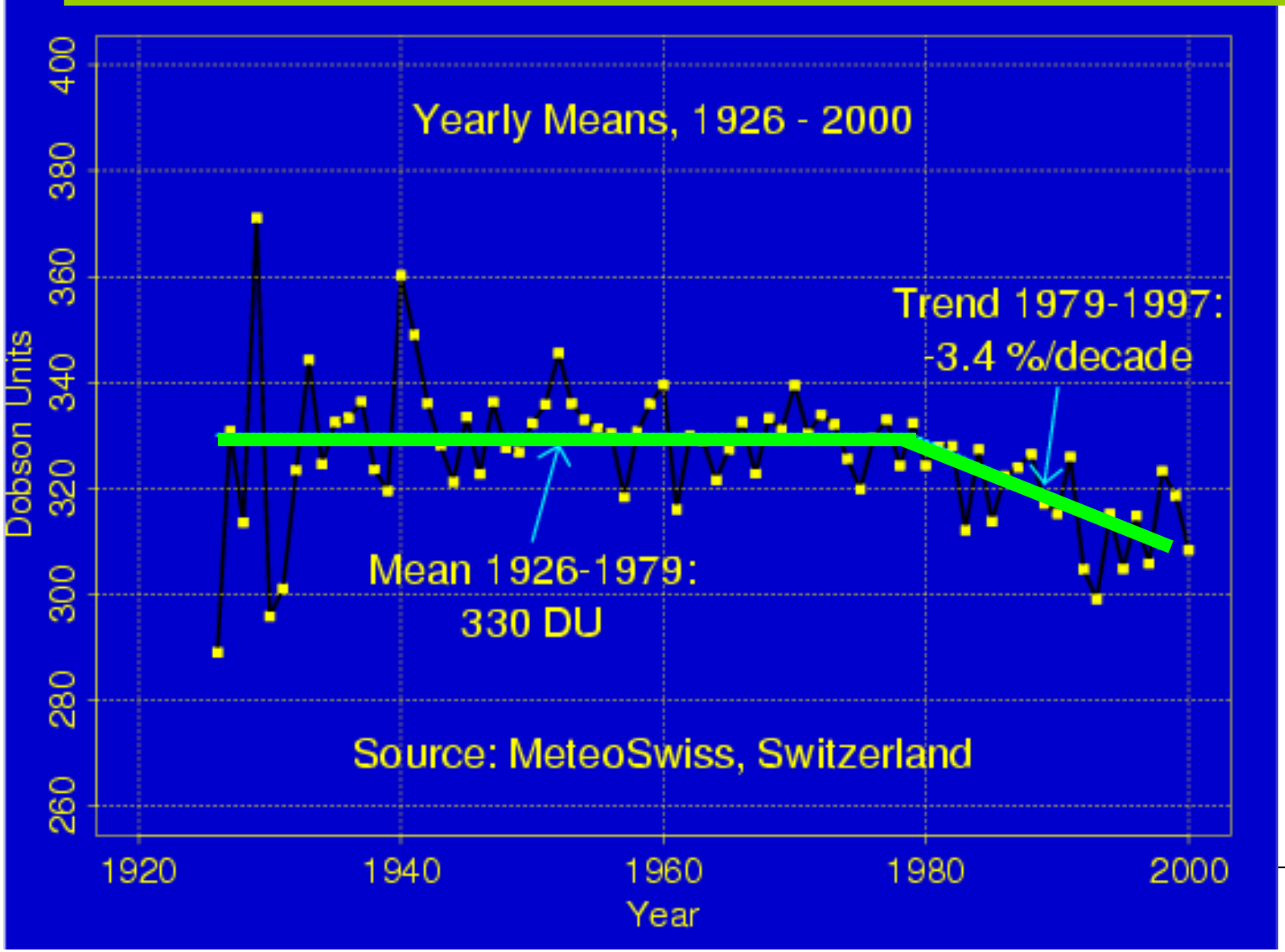
…and some additionnal Brewers on the same site…



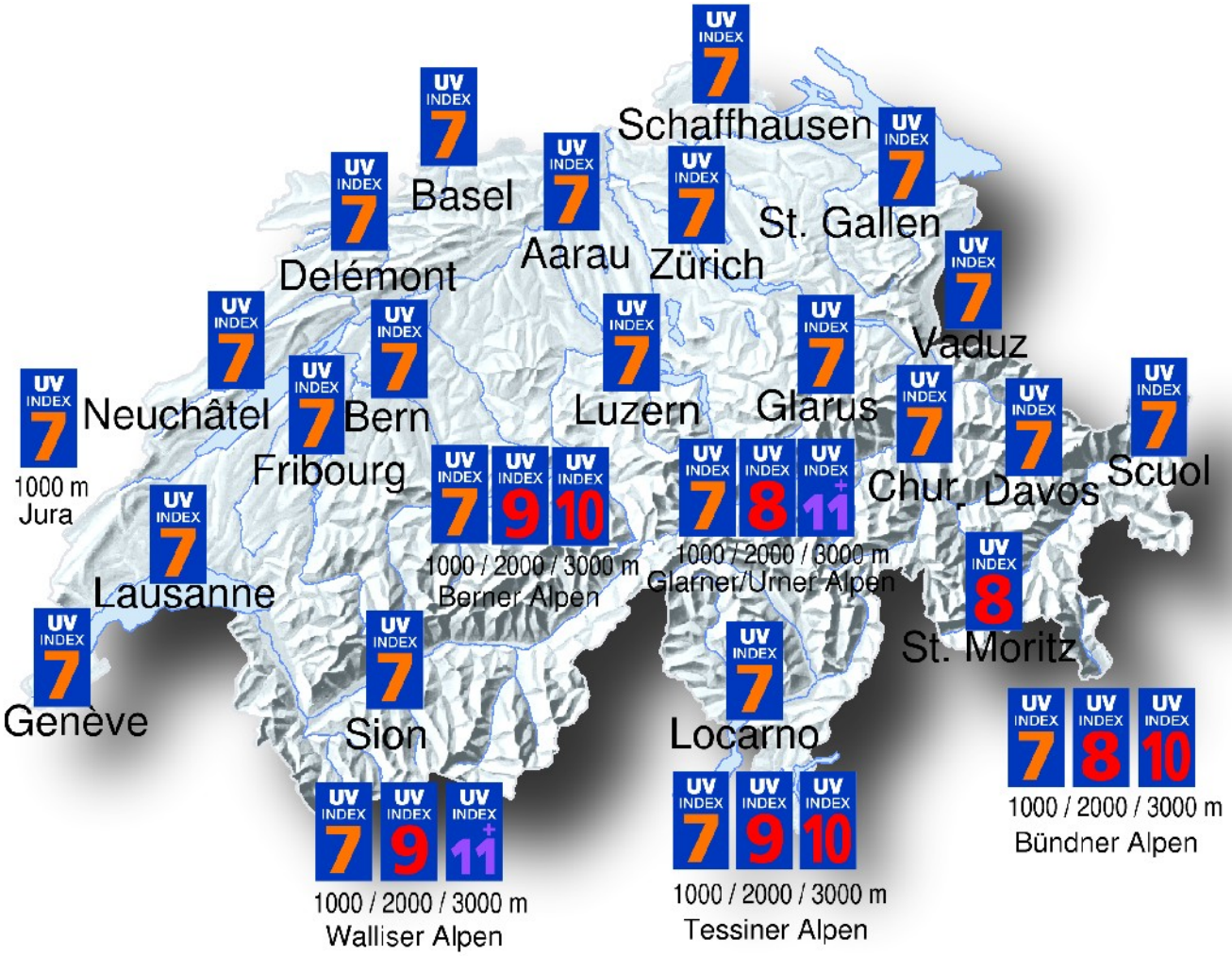
Total Ozone 2000 vs 1926-1970



75 years of continuous Ozone time series @ Arosa



UV index over Switzerland

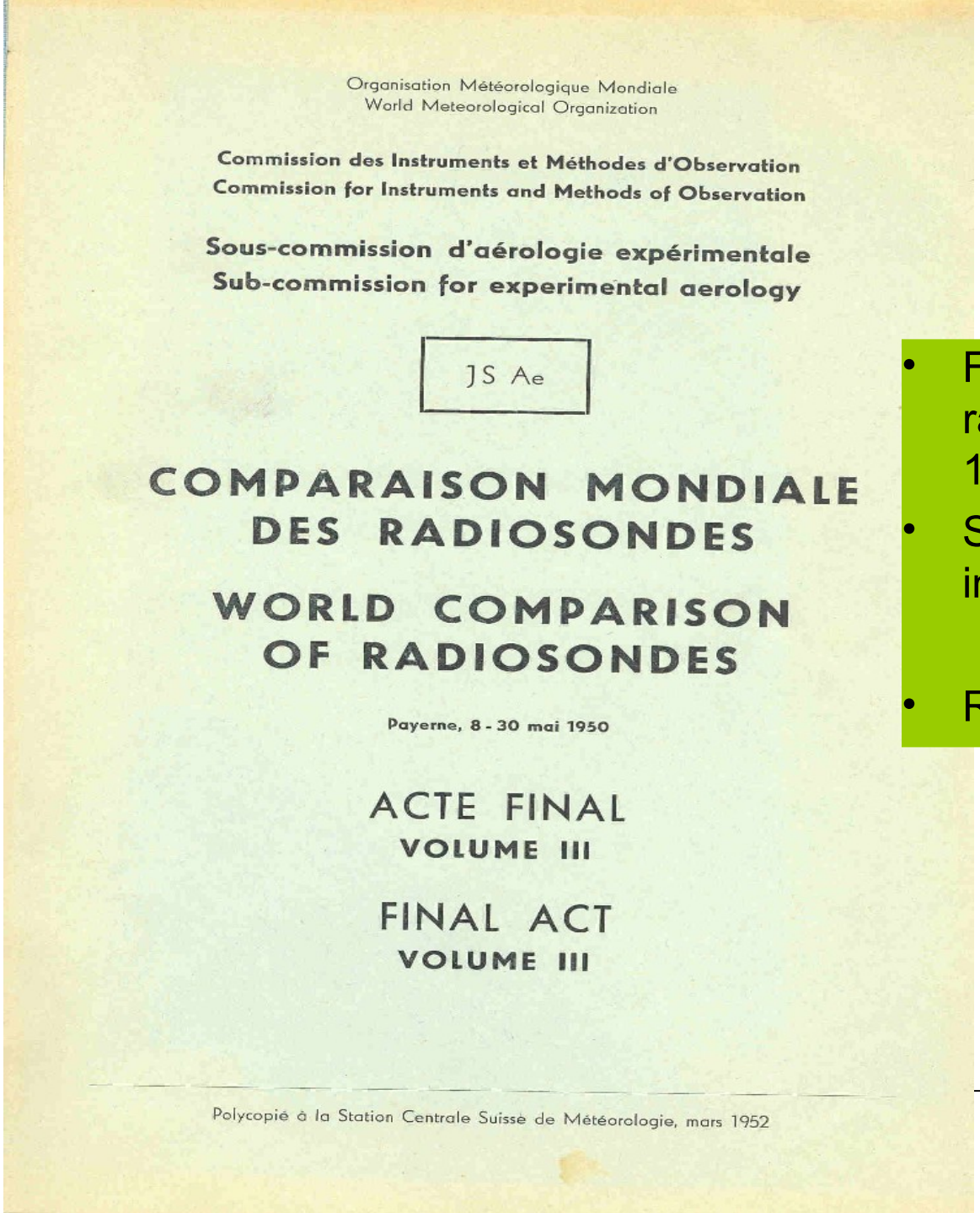


Radiosonde in Switzerland over the last decades…

- 1942: Start of regular radiosoundings
- 1954: 4 Soundings/day
- 1968: 3 Ozone soundings/week
- 1990: Introduction of new SRS-400
- 2001: Change of Ozone sensor (BM->ECC)

…and QA assessment over the decades: Radiosonde Intercomparisons

- 1950: 1. Internat. WMO Radiosonde Intercomparison
- 1956: 2. Internat. WMO Radiosonde Intercomparison
- 1978: ASOND-78 (ALPEX) [ETHZ, Vaisala, etc.]
- 1980: ASOND-80 (ALPEX) [ETHZ, Vaisala, etc.]
- 1992: PREFRS (Crawley, UK) [UK Met Office, NASA, MeteoSwiss]
- 1993: SONDEX93 [UK Met Office]
- 1996: SONDEX/OZEX [NASA]



Organisation Météorologique Mondiale
World Meteorological Organization

Commission des Instruments et Méthodes d'Observation
Commission for Instruments and Methods of Observation

Sous-commission d'aérologie expérimentale
Sub-commission for experimental aerology

JS Ae

COMPARAISON MONDIALE DES RADIOSONDES

WORLD COMPARISON OF RADIOSONDES

Payerne, 8 - 30 mai 1950

ACTE FINAL
VOLUME III

FINAL ACT
VOLUME III

Polycopié à la Station Centrale Suisse de Météorologie, mars 1952

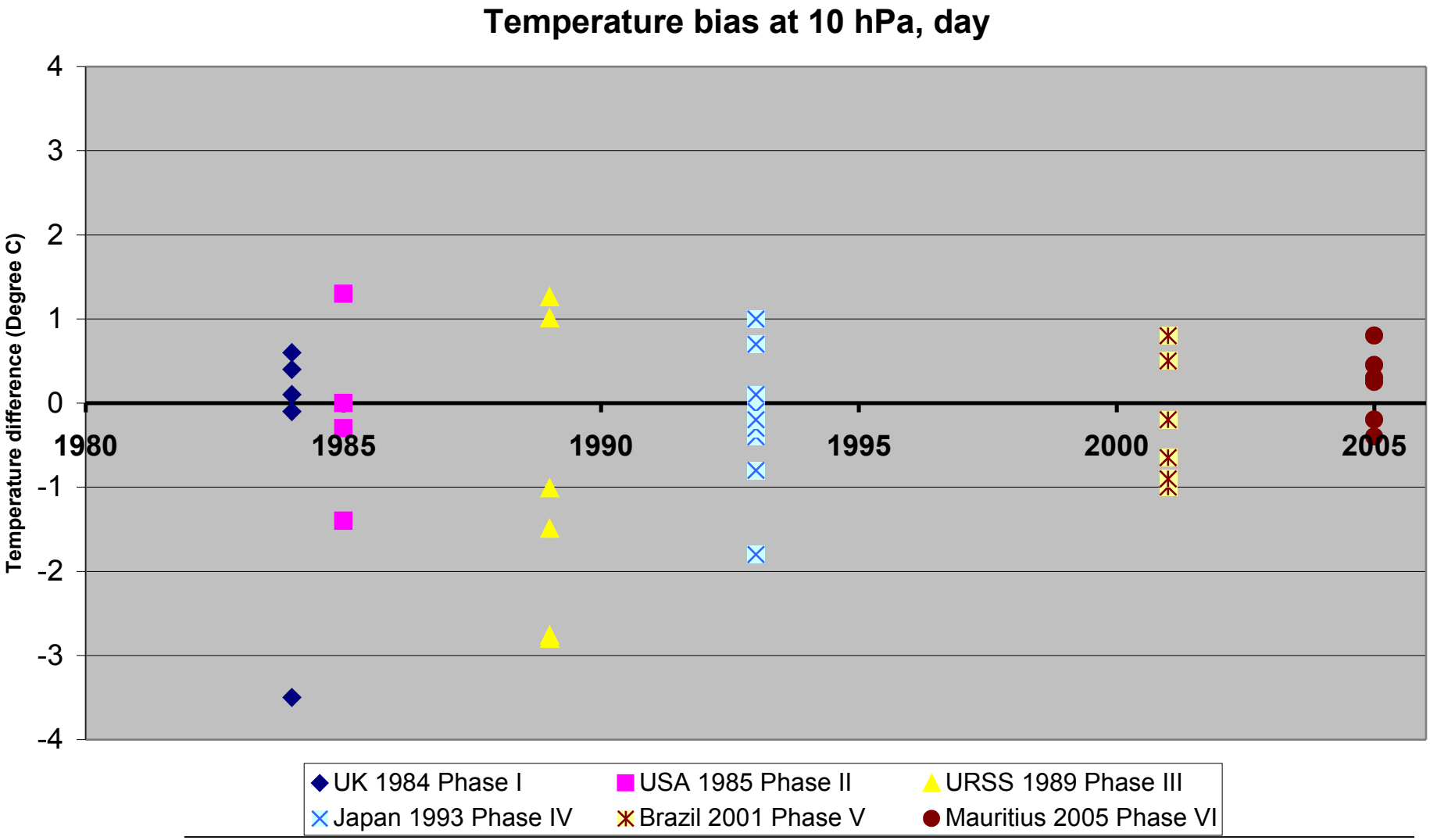
- First world comparison of radiosondes: at Payerne, 1950
- Second one at Payerne in 1956
- Reports are still available

Radiosonde results, 1950

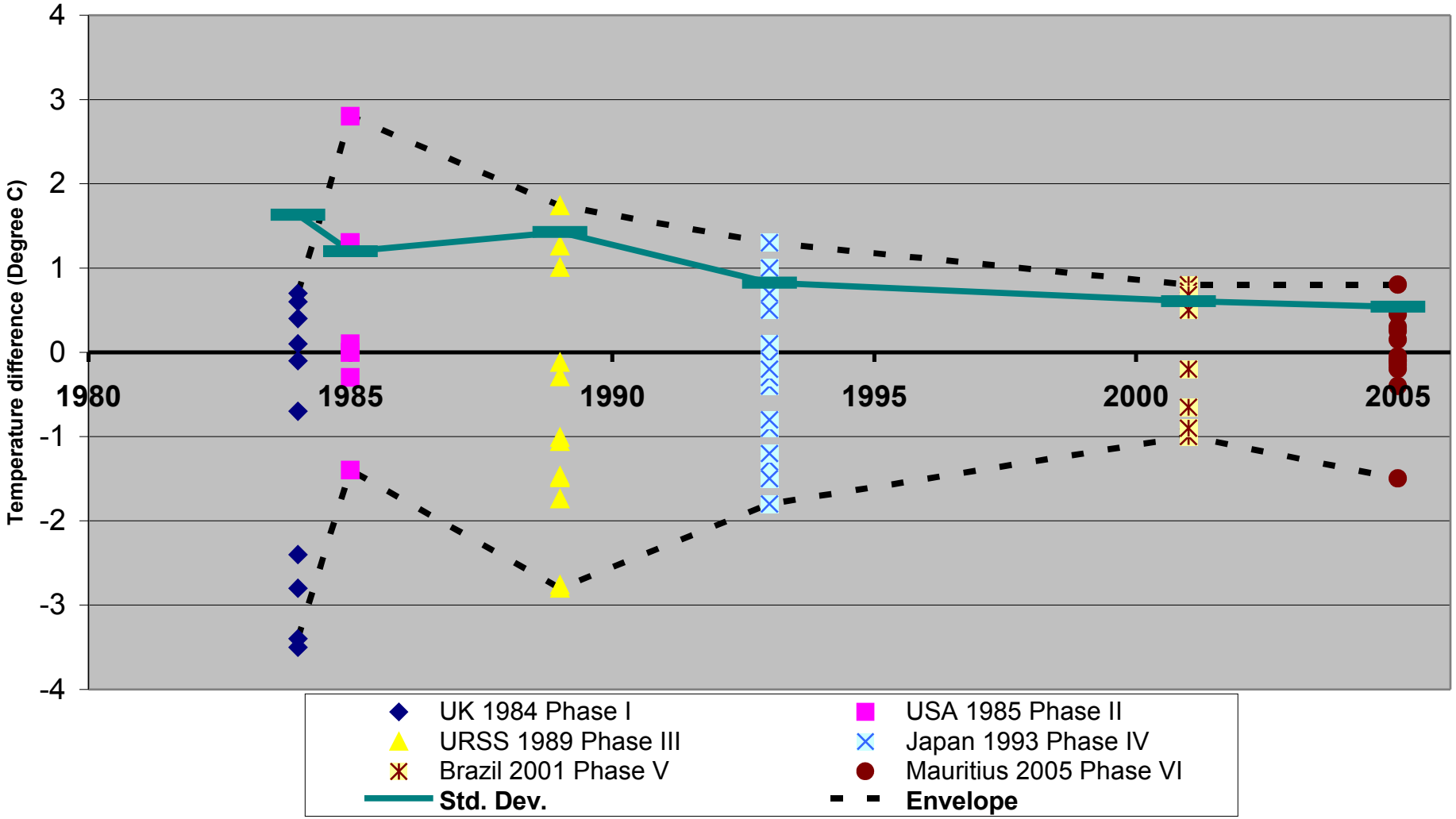
- Within 95% of the cases, the differences between the data given by any two sondes on the same flight are not greater than :
  - 15 hPa
  - 2 degrés Celsius
  - 20% R. H. up to 700 hPa
  - 1% of the height of a given pressure level

  - NB: the analyses were limited to 100 hPa (16 km)

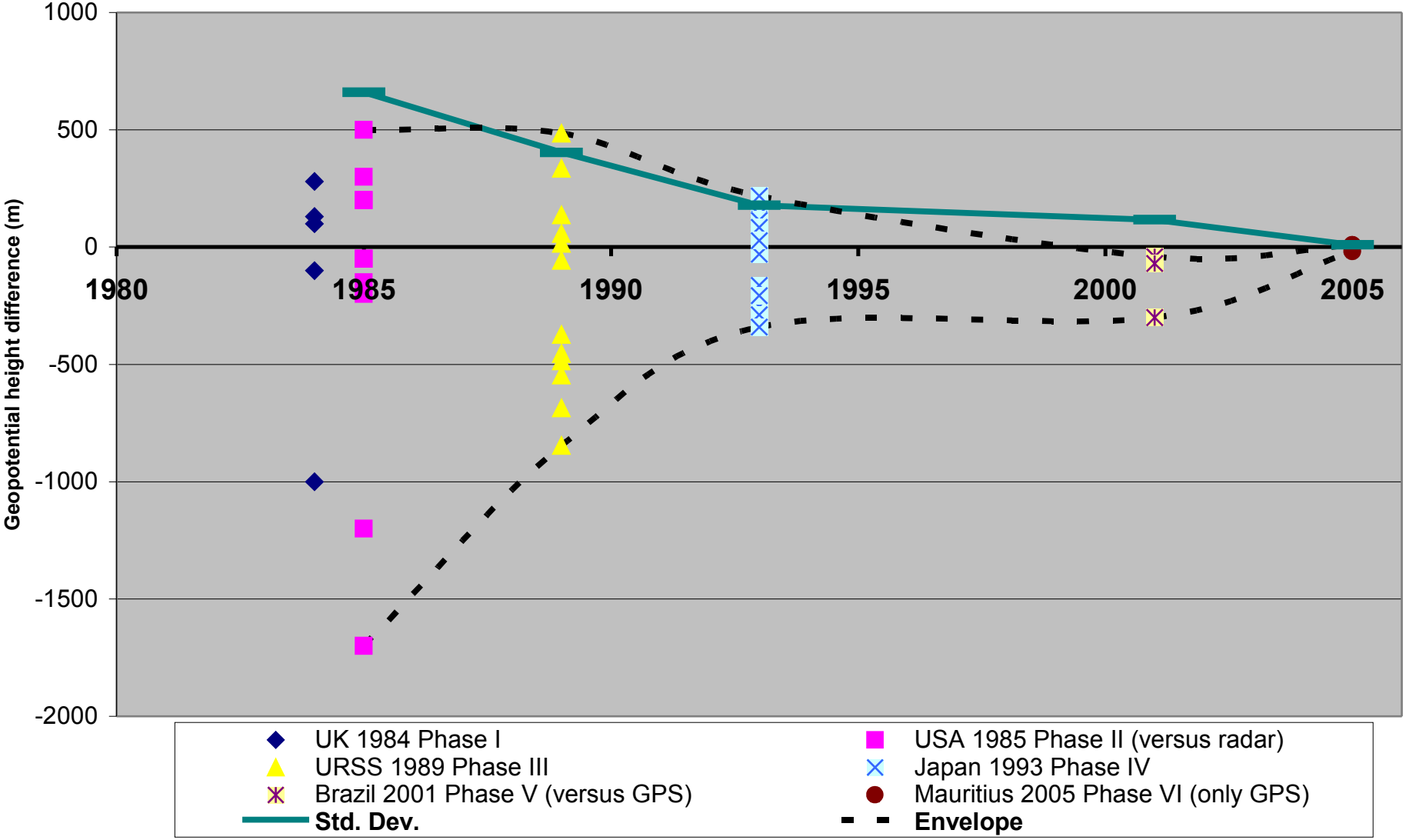
Global Criteria for Tracing the Improvement of Radiosonde Performance over the last 2 decades



Temperature bias at 10 hPa, day and night times

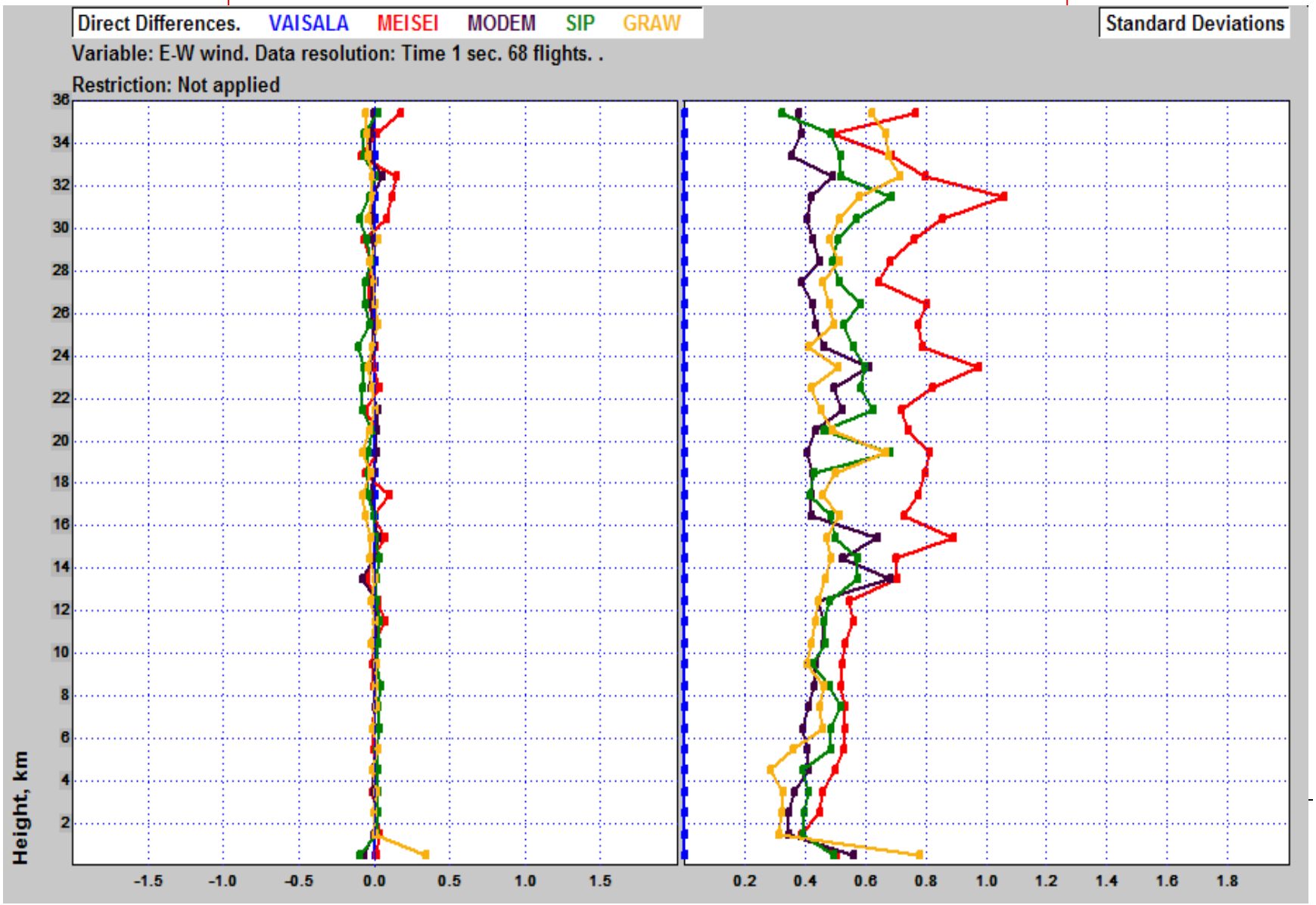


Geopotential height bias at 10 hPa (night and day for all Phases)



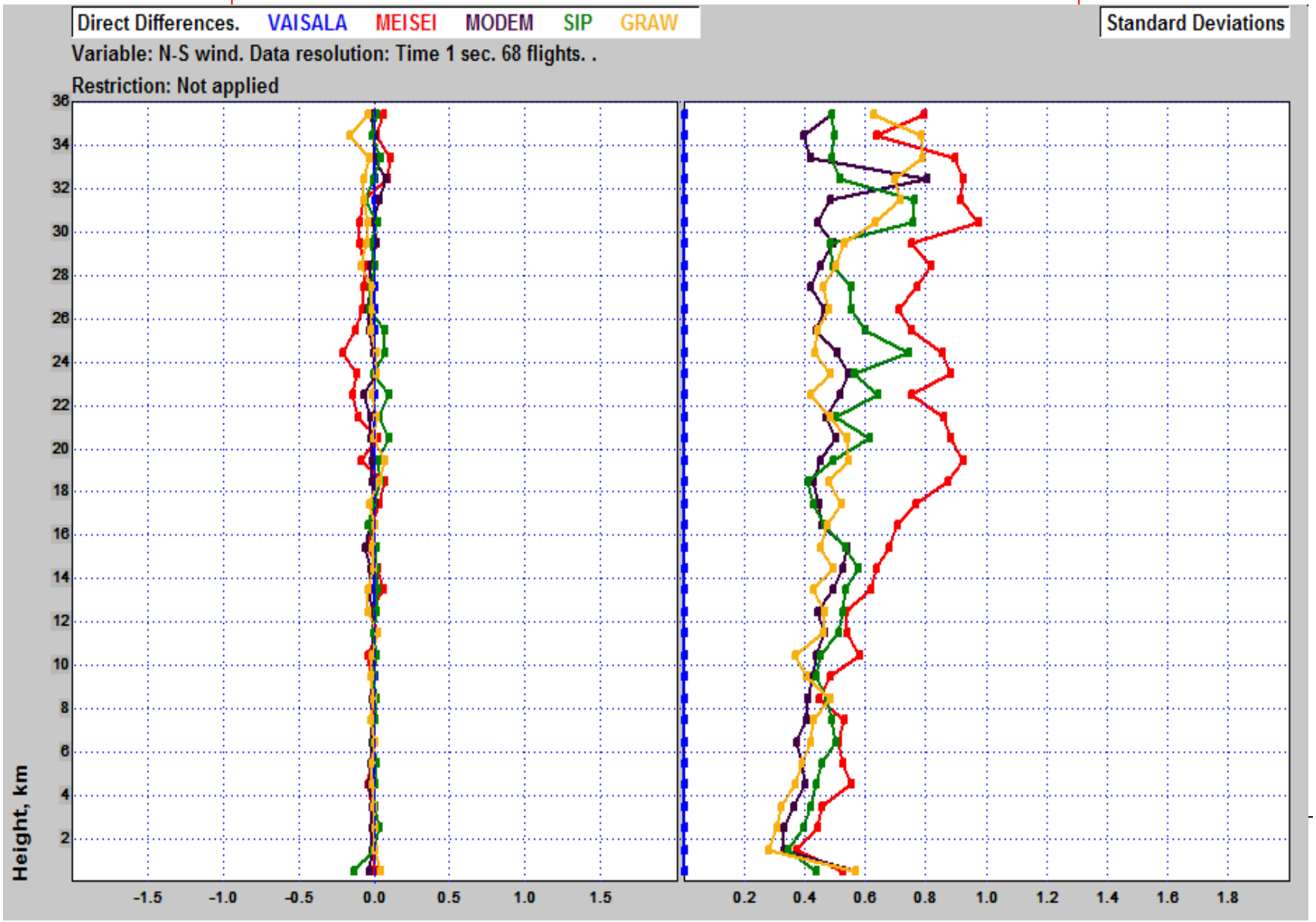
Statistics of U comparisons from all flights

Ref: CIMO Mauritius 2005, J. Nash et al.

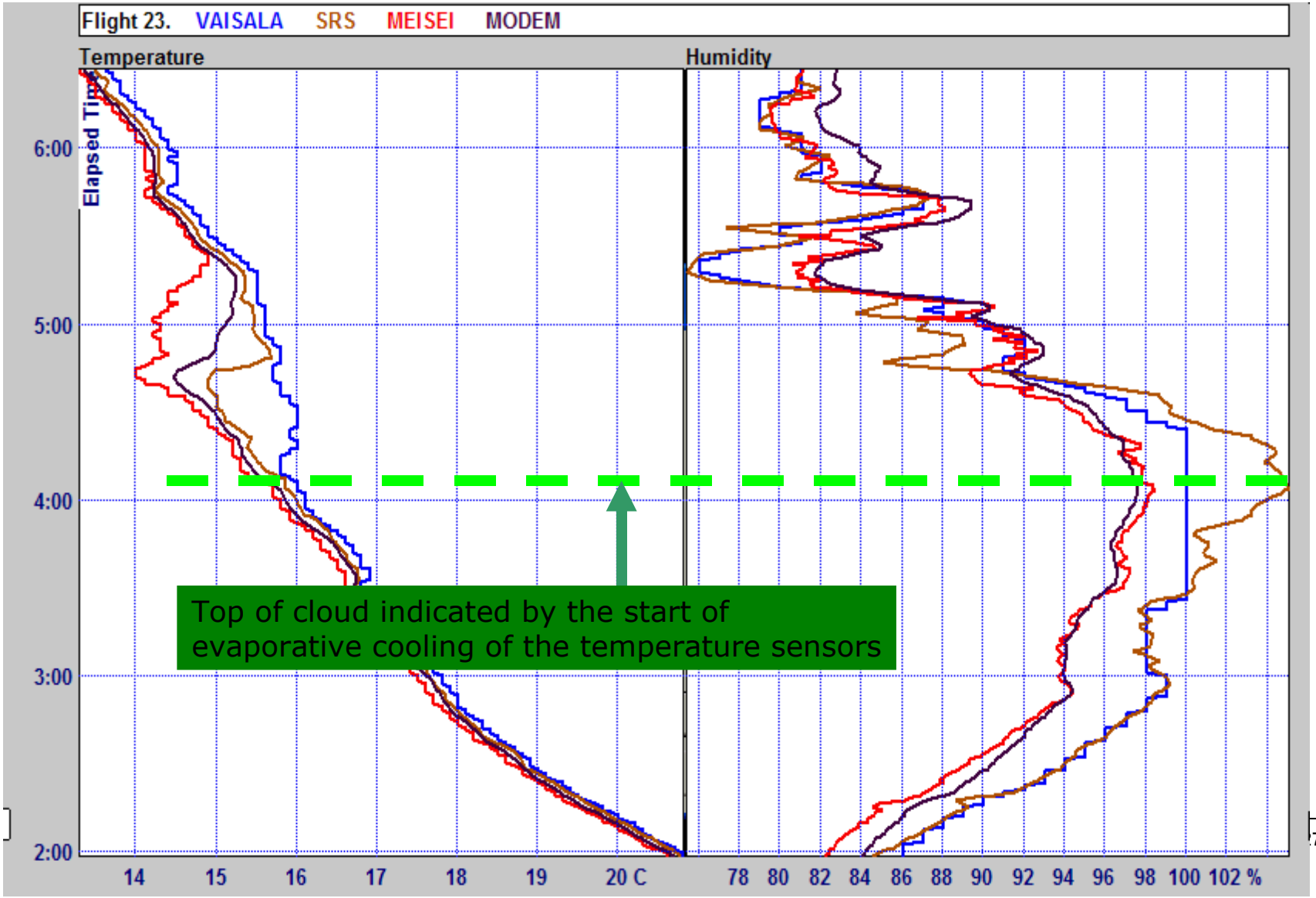


Statistics of V comparisons from all flights

Ref: CIMO Mauritius 2005, J. Nash et al.



Vaisala temperature cools least on emerging from top of cloud, whilst all relative humidity sensors were contaminated for a significant time after emerging from the cloud.
Ref: CIMO Mauritius 2005, J. Nash et al.



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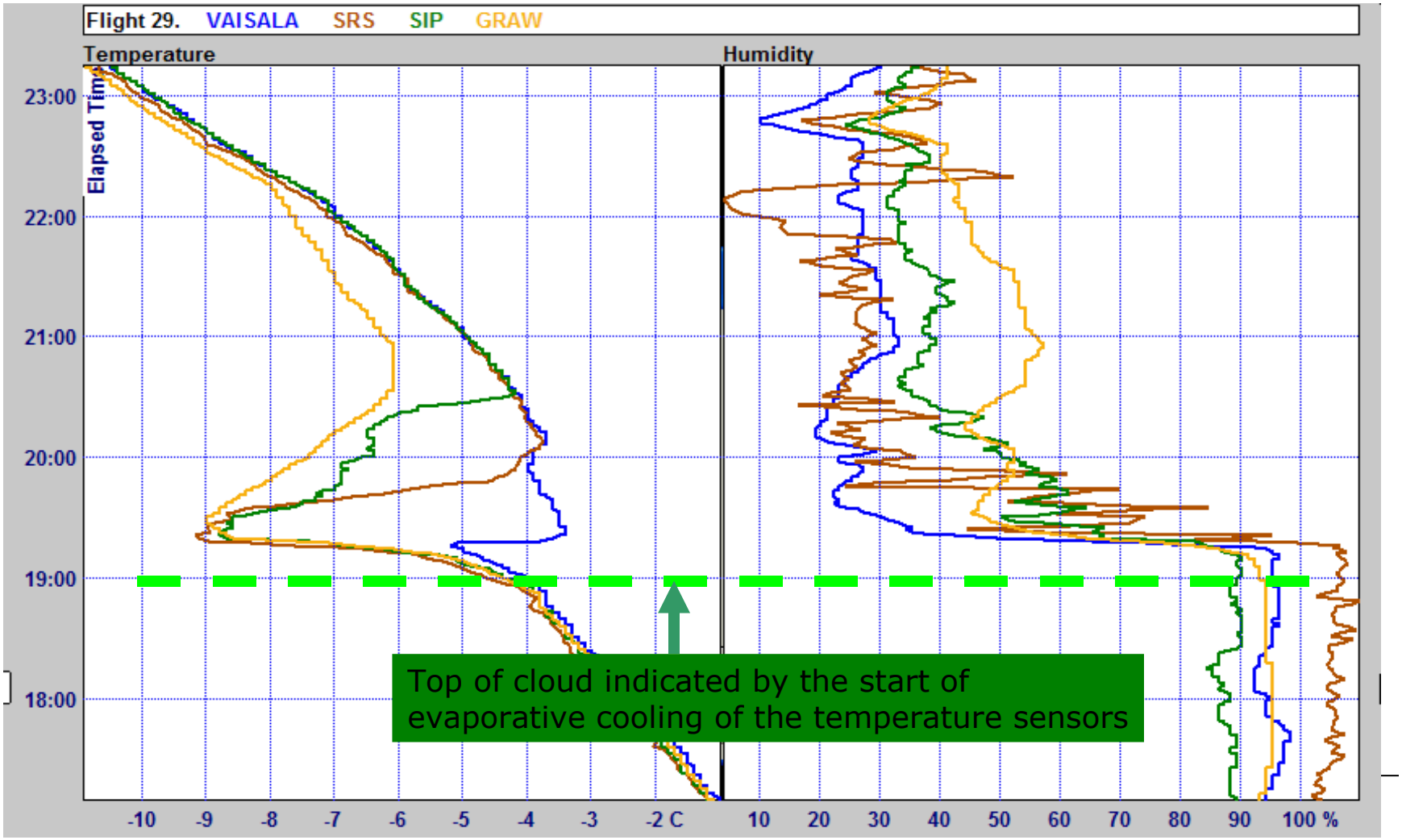
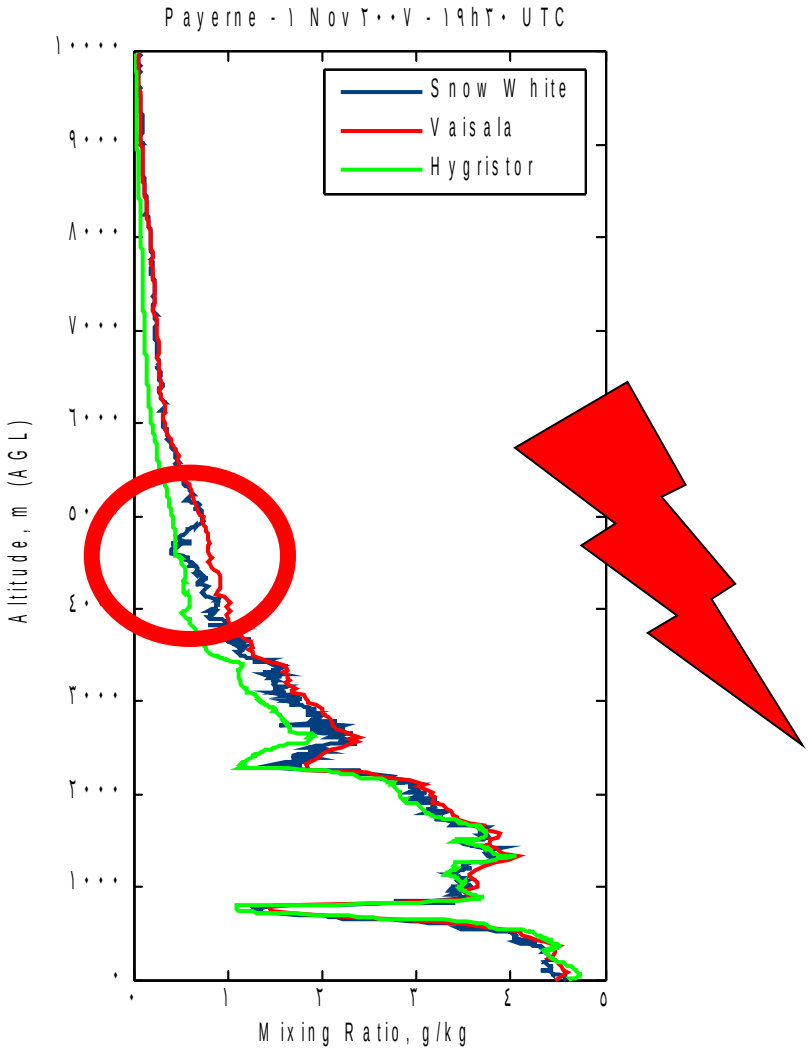
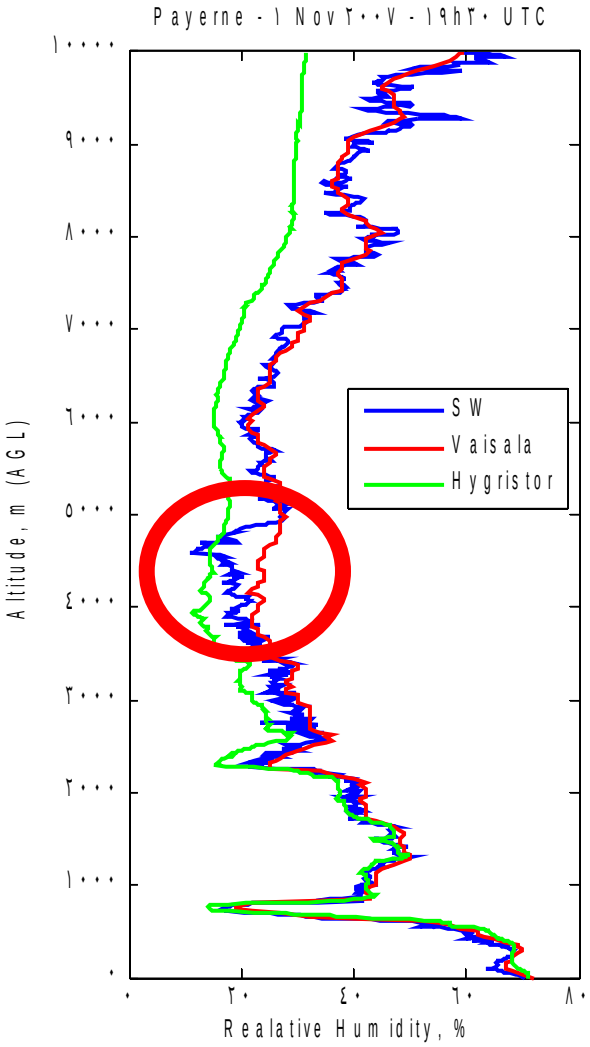
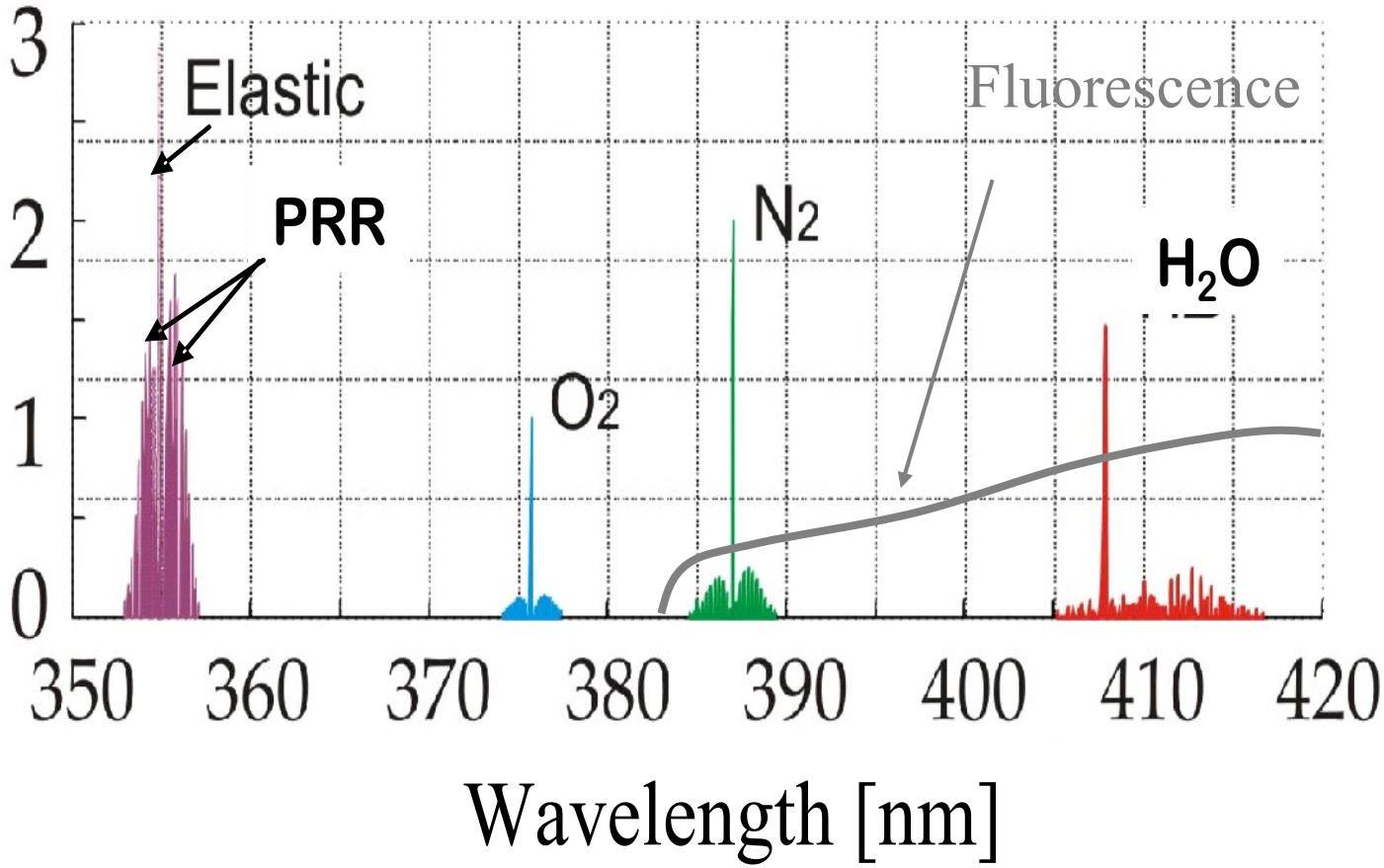


1 Nov 2007


Payerne - ١ Nov ٢٠٠٧ - ١٩h٣٠ UTC
Snow White
Vaisala
Hygristor
Altitude, m (AGL)
Mixing Ratio, g/kg

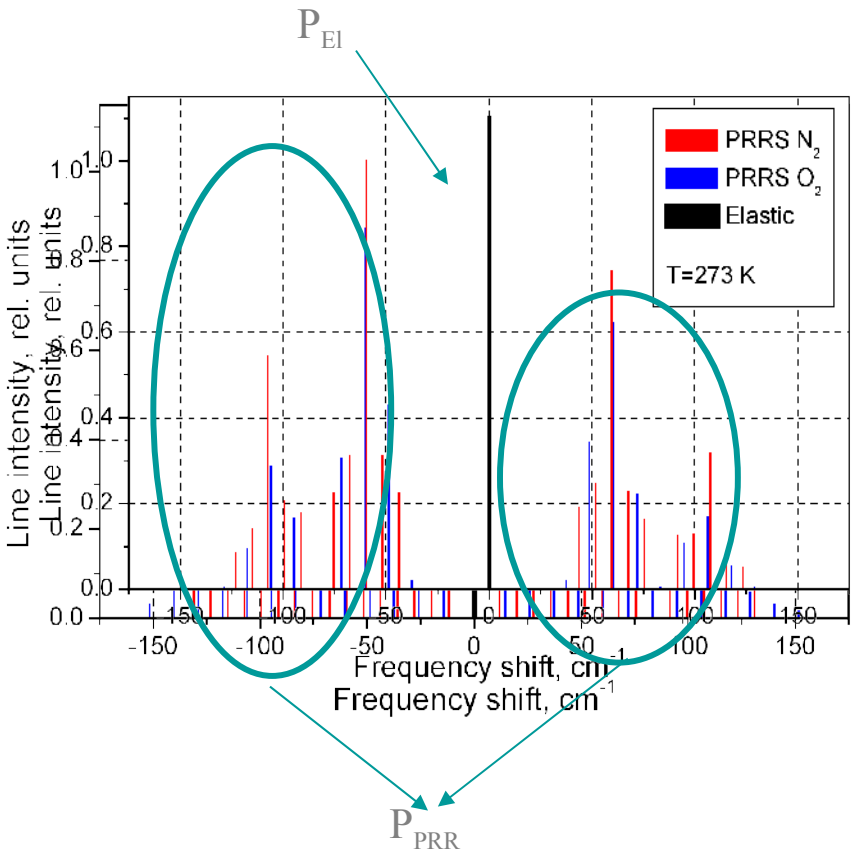

Payerne - ١ Nov ٢٠٠٧ - ١٩h٣٠ UTC
SW
Vaisala
Hygristor
Altitude, m (AGL)
Realative Humidity, %

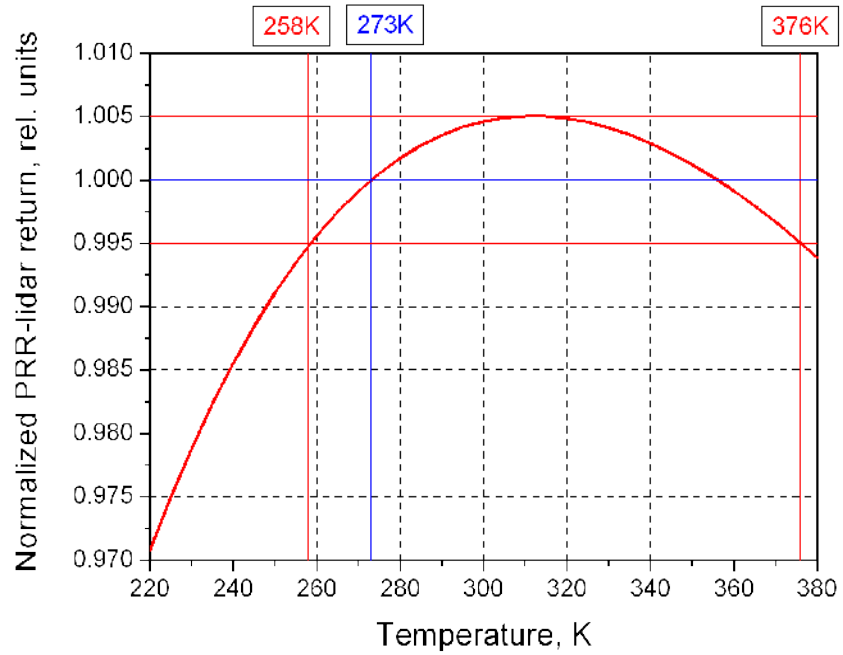
Raman Lidar


Elastic
PRR
O2
N2
H2O
Fluorescence
0
1
2
3
350
360
370
380
390
400
410
420
Wavelength [nm]

Aerosol backscatter and extinction

PRR method



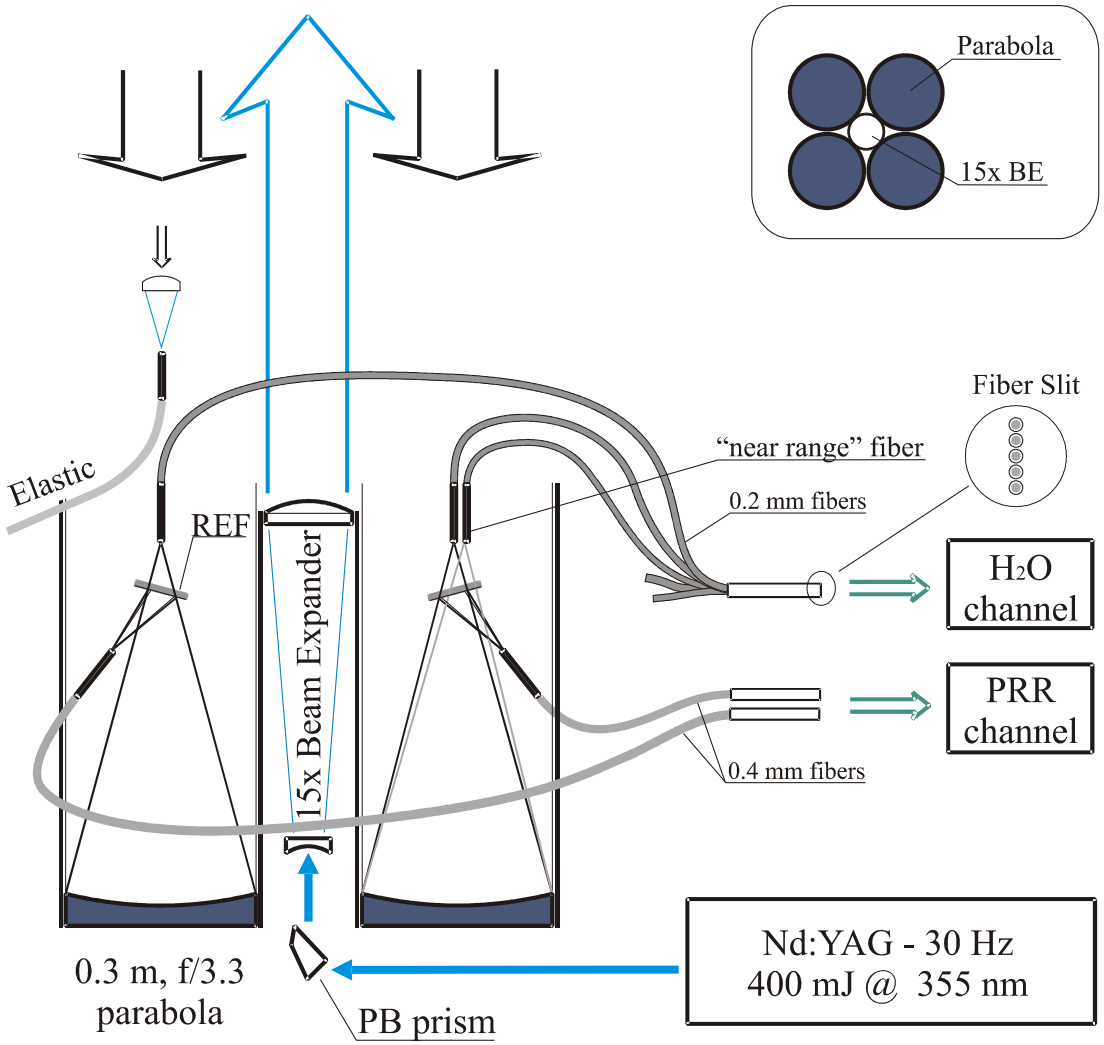


$$\alpha_{aer} = \frac{1}{2}\frac{d}{dR}\ln\frac{O(R)N(R)}{R^2 S_{PRR}(R)} - \alpha_m(R)$$

$$\beta(R) = a\beta_{PRR}\frac{P_{El}(R)}{P_{PRR}(R)}$$

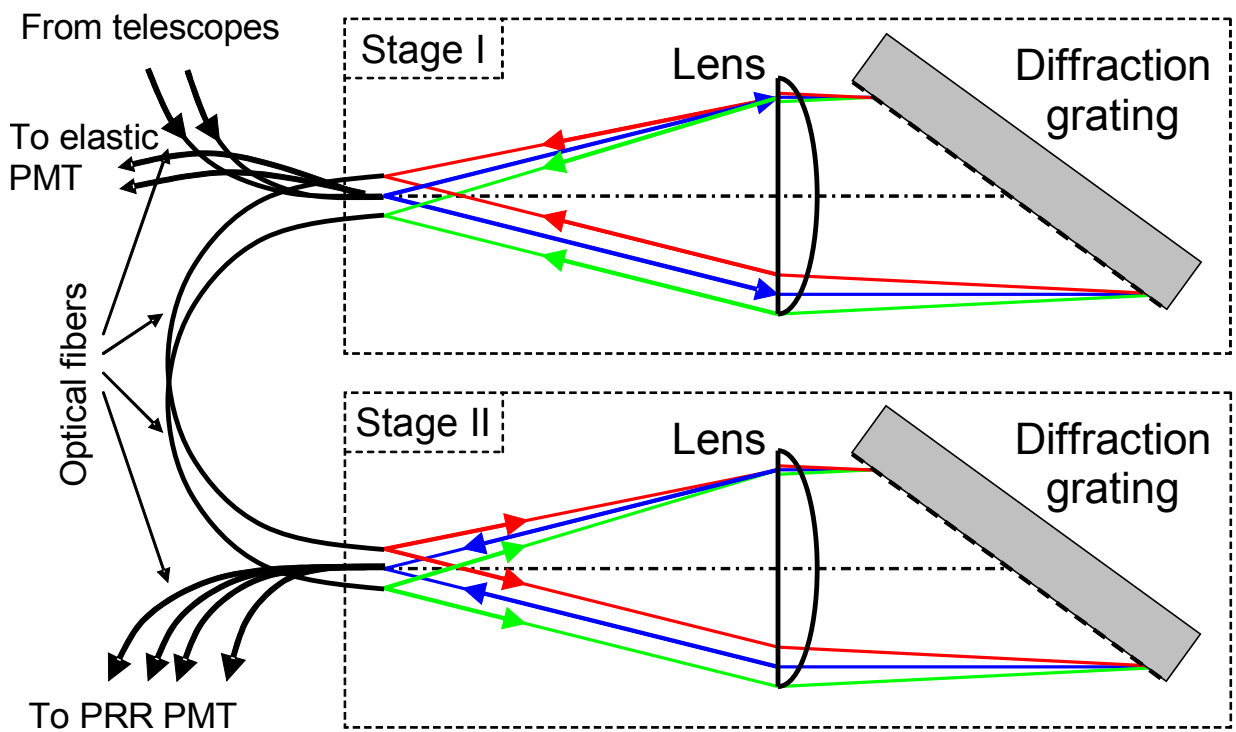
$$O(R) = k\frac{S_{NFV}(R)}{S_{BFV}(R)}$$

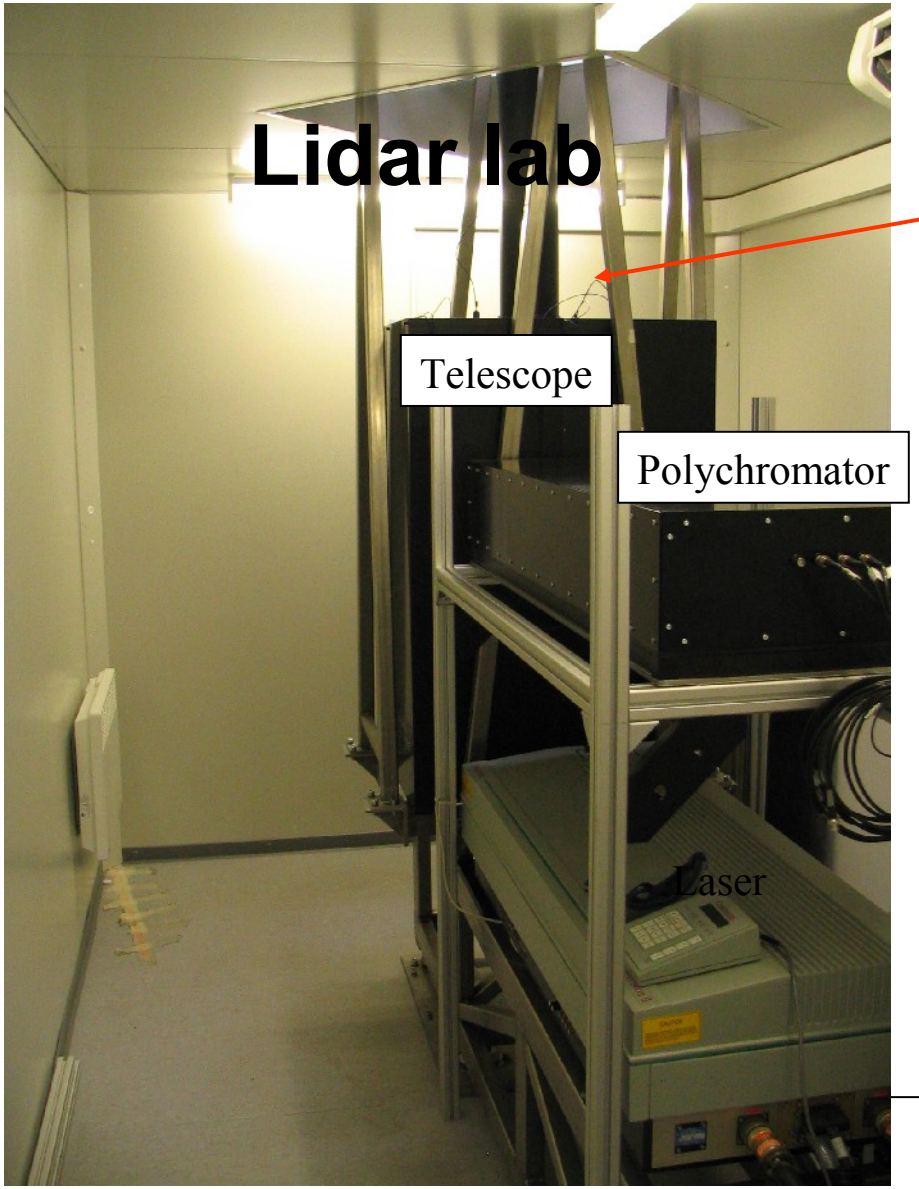
Aerosol channel



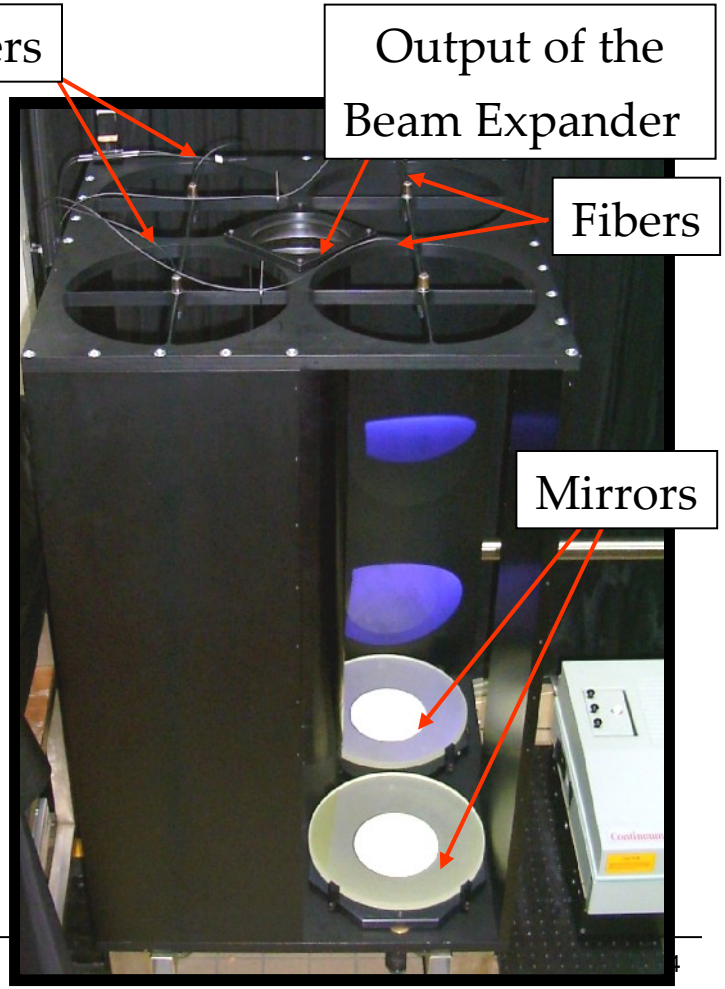
Aerosol PRR polychromator

Separates PRR from elastic signal
Combines four PRR bands
Suppresses the elastic noise in PRR channels (> 10^8)



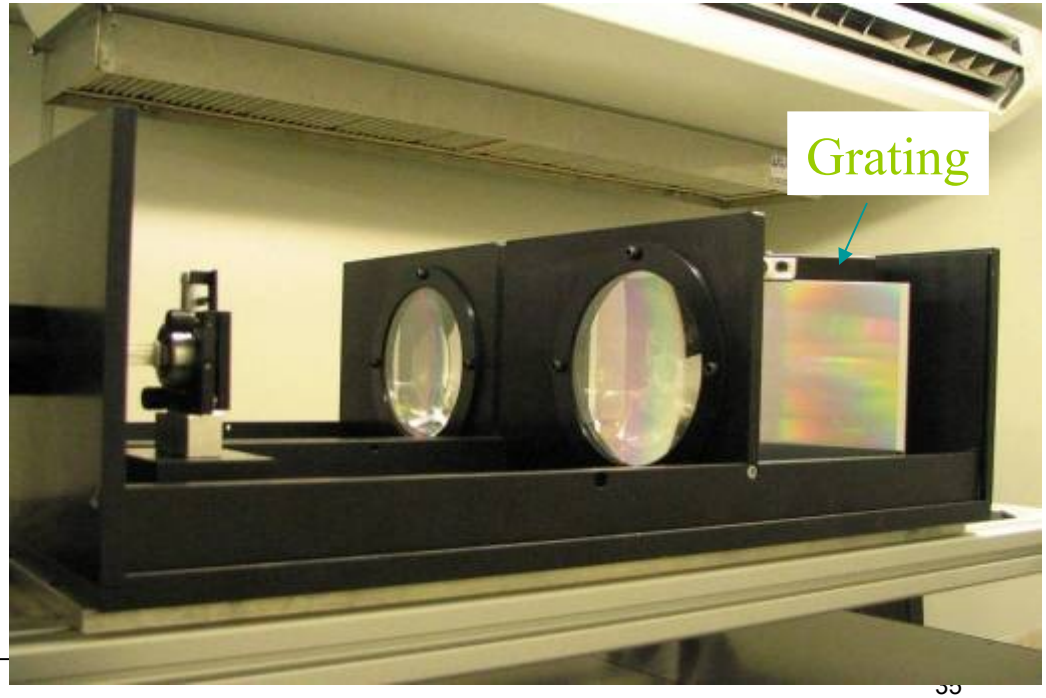

Lidar lab
Fibers
Telescope
Polychromator
Laser

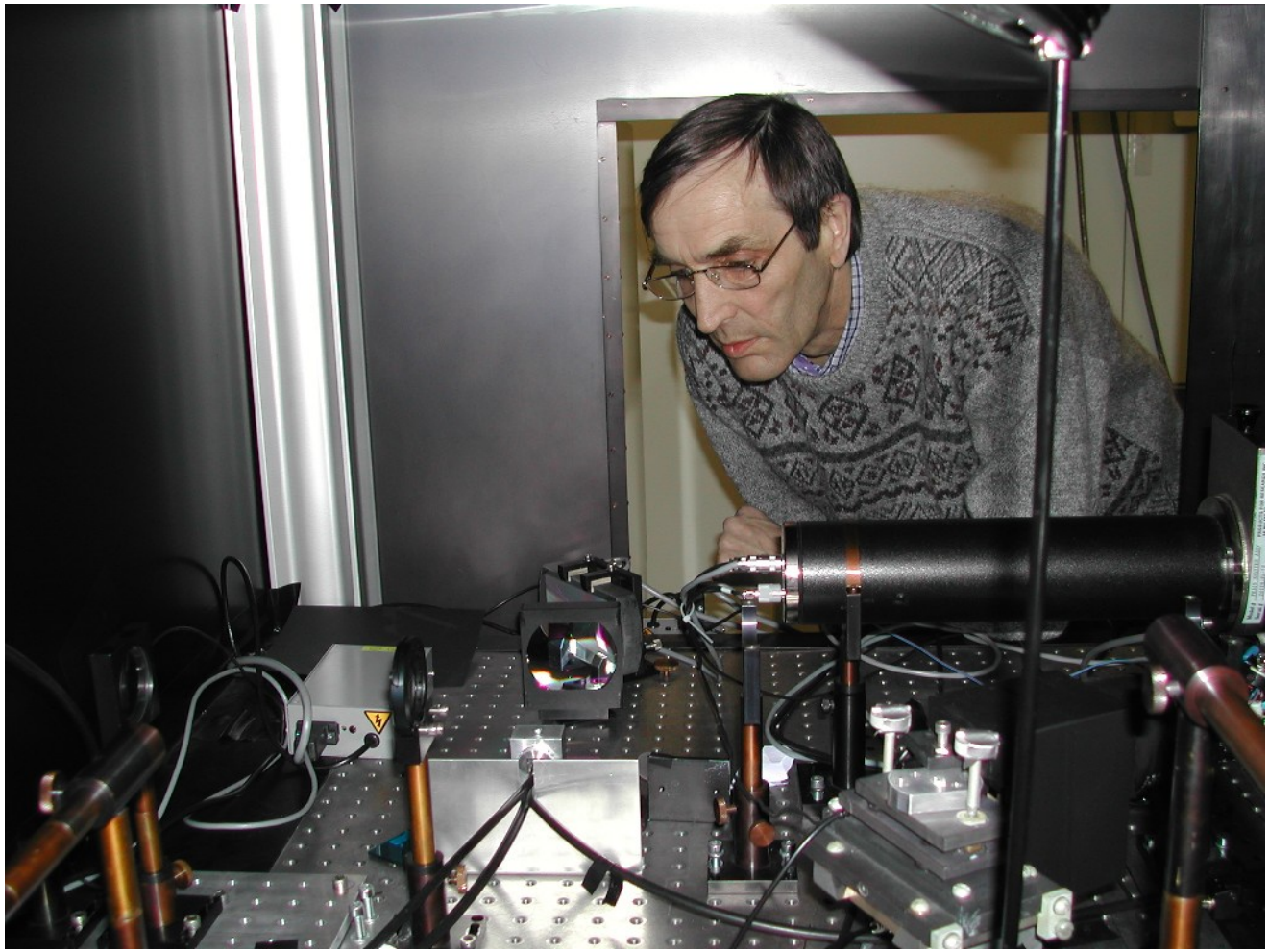
Telescope


Output of the
Beam Expander
Fibers
Mirrors

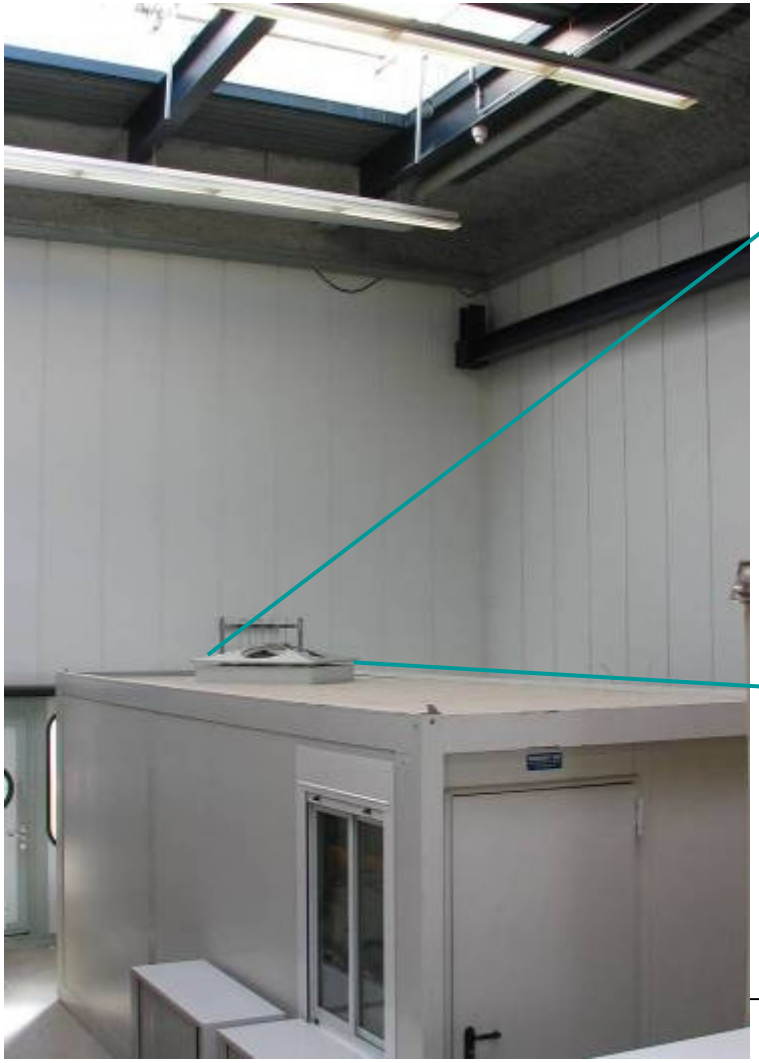
Aerosol channel

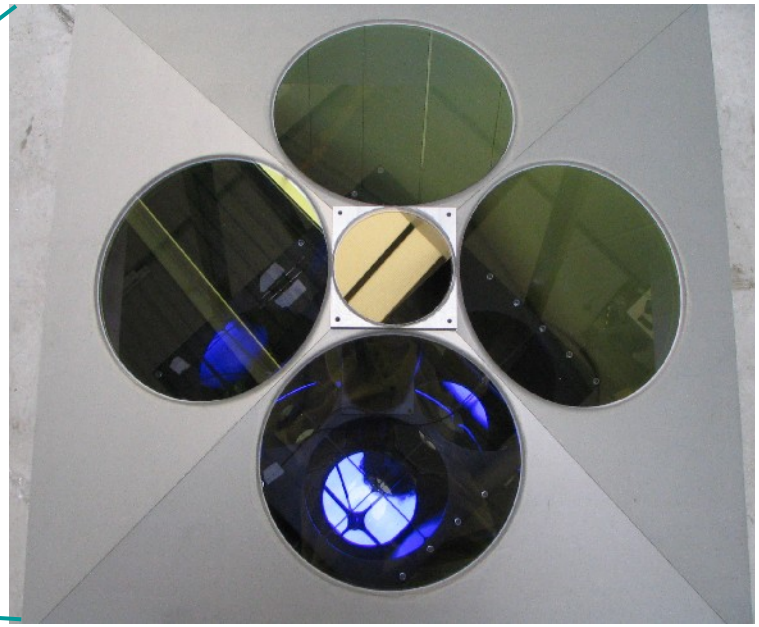
Double grating polychromator

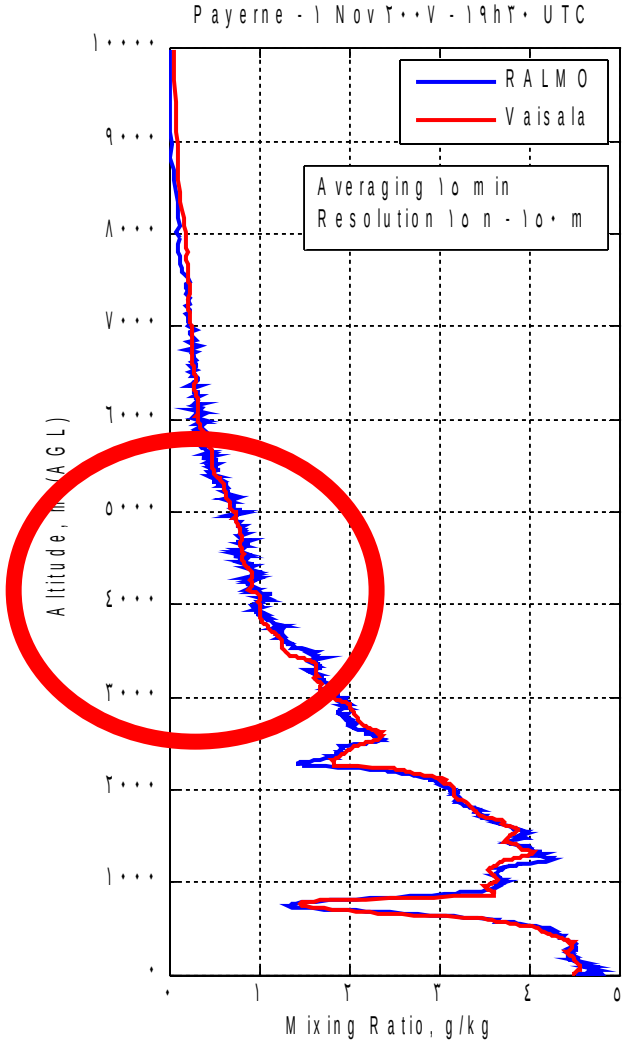




Youri Arshinov







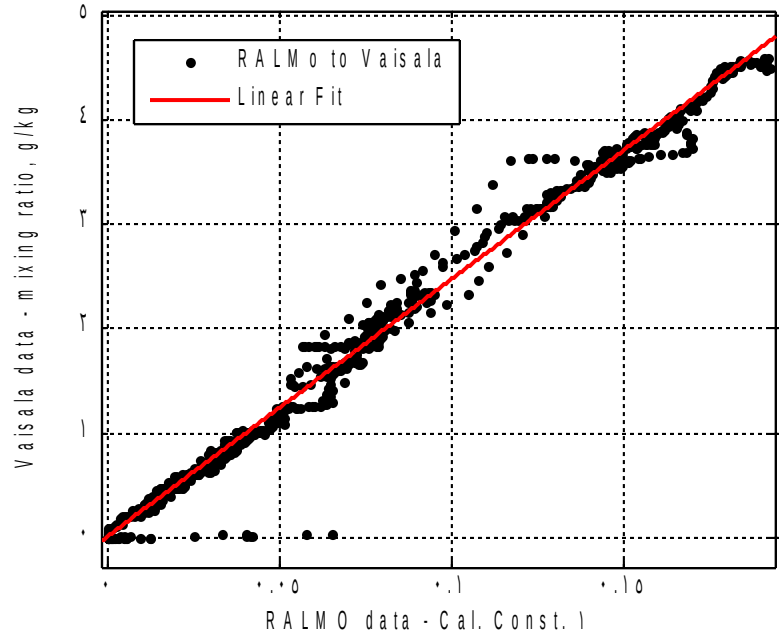


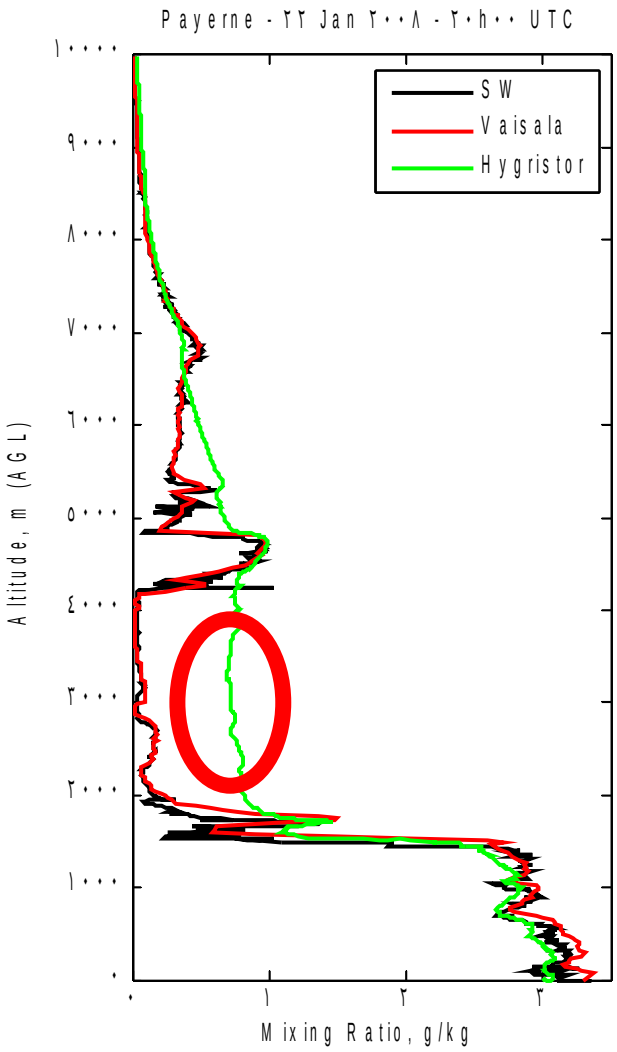
Fig. x. Linear fit of RALMO and Vaisala vertical water vapor mixing ratio profiles.

Linear regression using the following model:
*Vaisala(RALMO) = a*RALMO + b*

Coefficients with 95% confidence bounds
a = 24.7 (24.54, 24.87)
b = 0.003915 (-0.01076, 0.01859)

SSE: 0.03573
R-square: 0.9889
Adjusted R-square: 0.9889
RMSE: 0.006044

22 Jan 2008


Payerne - ٢٢ Jan ٢٠٠٨ - ٢٠h٠٠ UTC
SW
Vaisala
Hygristor
Altitude, m (AGL)
Mixing Ratio, g/kg
١٠٠٠٠
٩٠٠٠
٨٠٠٠
٧٠٠٠
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٥٠٠٠
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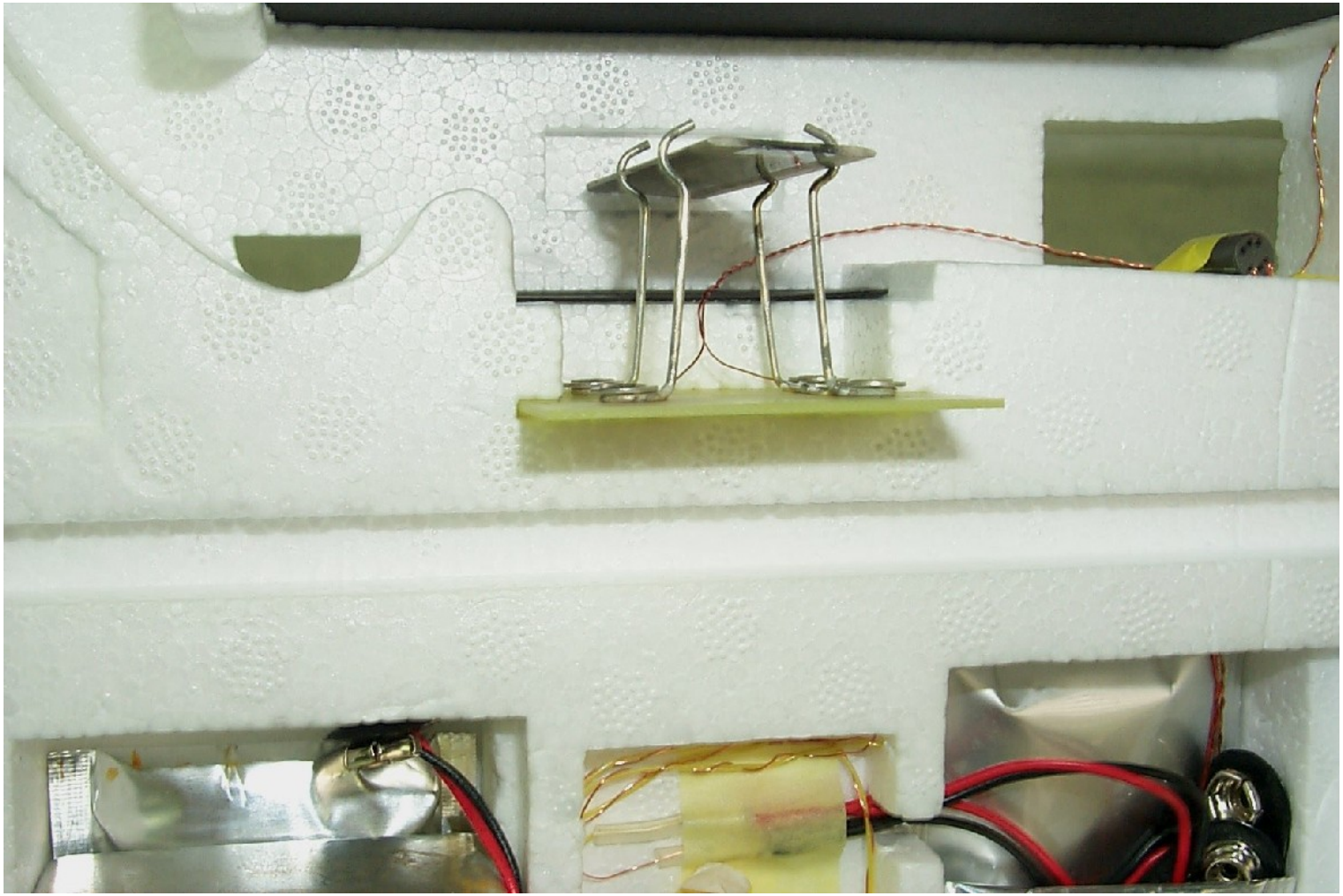
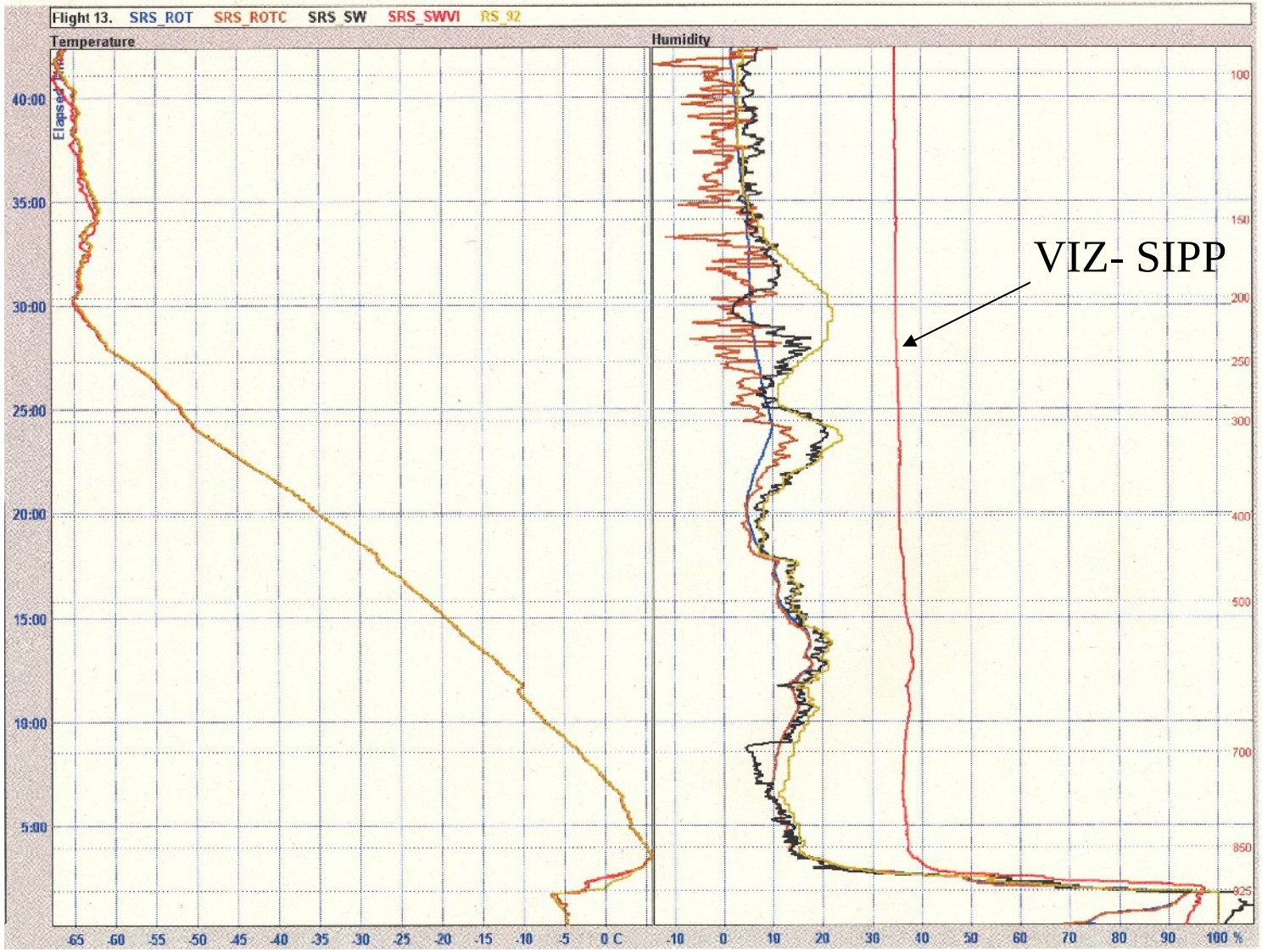
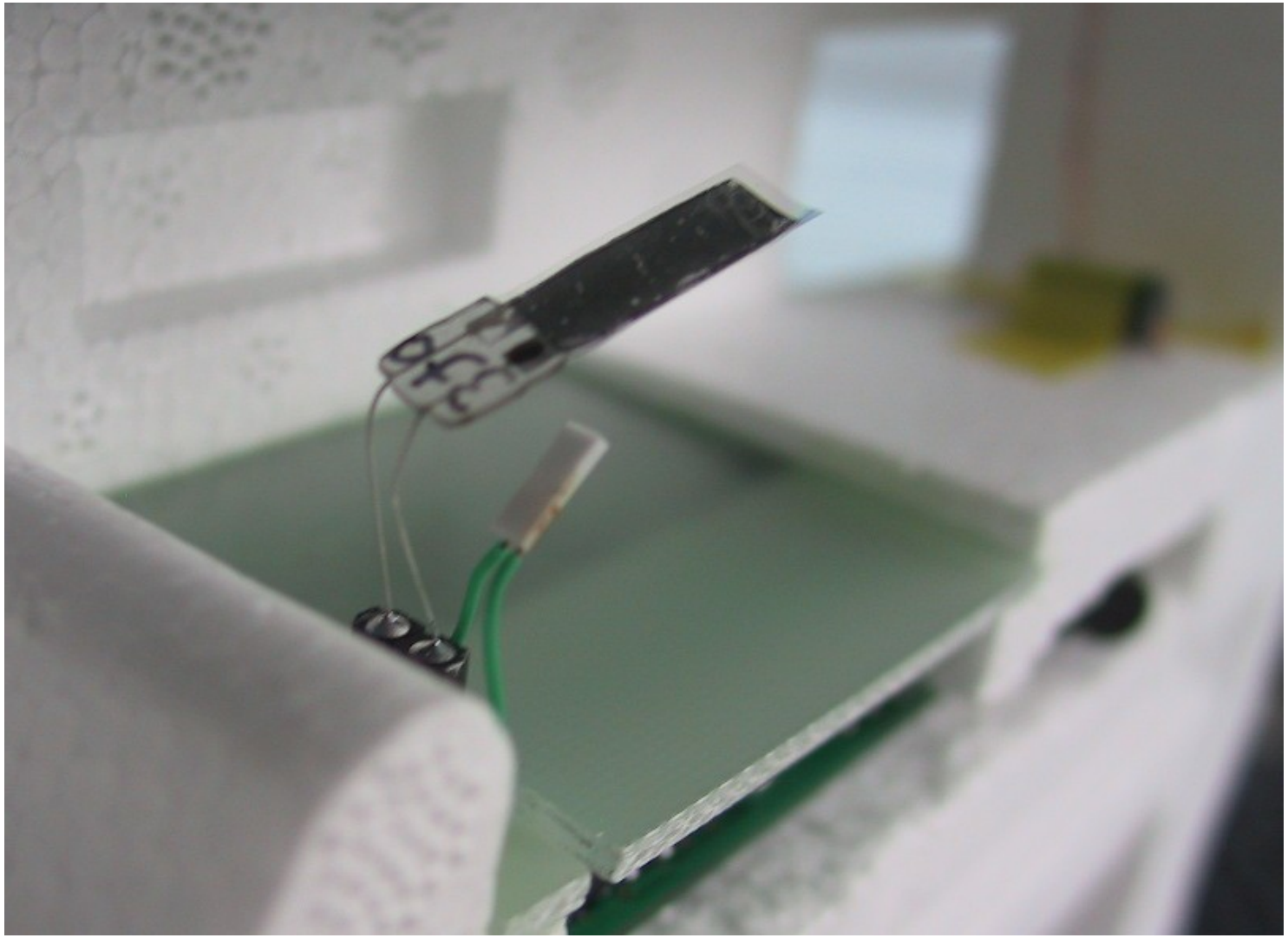


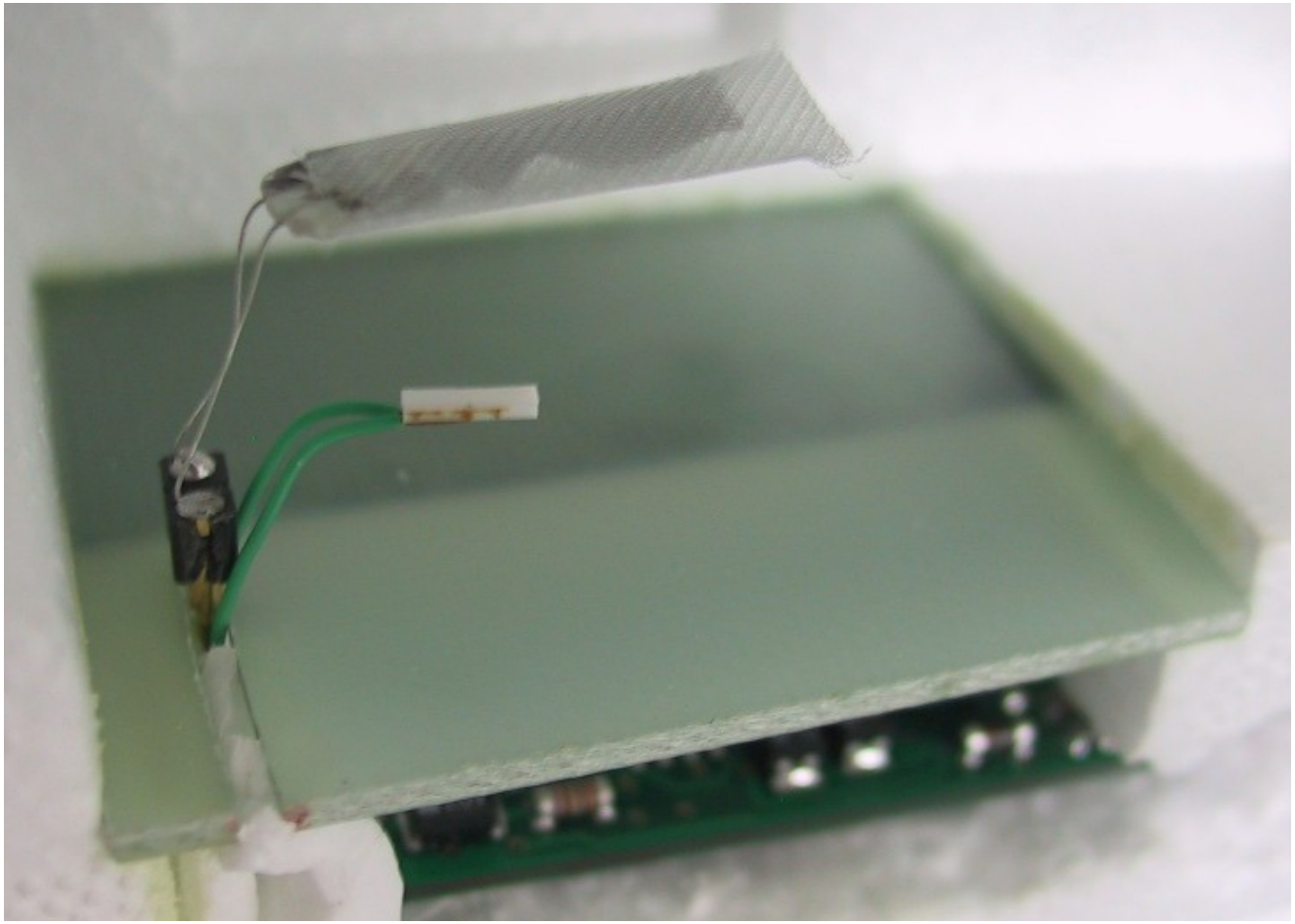

Flight 13.
SRS_ROT
SRS_ROTC
SRS_SW
SRS_SWVI
RS_92
Temperature
Humidity
Elapsed time
40:00
35:00
30:00
25:00
20:00
15:00
10:00
5:00
-65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 C
-10 0 10 20 30 40 50 60 70 80 90 100 %
100
150
200
250
300
400
500
700
850
925
VIZ- SIPP

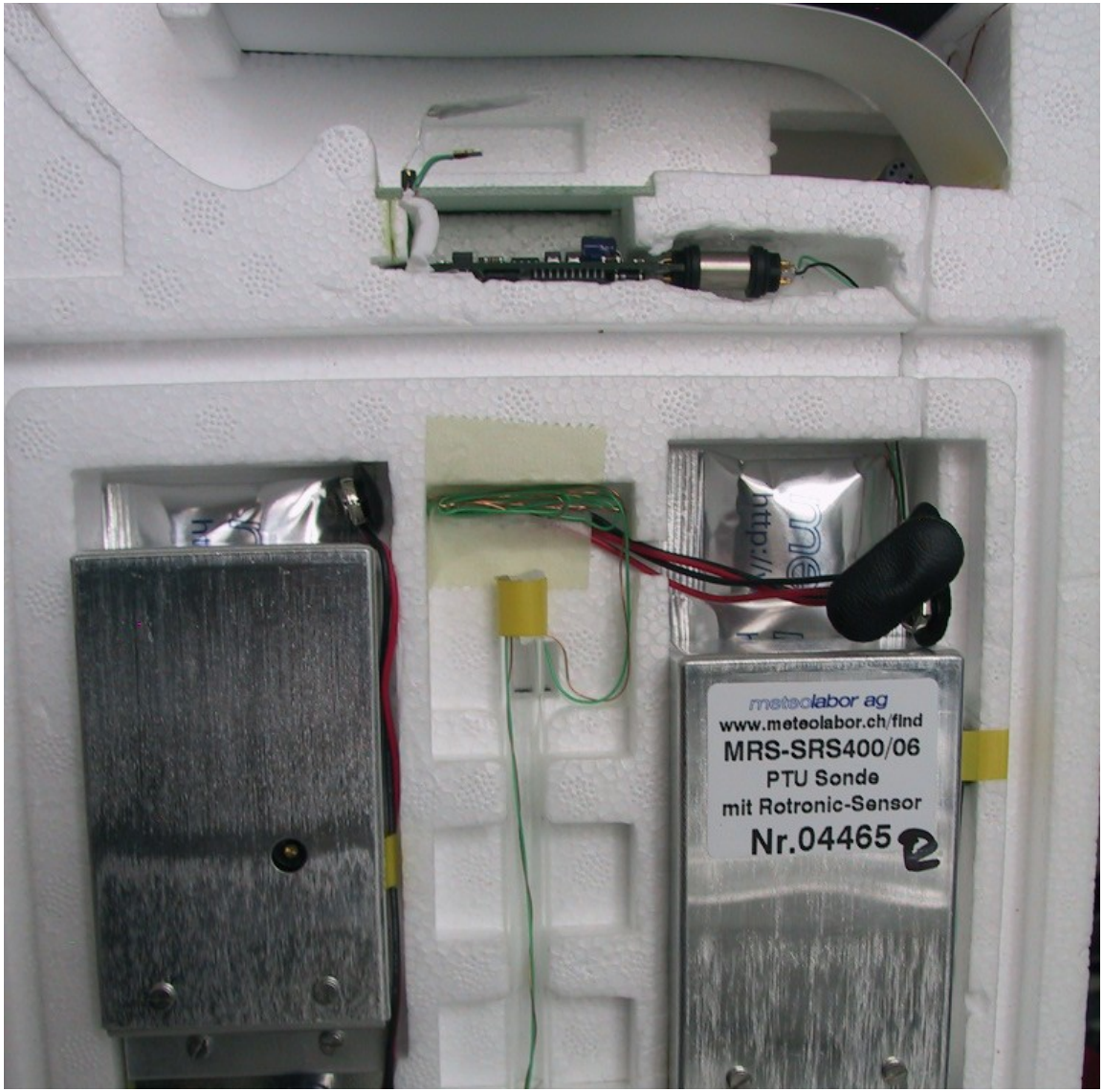
<u>Viz sippican on the SRS 400</u>

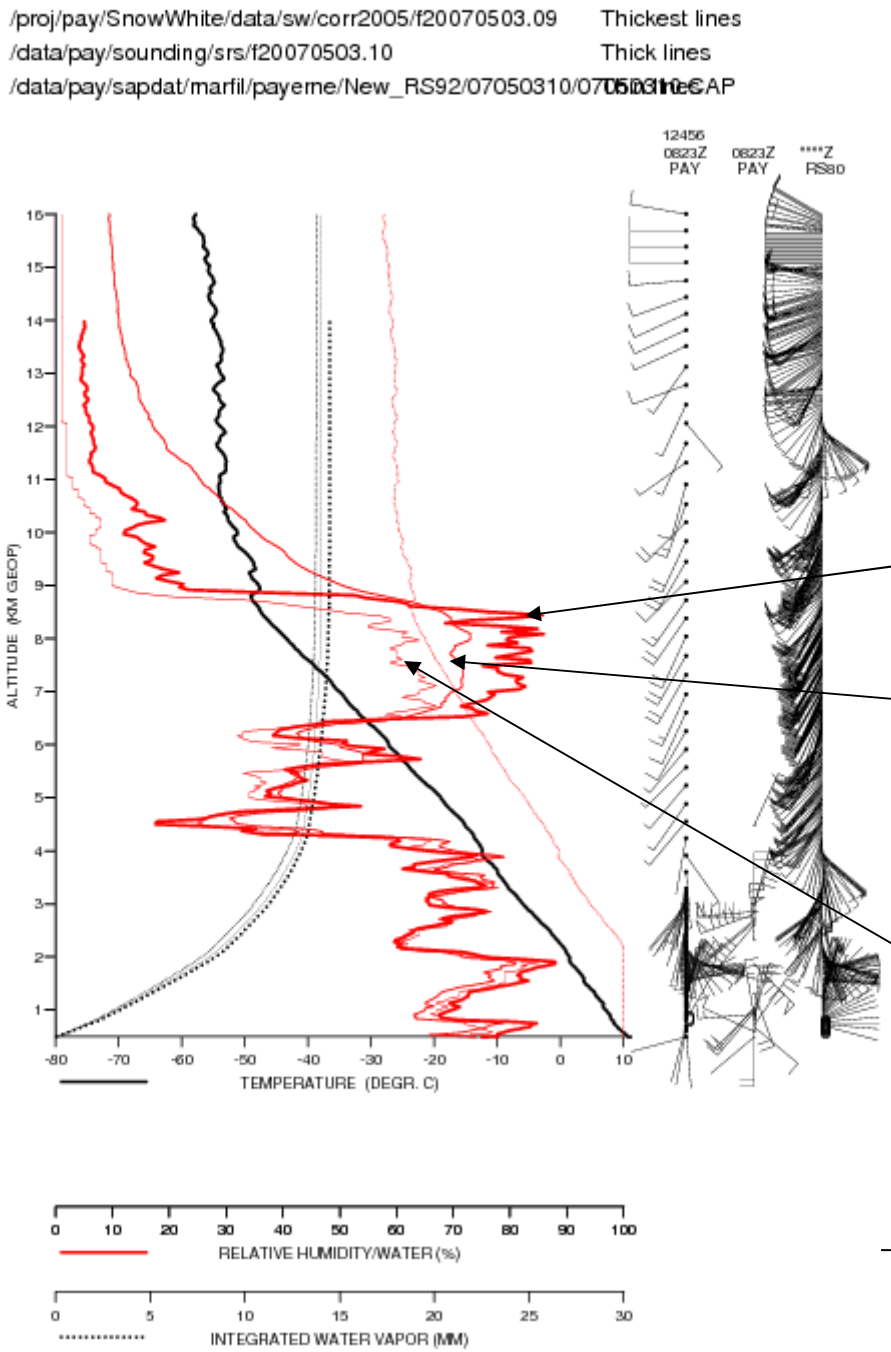
Renewal of the radiosonde facility in Payerne expected 2011-2012 (eg. fundings) :

Transition toward a new Water vapor sensor ??






meteolabor ag
www.meteolabor.ch/find
MRS-SRS400/06
PTU Sonde
mit Rotronic-Sensor
Nr.04465



3rd of May 2007,
triple day time sounding

- black: temperature
- red: relative humidity:

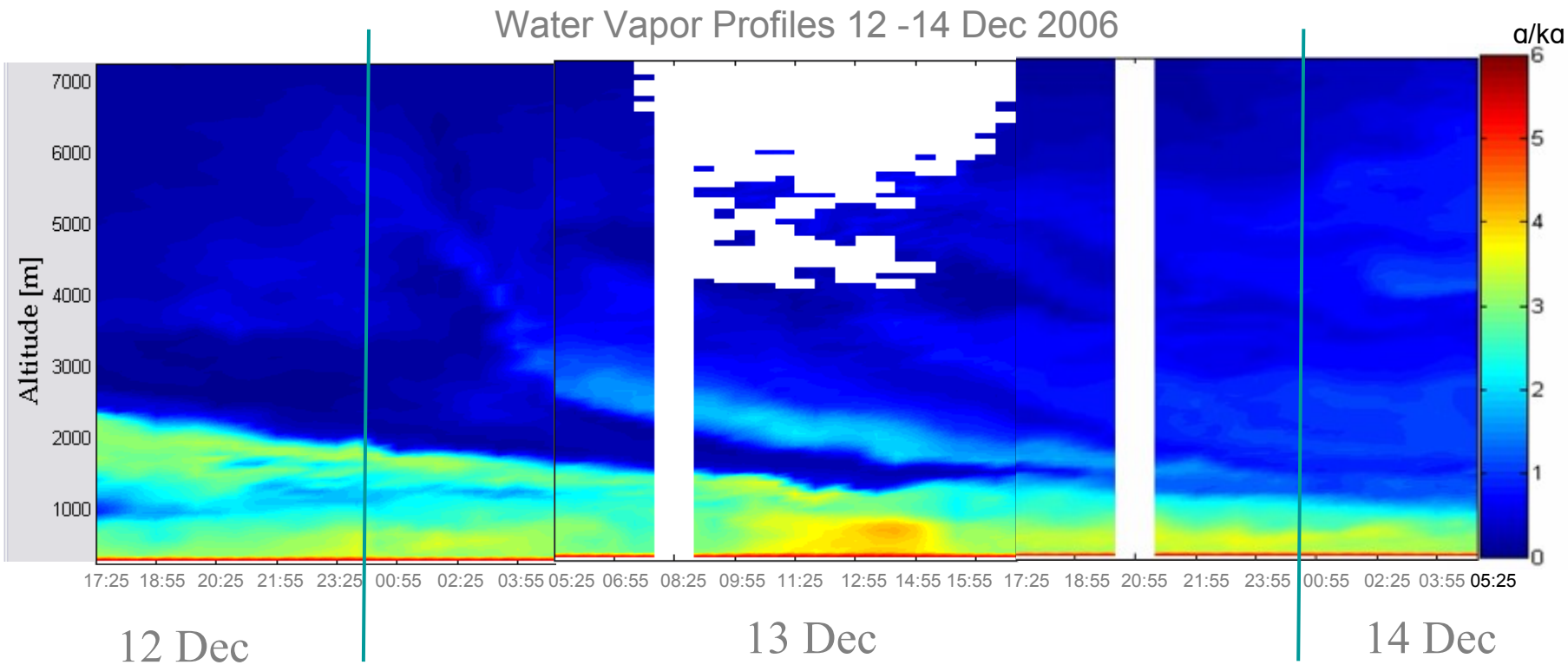
= thick line: SnowWhite

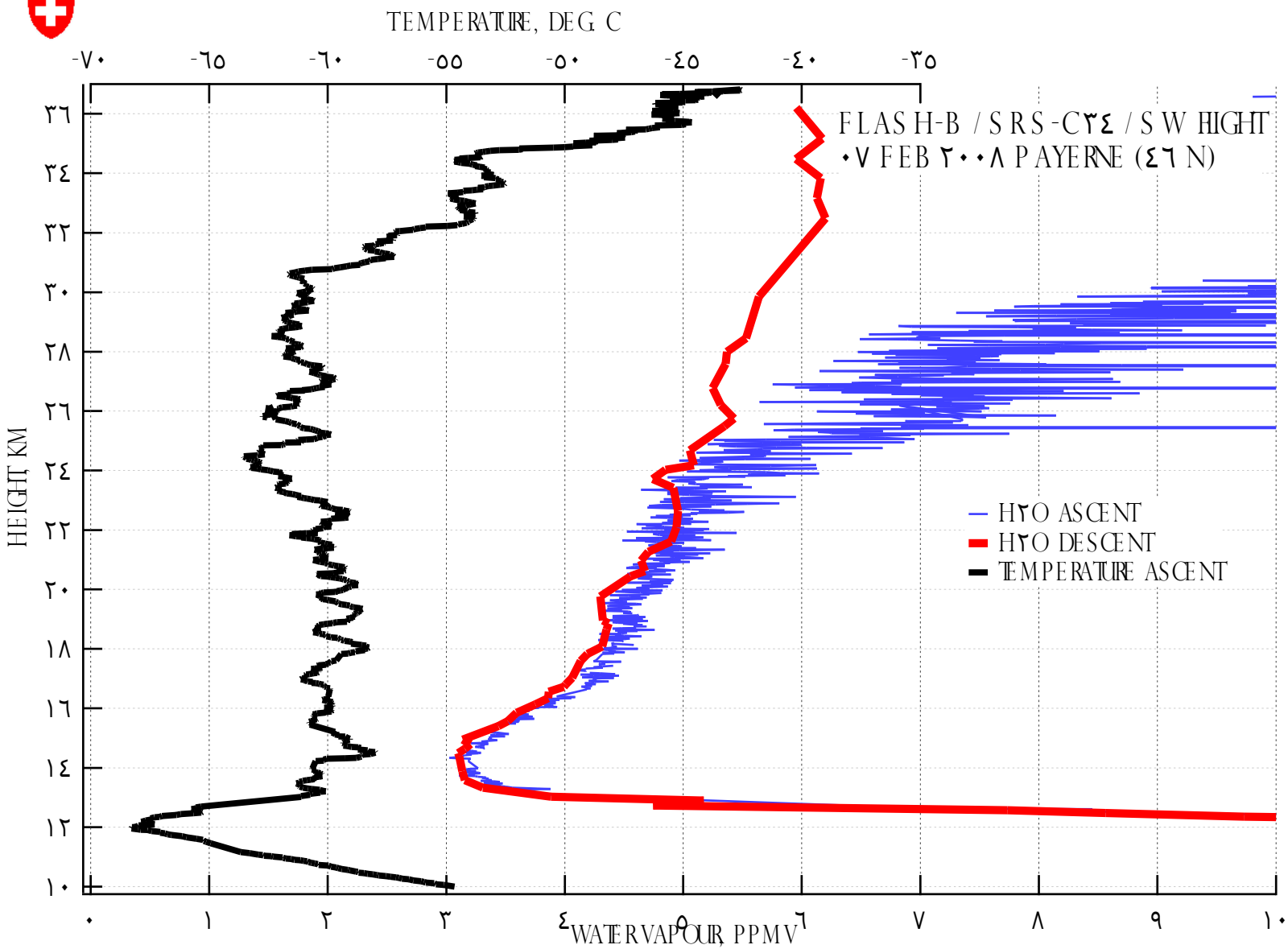
= thinner line: Rotronic

(replacement for our VIZ/Sippican operational carbon hygristor)

= very thin line: RS92

Water vapor time series : 3 days




TEMPERATURE, DEG. C
-٧٠
-٦٥
-٦٠
-٥٥
-٥٠
-٤٥
-٤٠
-٣٥
FLASH-B / SRS-C٣٤ / SW HIGHT
٠٧ FEB ٢٠٠٨ PAYERNE (٤٦ N)
HEIGHT, KM
٣٦
٣٤
٣٢
٣٠
٢٨
٢٦
٢٤
٢٢
٢٠
١٨
١٦
١٤
١٢
١٠
H٢O ASCENT
H٢O DESCENT
TEMPERATURE ASCENT
٠
١
٢
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٦
٧
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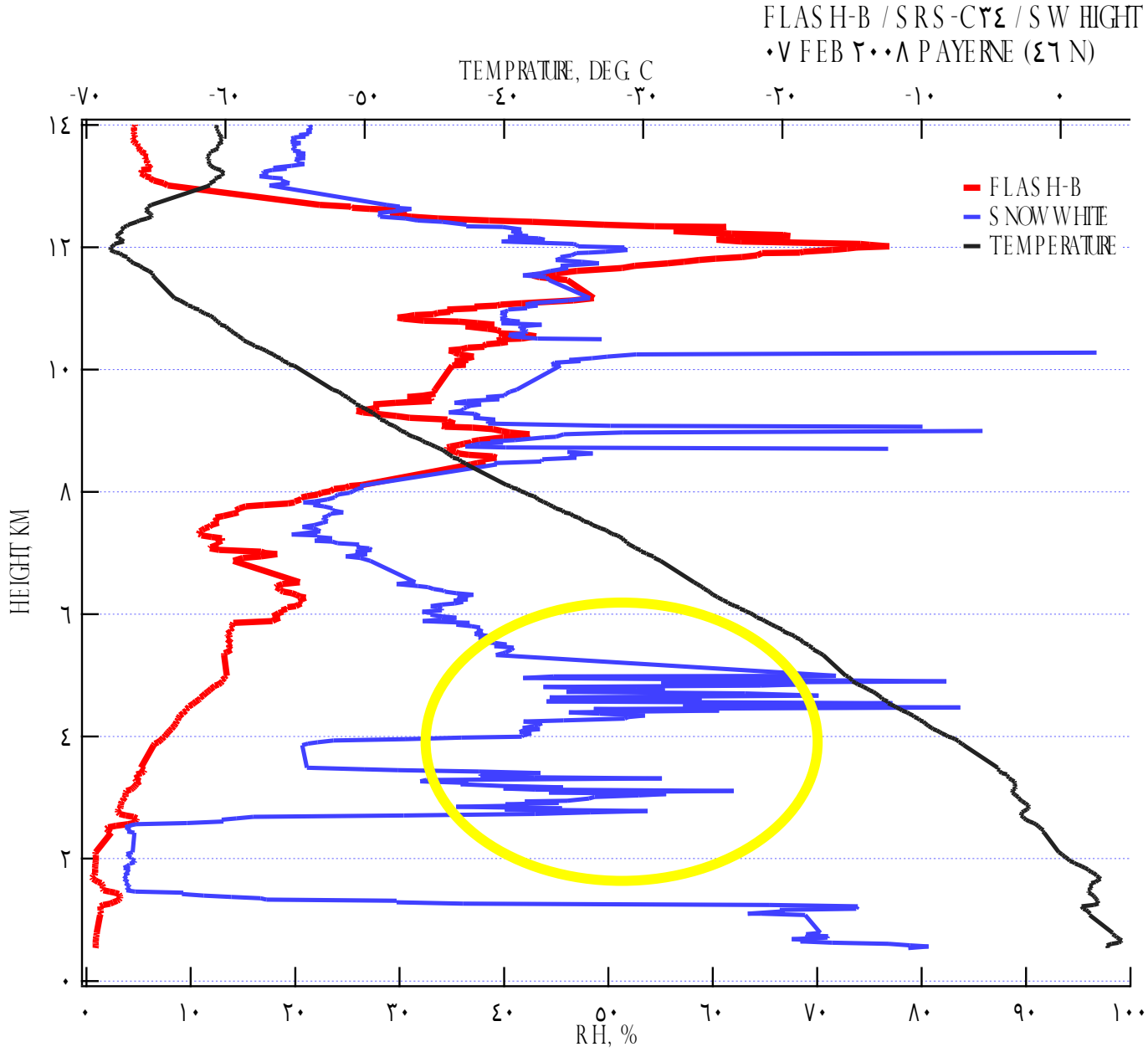
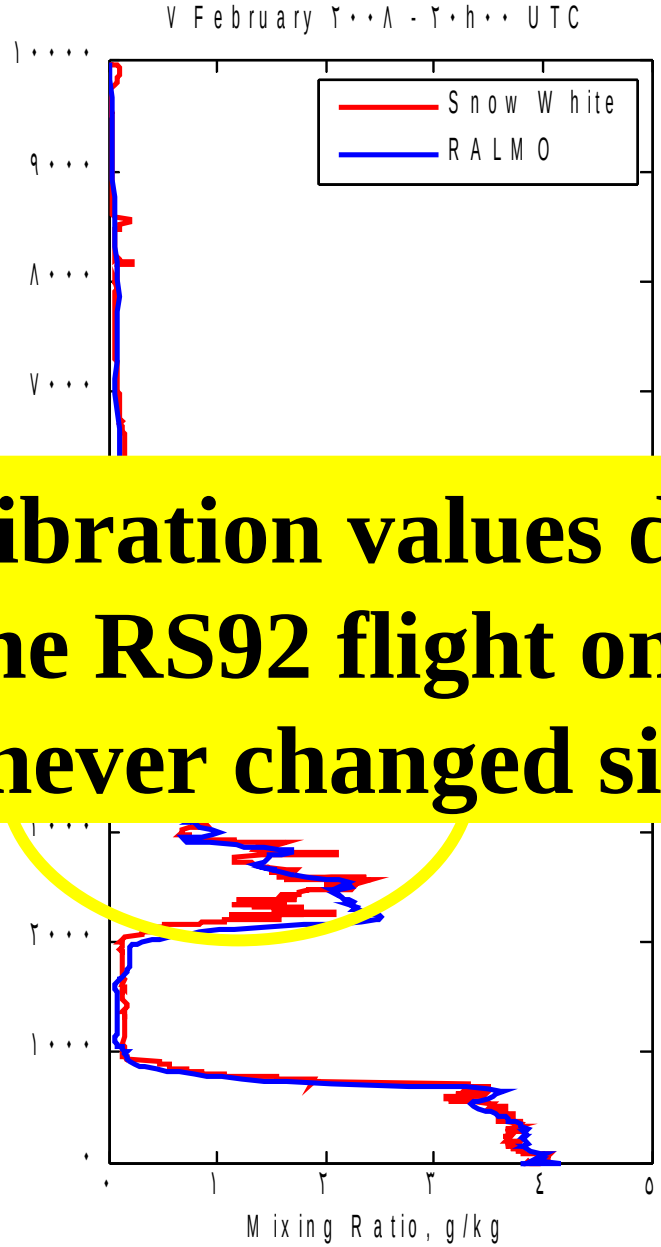
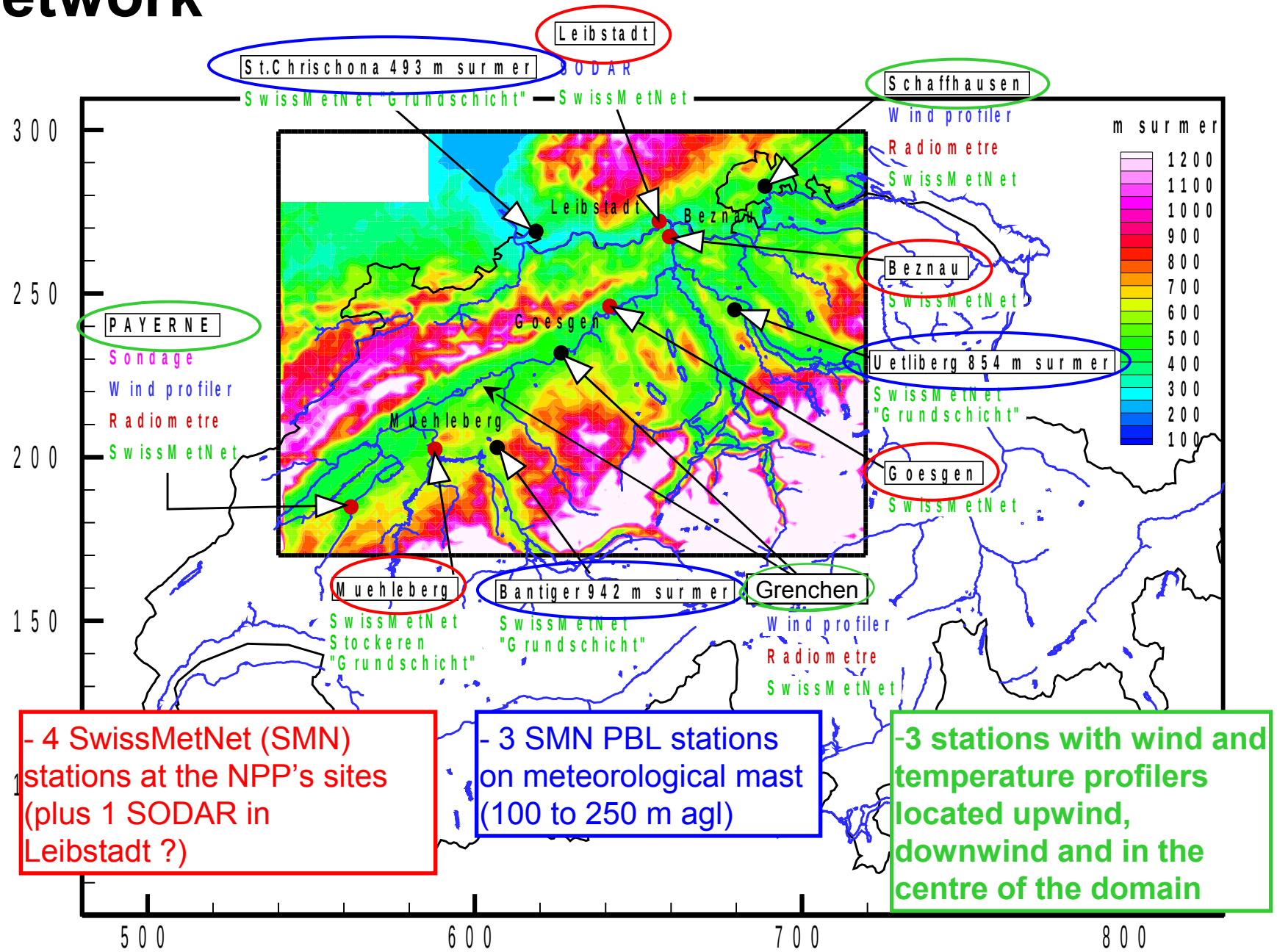
٩
١٠
WATERVAPOUR, PPMV


FLASH-B / SRS-C٣٤ / SW HIGHT
٠٧ FEB ٢٠٠٨ PAYERNE (٤٦ N)
TEMPRATURE, DEG. C
-٧٠
-٦٠
-٥٠
-٤٠
-٣٠
-٢٠
-١٠
٠
FLASH-B
SNOW WHITE
TEMPERATURE
HEIGHT, KM
١٤
١٢
١٠
٨
٦
٤
٢
٠
٠
١٠
٢٠
٣٠
٤٠
٥٠
٦٠
٧٠
٨٠
٩٠
١٠٠
RH, %



Calibration values defined from the RS92 flight on 1.11.2007 …never changed since…

Network

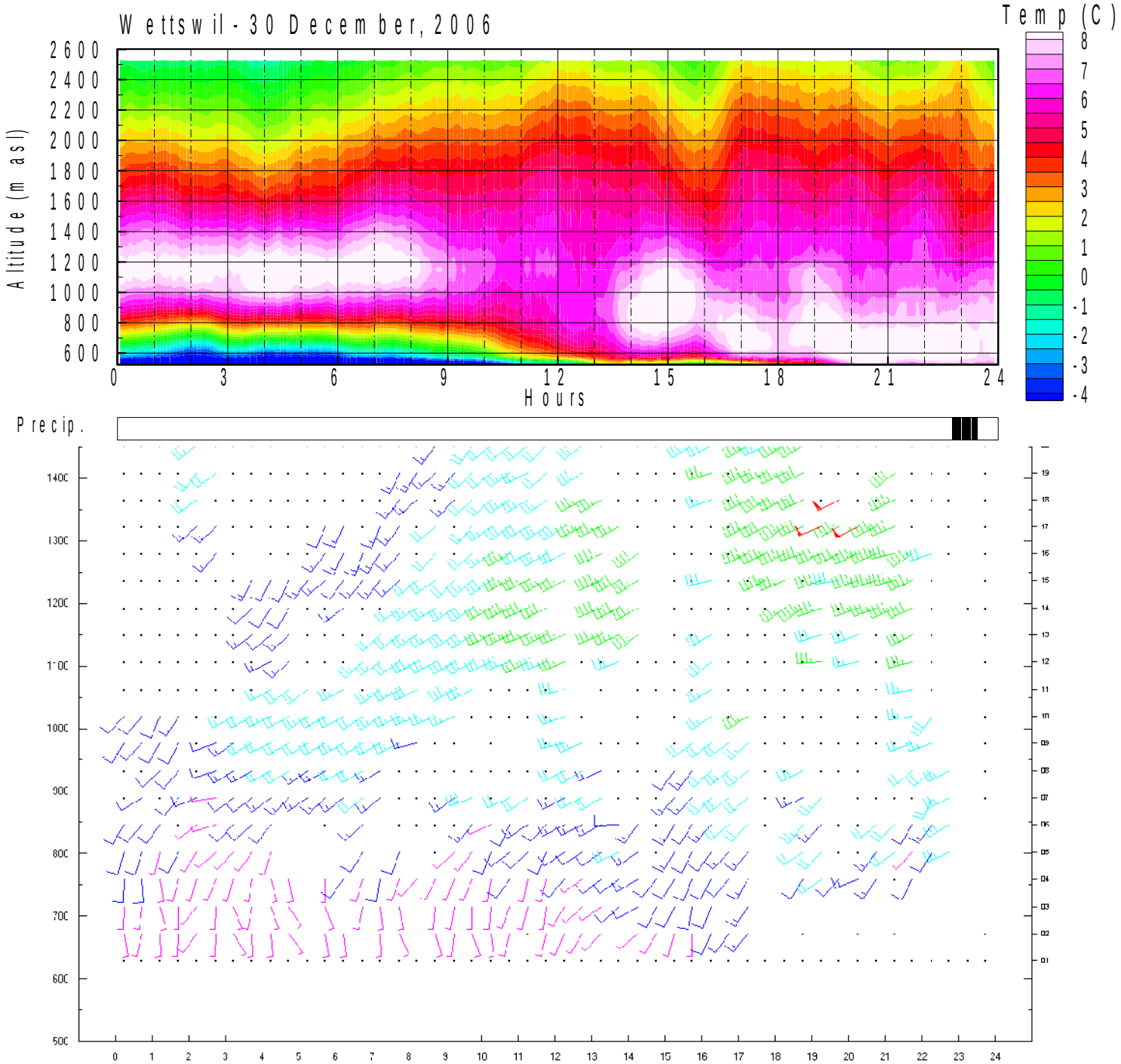


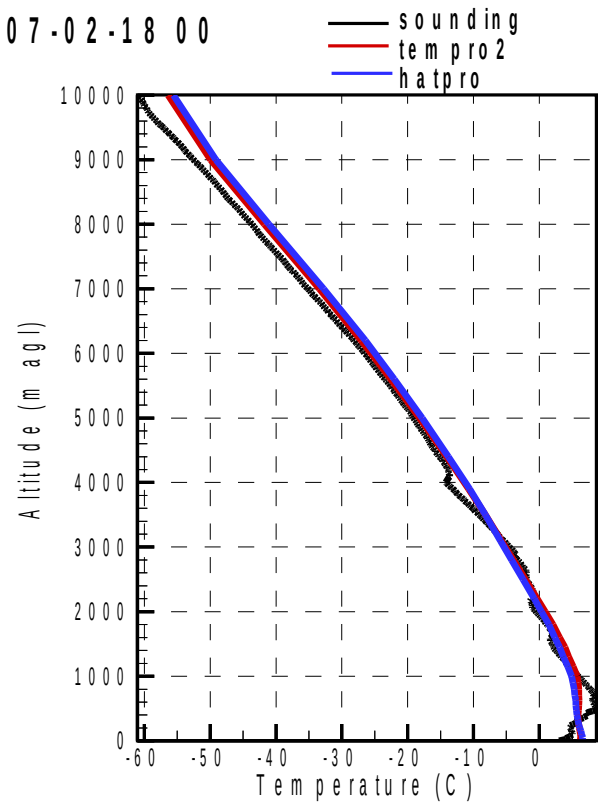
- 4 SwissMetNet (SMN) stations at the NPP's sites (plus 1 SODAR in Leibstadt ?)

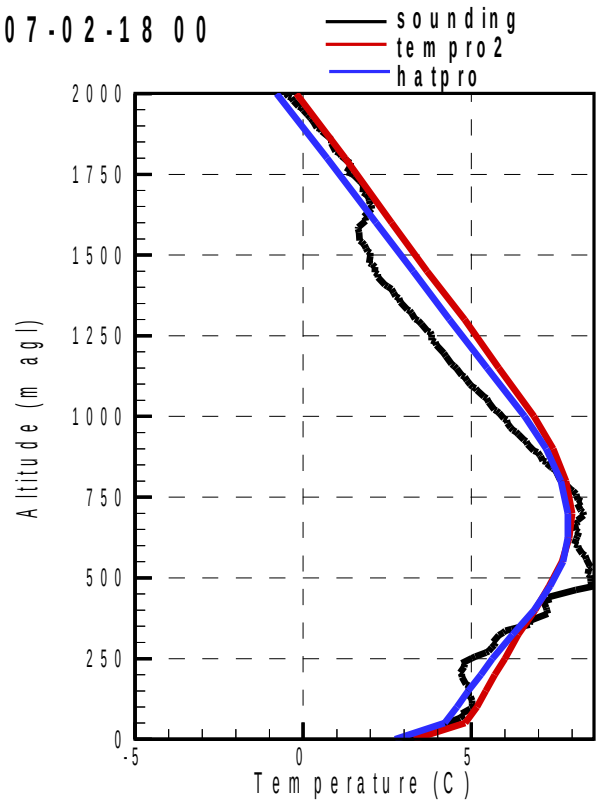
- 3 SMN PBL stations on meteorological mast (100 to 250 m agl)

-3 stations with wind and temperature profilers located upwind, downwind and in the centre of the domain

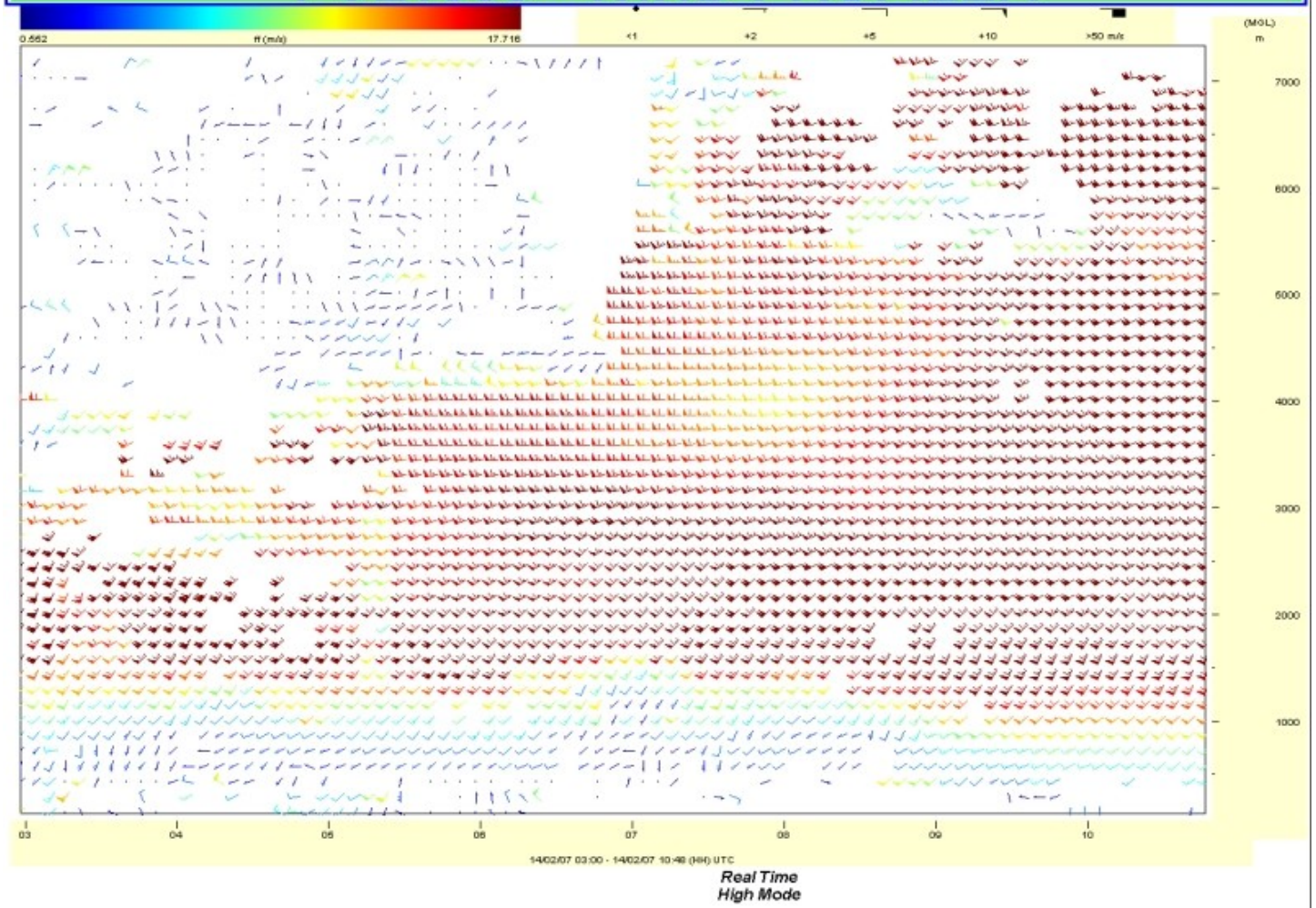
Wind and Temperature profilers @ Payerne


Wettswil - 30 December, 2006
Temp (C)
Altitude (m asl)
Hours
Precip.


07-02-18 00
sounding
tempro2
hatpro
Altitude (m agl)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-60
-50
-40
-30
-20
-10
0
Temperature (C)


07-02-18 00
sounding
tempro2
hatpro
Altitude (m agl)
2000
1750
1500
1250
1000
750
500
250
0
-5
0
5
Temperature (C)

PCL1300 - WIND PROFILER



7000 [m agl]

5000

3000

1000

MeteoSwiss Payerne

- Payerne
  - O3+PTU+wind radiosonde
  - BSRN ref station
  - O3 passive microwave (strato)
  - H2O, T passive microvawe (tropo)
  - WPs (tropo)
- JJOch ref site
- Arosa Dobson measurements

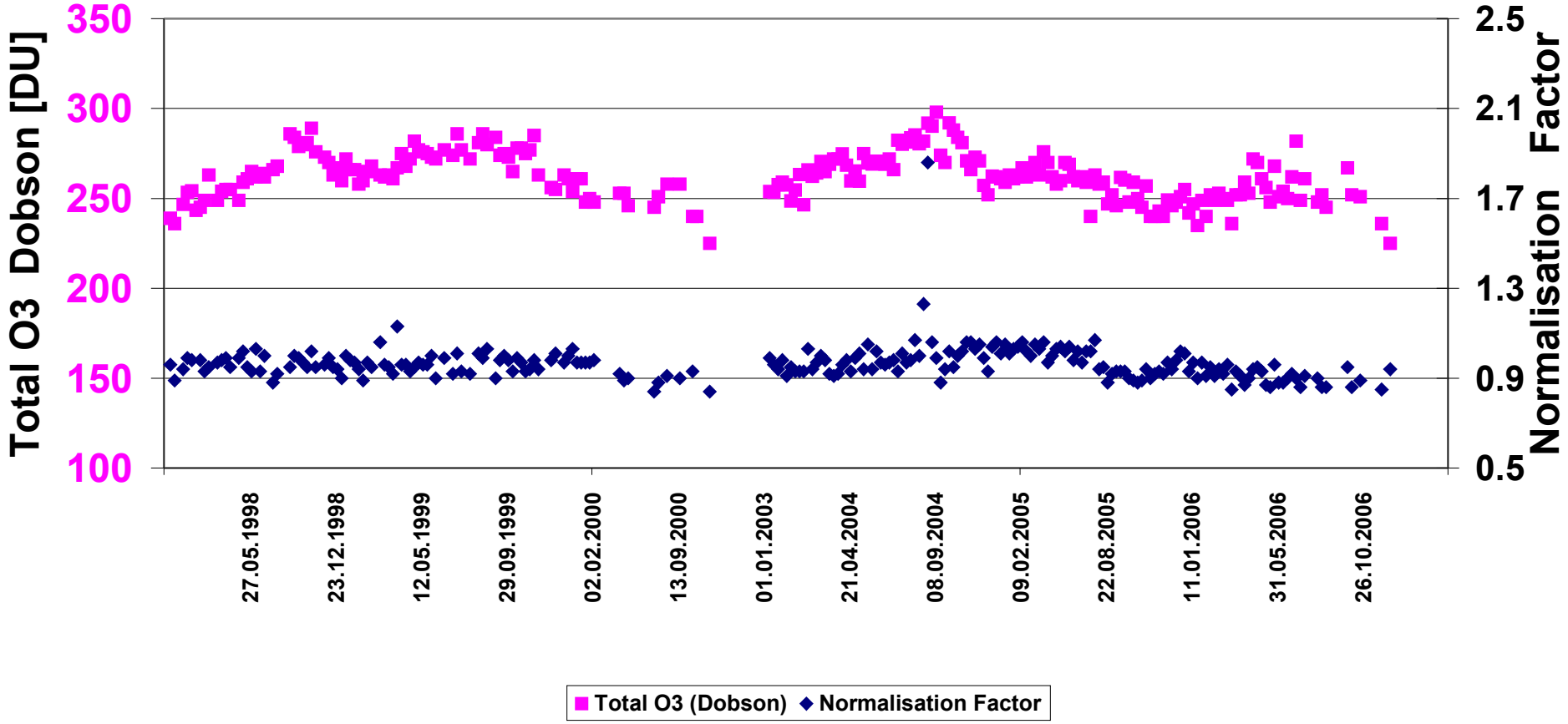
A candidate GRUAN site ?

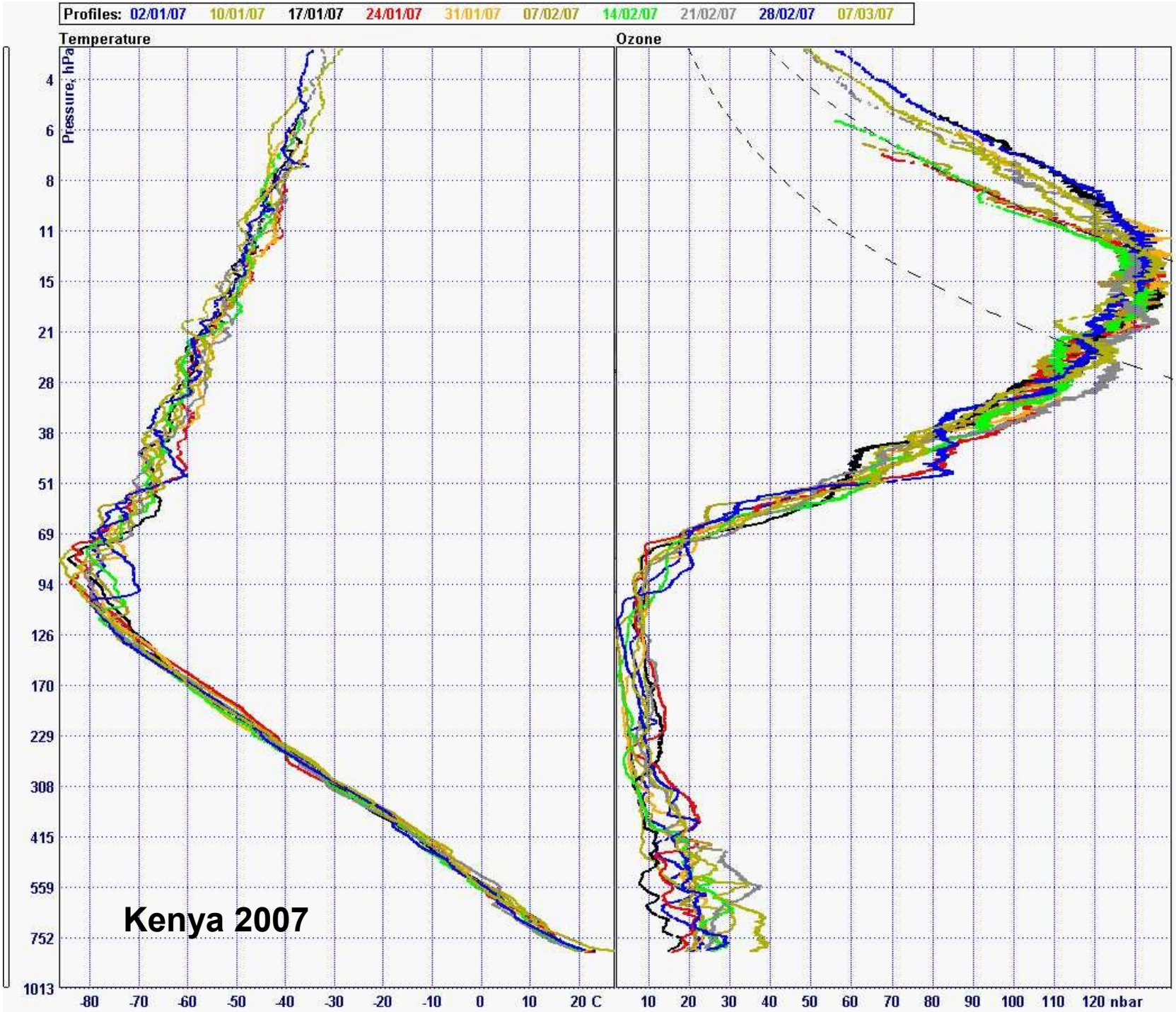
…with a companion site from a less favoured country:

Kenya Nairobi

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

OZONE Nairobi, Kenya




Profiles: 02/01/07 10/01/07 17/01/07 24/01/07 31/01/07 07/02/07 14/02/07 21/02/07 28/02/07 07/03/07
Temperature
Ozone
Pressure, hPa
4
6
8
11
15
21
28
38
51
69
94
126
170
229
308
415
559
752
1013
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 C
10 20 30 40 50 60 70 80 90 100 110 120 nbar
Kenya 2007

THANKS !