# Wind profiler, data availability and quality

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- Wind profiler at MeteoSwiss
- Availability
- Quality control
- Summary

MeteoSwiss

# Wind profilers in Europe

- Active ground-based remote sensing systems
- 3 main types:
  - low-tropospheric **(LT)**
  - strato-tropospheric **(ST)**
  - meso-strato-tropospheric **(MST)**

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**Payerne**:
-1290 MHz
-fixed system
-9 panels
-standard clutter fences
-digital upgrade

**Kloten:**
-1290 MHz
-4 panels
-mobile system on trailer
-light clutter fences
-old software design

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## Main products

In real time

- **Wind speed and direction profiles (averaged over 10-30 minutes)**
- **North, east and vertical components (averaged over 10-30 minutes)**
- **Estimate of the melting layer**
- **Estimate of the fog limit**

Not in real time

at a higher temporal resolution (3-10 minutes):

- **Characteristic heights (fog, clouds, melting layer, PBL)**
- **Profiles of vertical motions**

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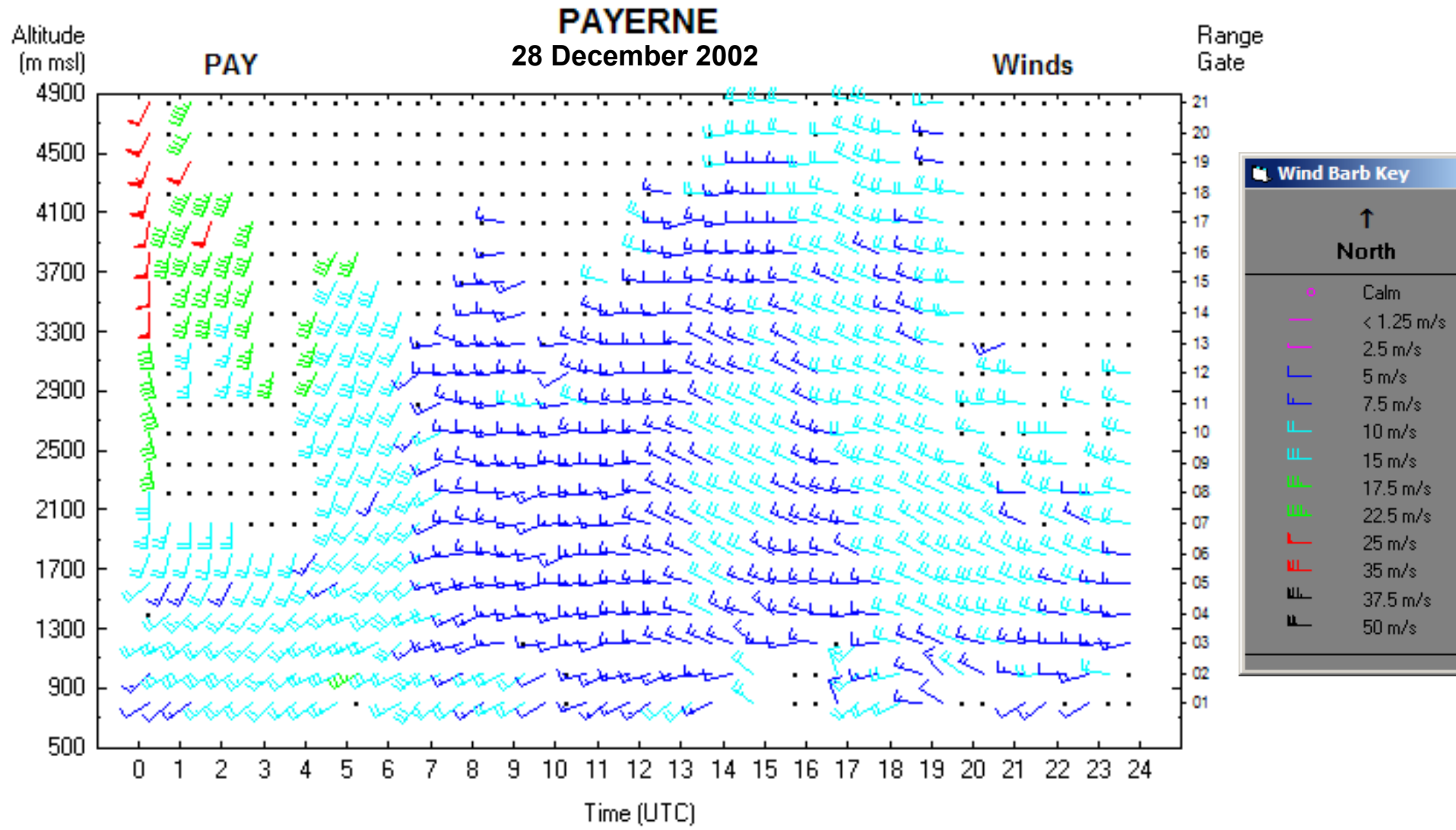
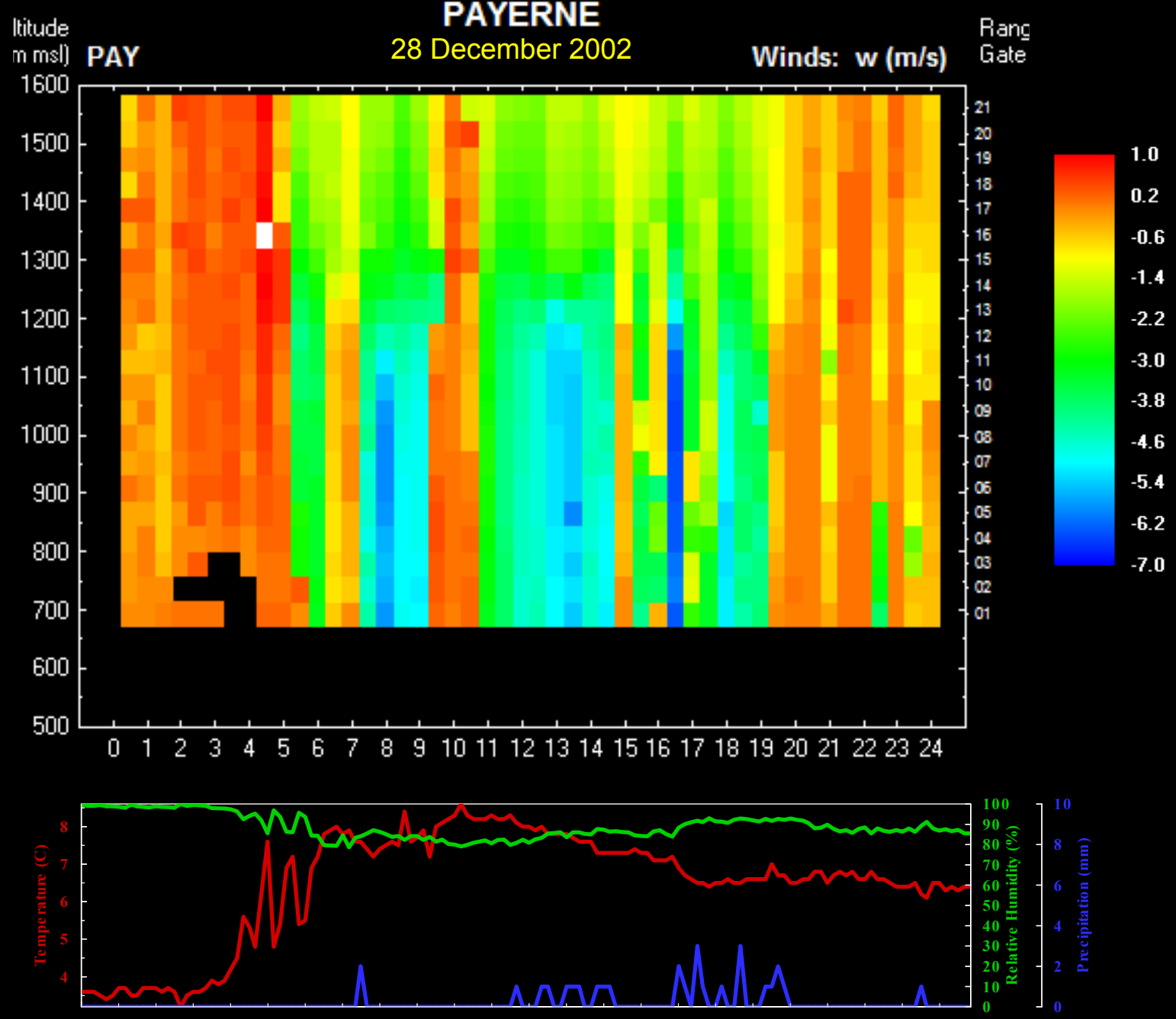
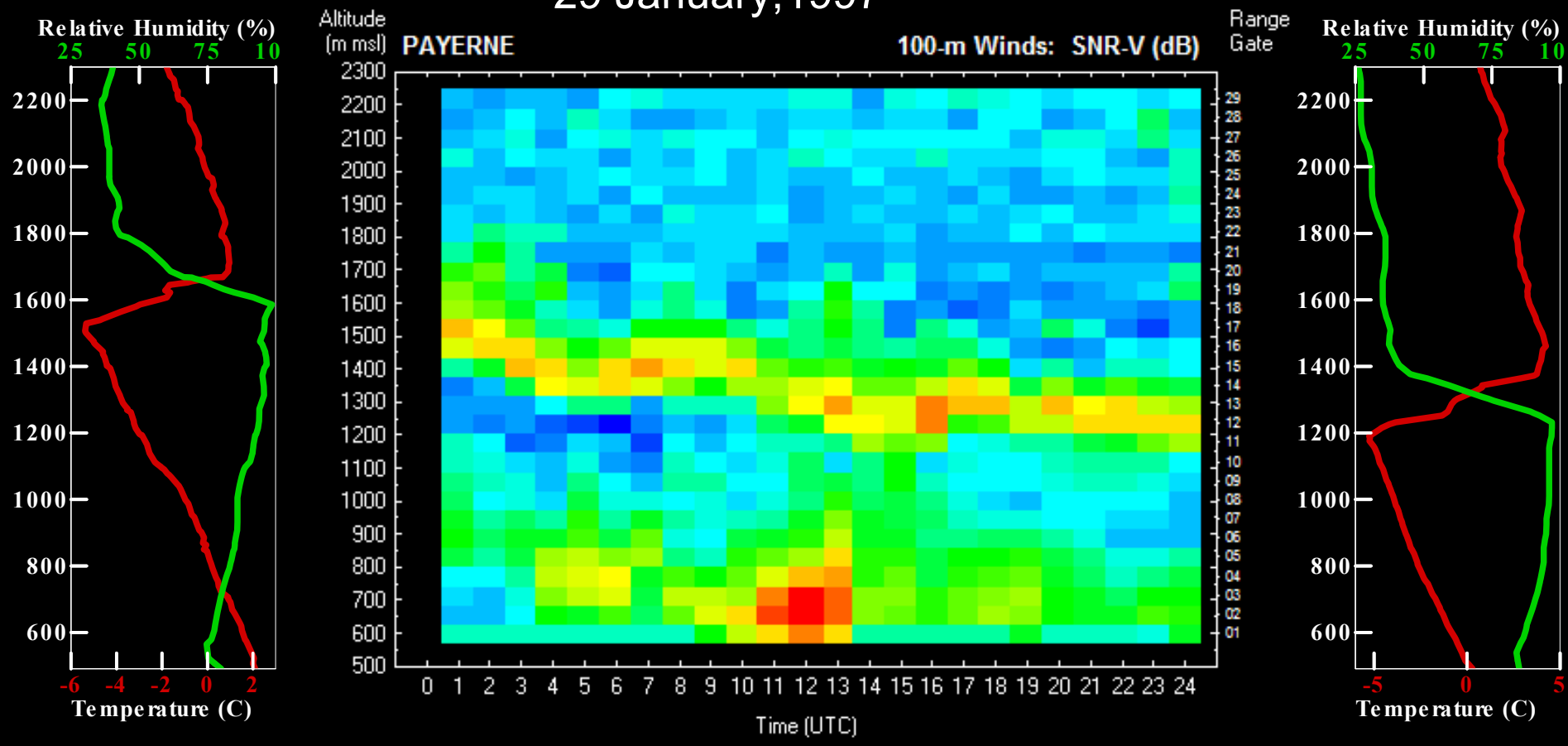
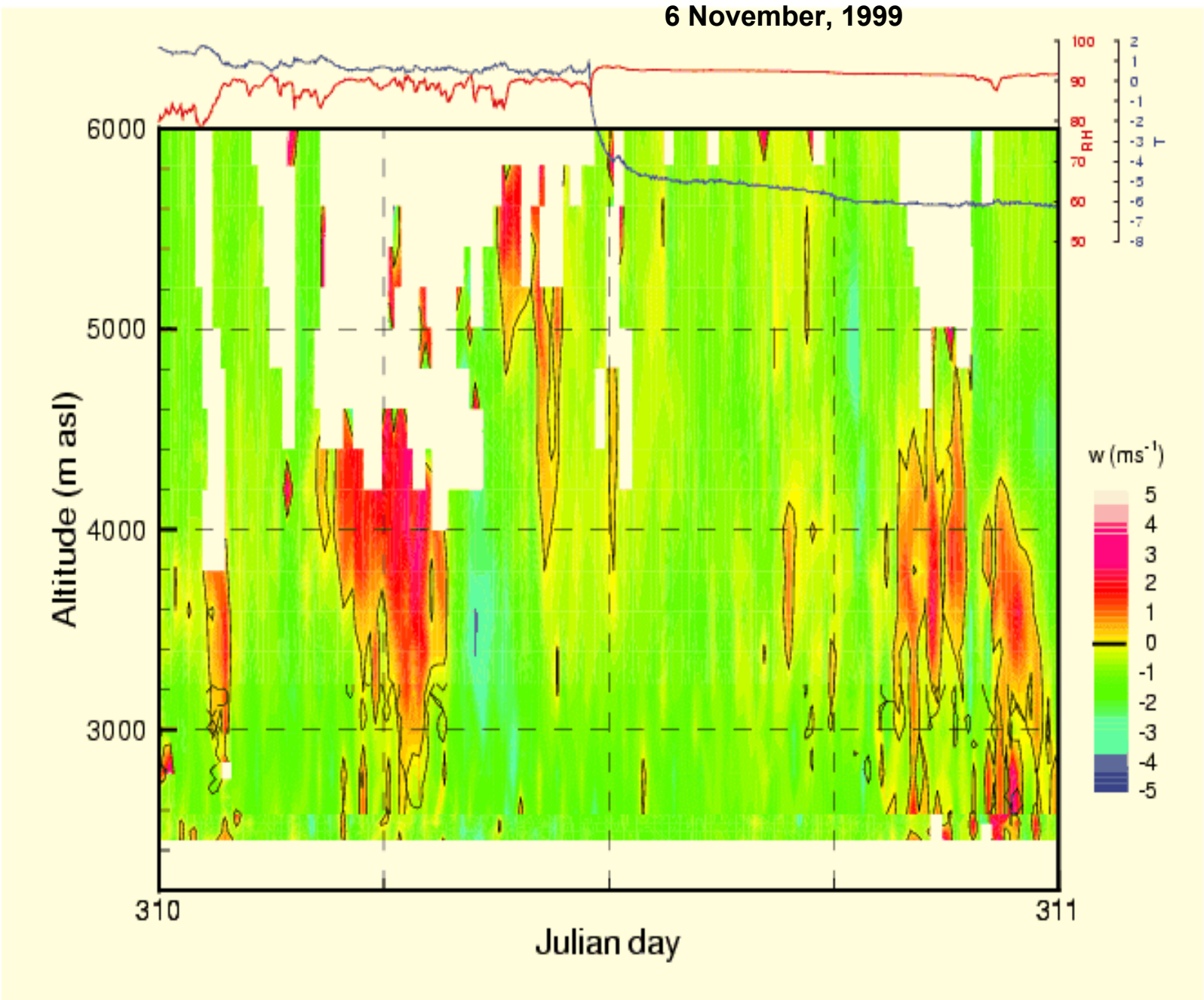

PAYERNE
28 December 2002
PAY
Winds
Altitude (m msl)
Range Gate
4900
4500
4100
3700
3300
2900
2500
2100
1700
1300
900
500
21
20
19
18
17
16
15
14
13
12
11
10
09
08
07
06
05
04
03
02
01
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (UTC)
Wind Barb Key
North
Calm
< 1.25 m/s
2.5 m/s
5 m/s
7.5 m/s
10 m/s
15 m/s
17.5 m/s
22.5 m/s
25 m/s
35 m/s
37.5 m/s
50 m/s

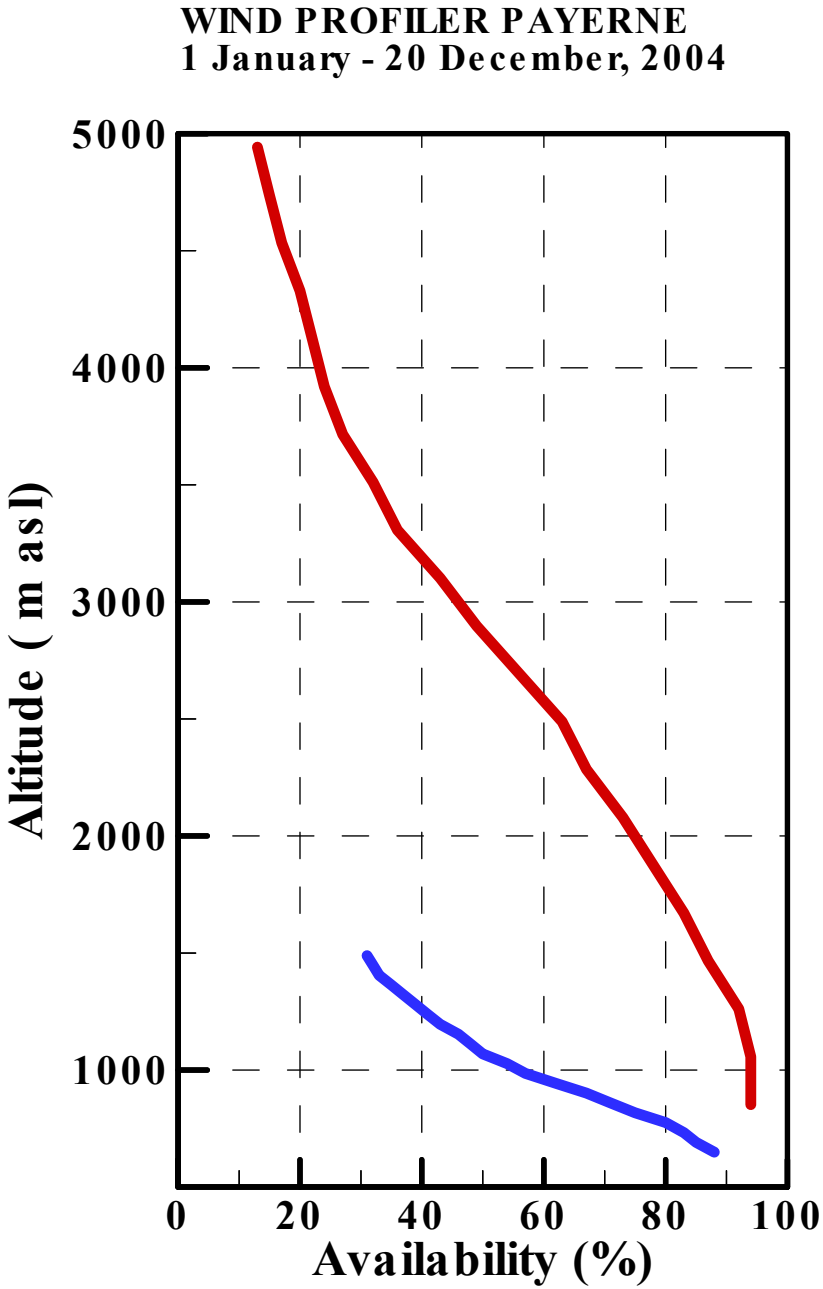

PAYERNE
28 December 2002
ltitude
m msl)
PAY
Winds: w (m/s)
Rang
Gate
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01
1.0
0.2
-0.6
-1.4
-2.2
-3.0
-3.8
-4.6
-5.4
-6.2
-7.0
Temperature (C)
Relative Humidity (%)
Precipitation (mm)

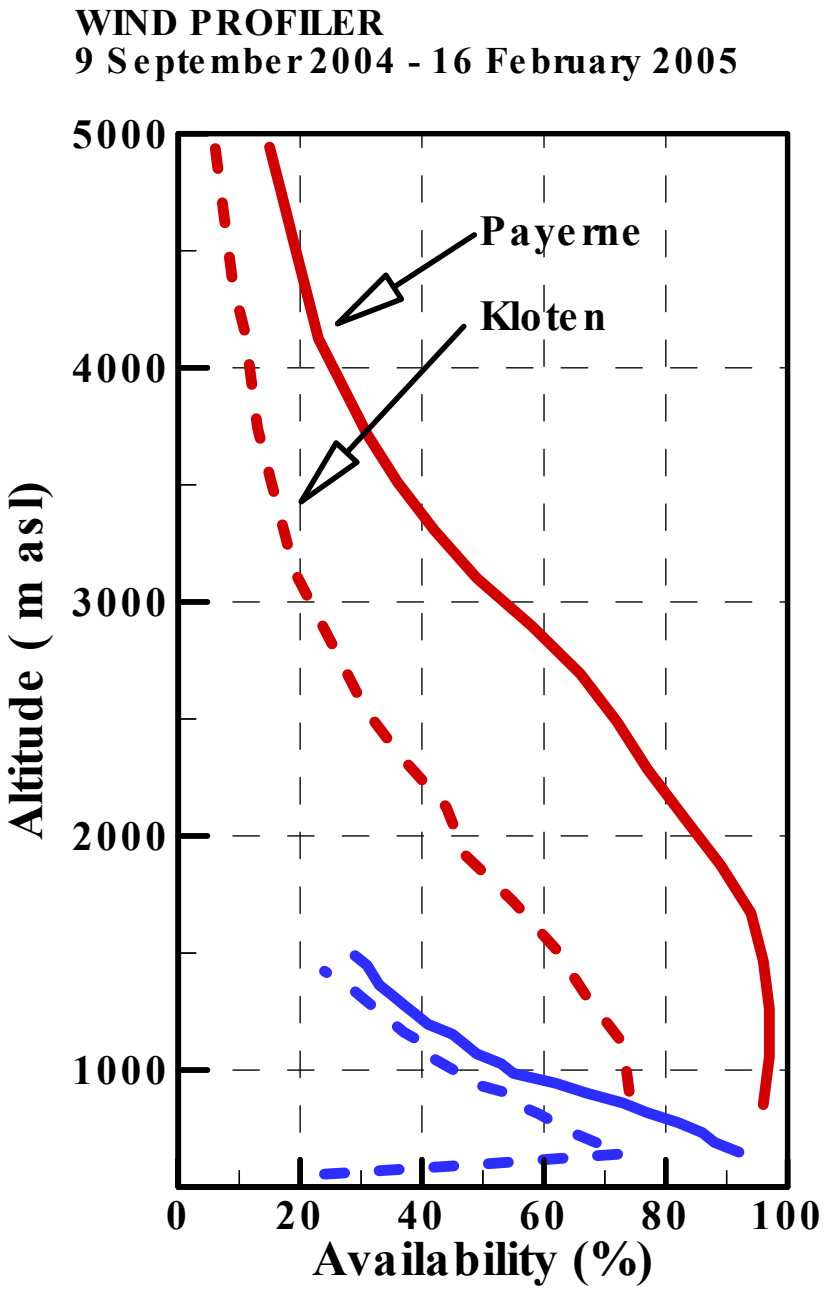
# 29 January,1997




6 November, 1999
Altitude (m asl)
6000
5000
4000
3000
310
311
Julian day
RH
T
w (ms⁻¹)
5
4
3
2
1
0
-1
-2
-3
-4
-5

Swiss


WIND PROFILER PAYERNE
1 January - 20 December, 2004
5000
4000
3000
2000
1000
Altitude ( m asl)
0
20
40
60
80
100
Availability (%)


WIND PROFILER
9 September 2004 - 16 February 2005
Payerne
Kloten
5000
4000
3000
2000
1000
Altitude ( m asl)
0
20
40
60
80
100
Availability (%)

# Low-tropospheric systems

- contamination by birds
- contamination by planes
- contamination by fixed systems
- electromagnetic contamination
- see clutter

- location
- clutter fences
- software
  - clear-air signal from noise (algorithms like multipeak, fuzzi logic, neural network)
  - flagging of suspect data (QC)

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# Operational low tropospheric wind profiler at Payerne

- 35’136 profiles/year
- >99% in operation
- at least 1 point within 1’000m/ground > 99%
- at least 1 point within 500 m/ground > 98%

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# Wind profiler quality control at MeteoSwiss

- operational check of the wind profiler's performances
  - in function of height
  - in function of weathers
  - in function of time (trends)
- setting of an operational tool to control the performances of the wind profiler, without reference
  - vs the radiosoundings performed at Payerne
  - vs the aLMo NWP model of MeteoSwiss

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aLMo Validation - Interpolation / Plot - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www.sap.sma.ch/docs/da/rem/interpolation/ Go

Links

# PAYERNE

## Daily plots

To see the plots, select a date (click on plot for zooming) :

Choose the date

Four plots are created for every day. They represent the WP data, the radiosounding data and aLMo data for wind speed and wind direction (initialization of aLMo at 00z and 12z (without forecast, aLMo 0) and with forecast, aLMo -12z, aLMo -24z, aLMo -36z, aLMo -48z).

## Plots of statistics

To see the plots, select a start date and an end date (click on plots for zooming) :

Start:
Year Month Day
End:
Year Month Day Go

Three plots are created for the wind speed and direction (one for the bias, one for the root mean square (RMS) and one for the numbers of points). The mean of wind direction is calculated with the vectors u and v * (see the end of the page to know the method).

For the bias and the RMS, radiosounding is the reference. The blue line is the WP minus the radiosounding and the red line is the aLMo 0 minus the radiosounding. For the number of points, WP is the reference.

## Monthly plots and tables of statistics

To see the plots, select an altitude and a year (click on plots for zooming) :

Choose the altitude Choose the year Go

For each year (since 1 November, 2002), one table is produced for each altitude (29 tables per year).
The red numbers signify that the statistic is worse than the previous month.
The blue numbers signify that the statistic is better than the previous month.
The black numbers signify that the statistic is the same as the previous month.

The data of the tables are used to produce plots. For each year (since 1 November, 2002 one plot per altitude is produced (29 plots per year).

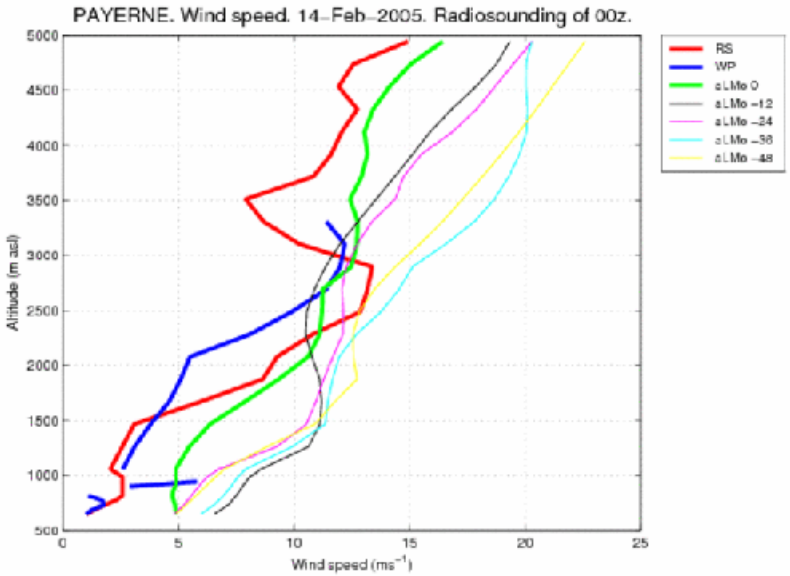
# KLOTEN

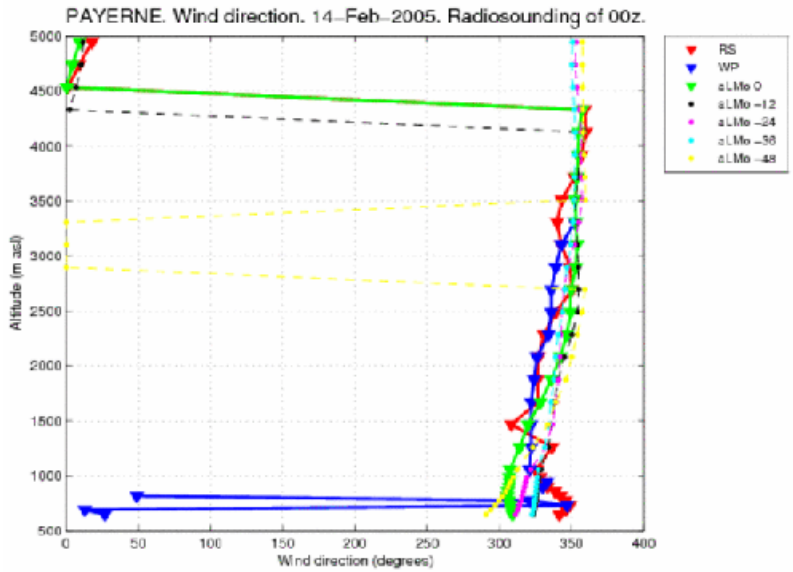
Done Local intranet

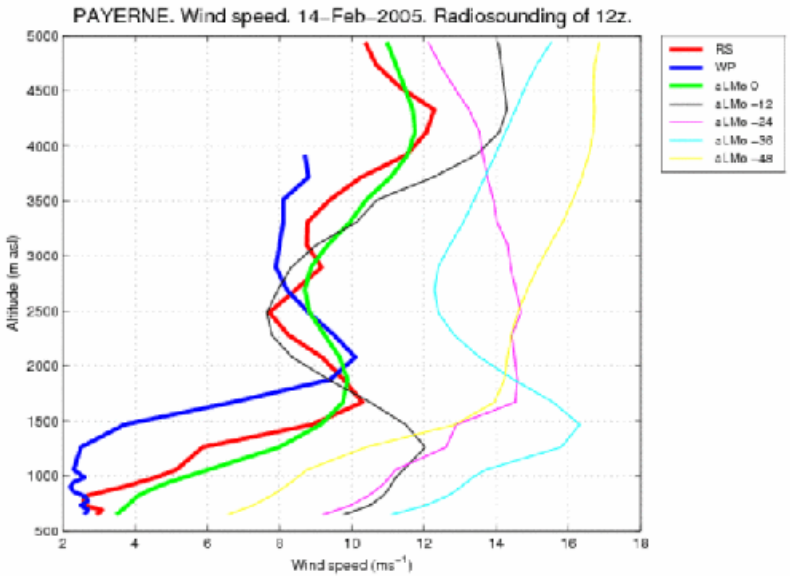
Start Boîte de réceptio... k220.sma.ch - Xm... Total Commander... availa.lay - Notepad Microsoft PowerP... aLMo Validatio... FR 3:50 PM

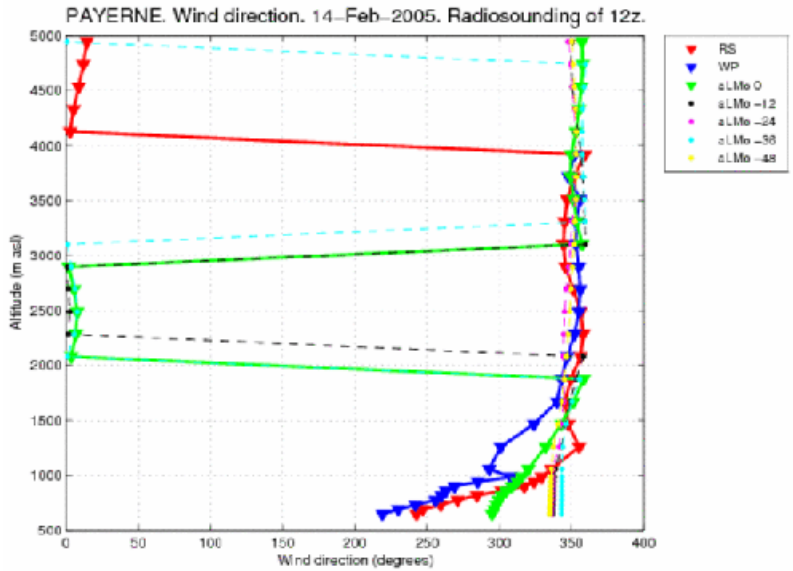
Daily plots

# Plots of Payerne



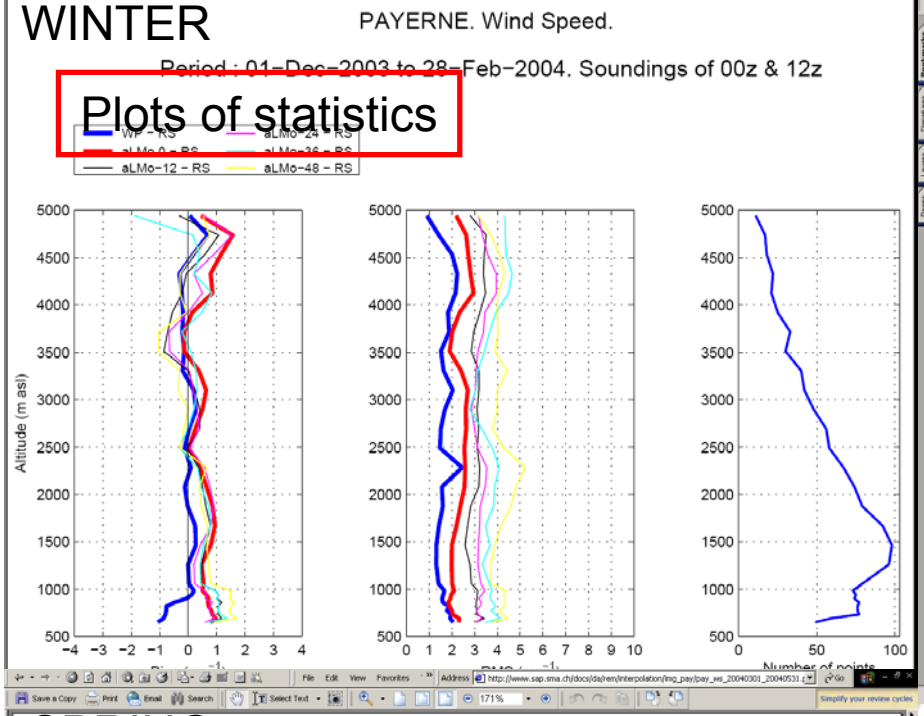



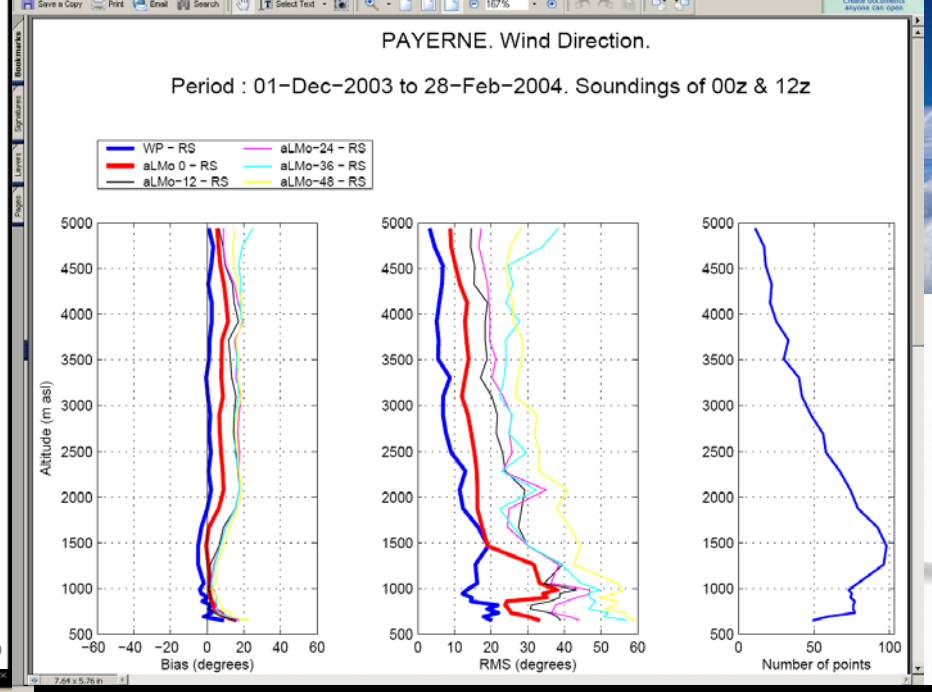



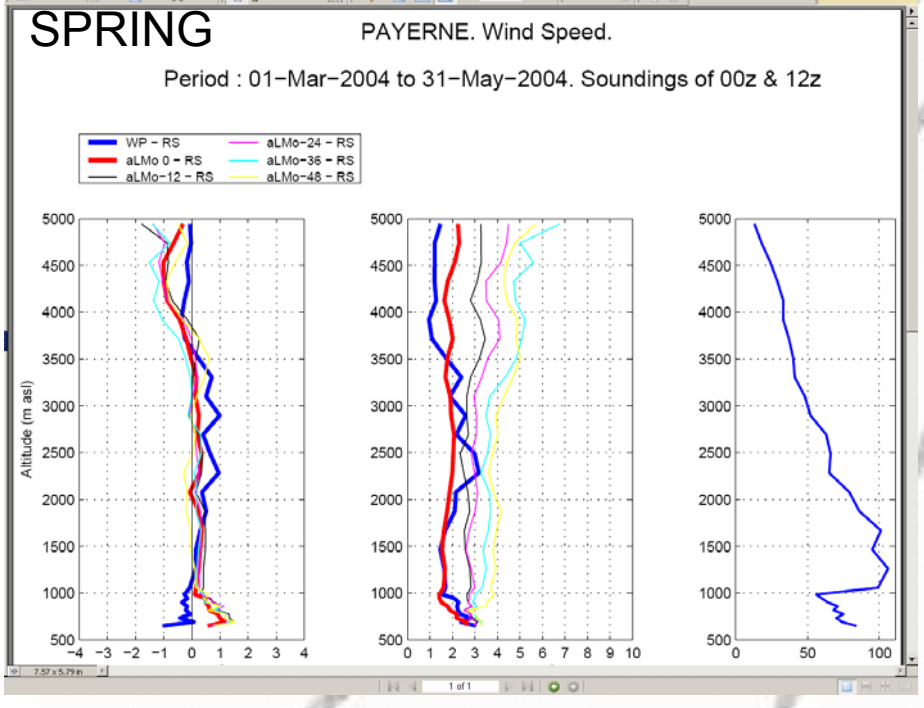
# WINTER

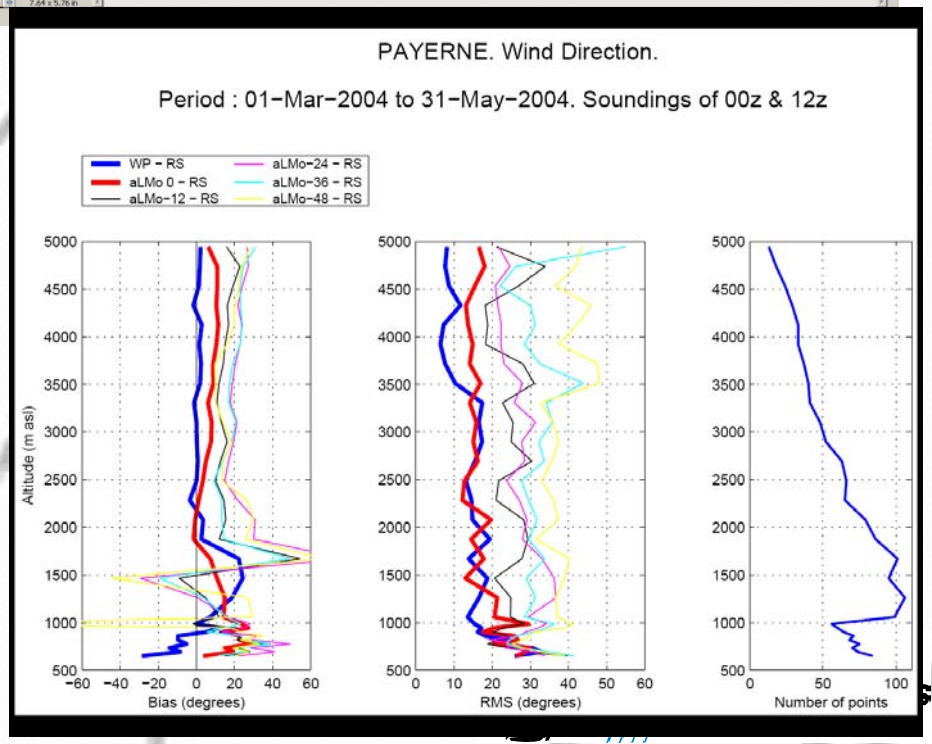
Plots of statistics



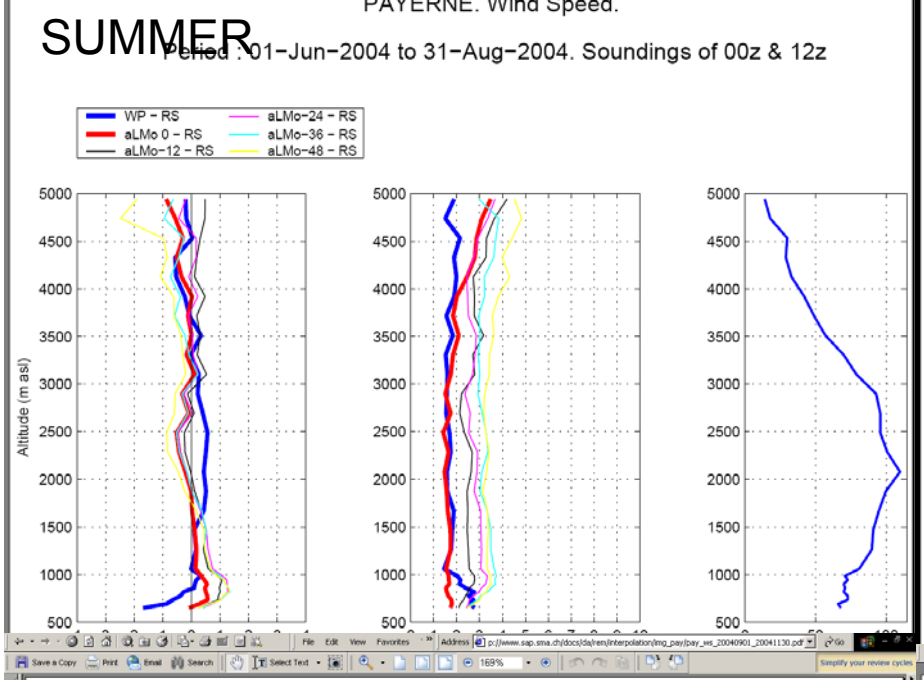



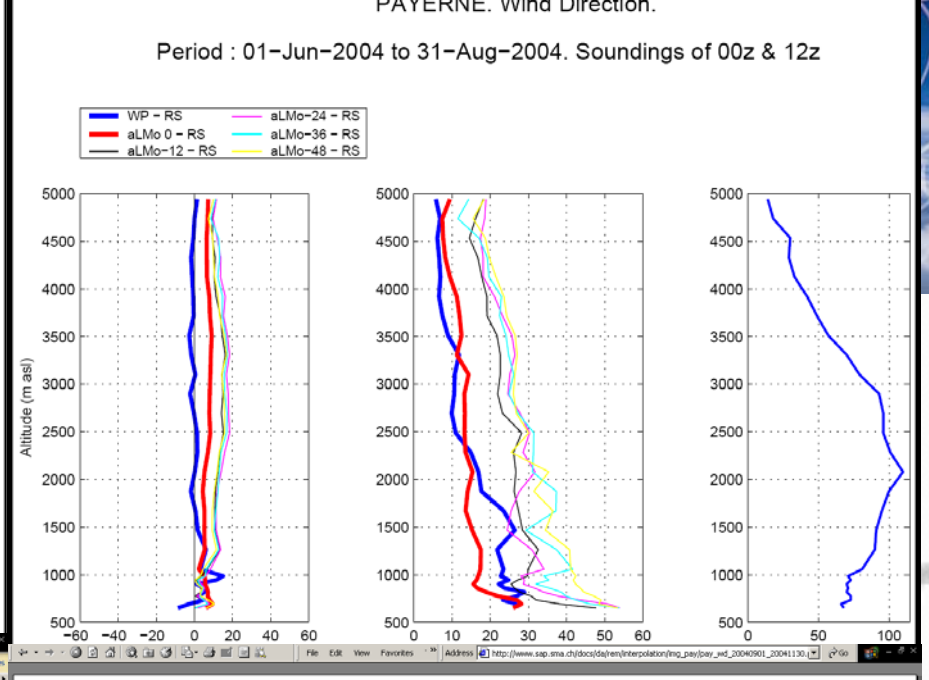

# SPRING



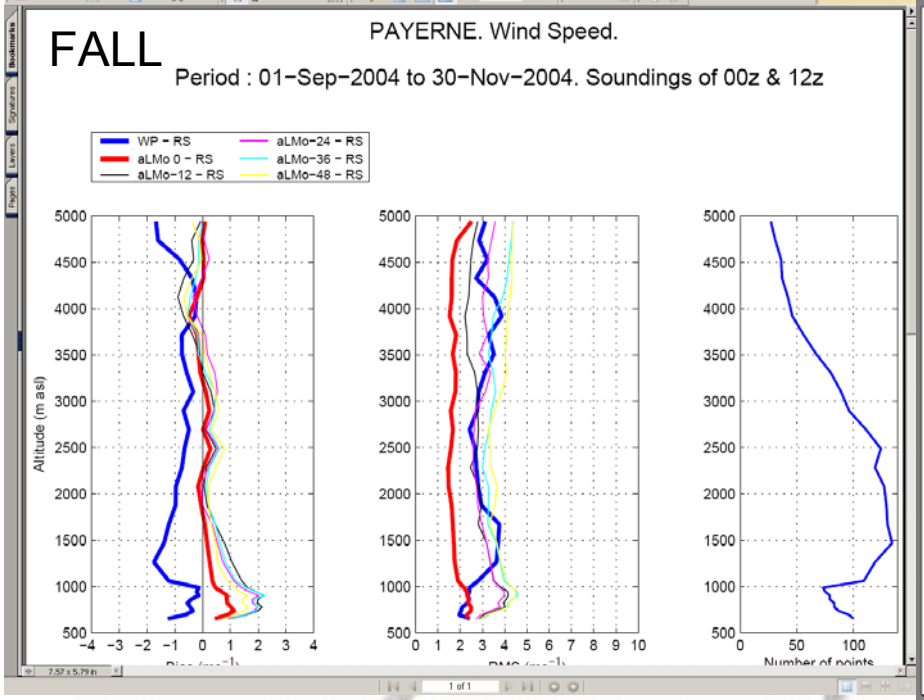



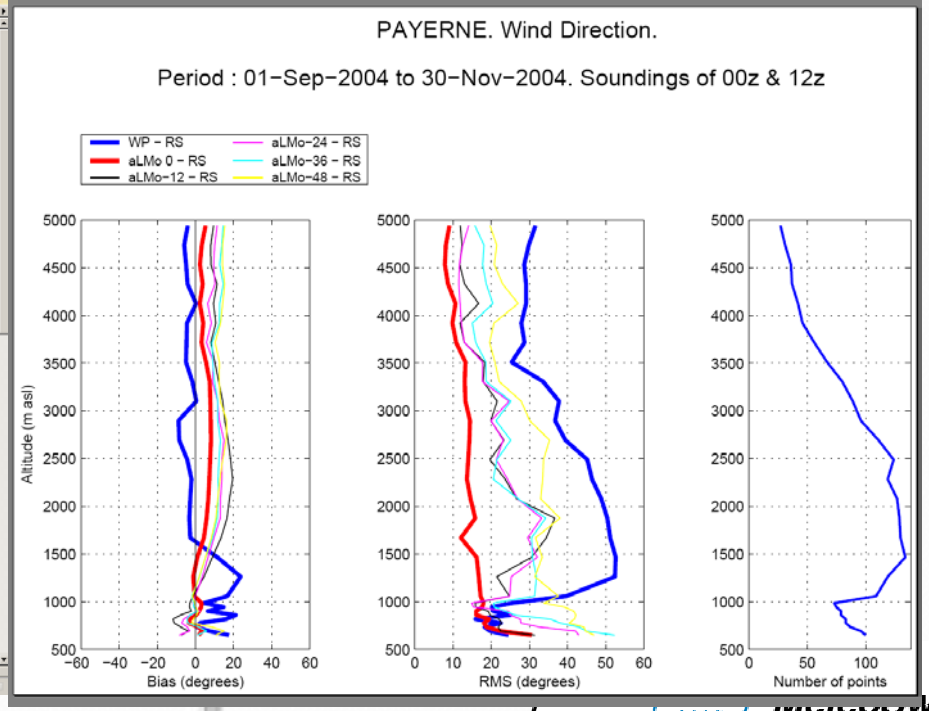
SUMMER




FALL

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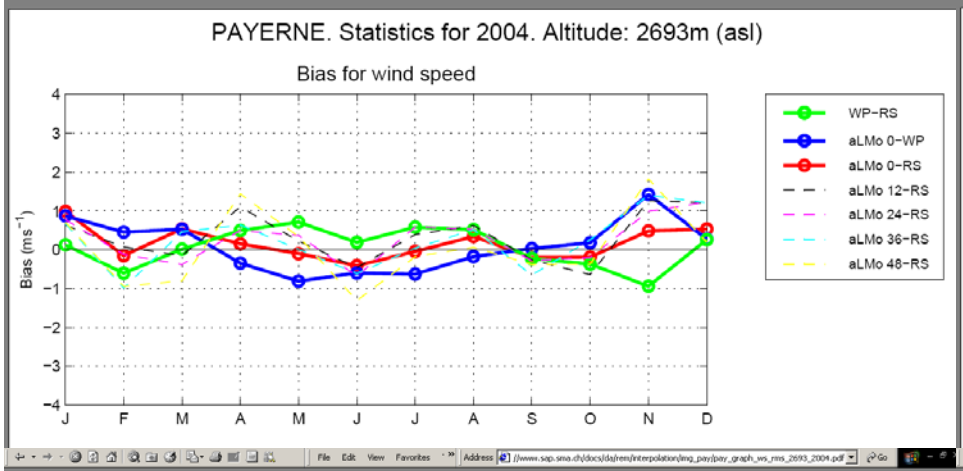
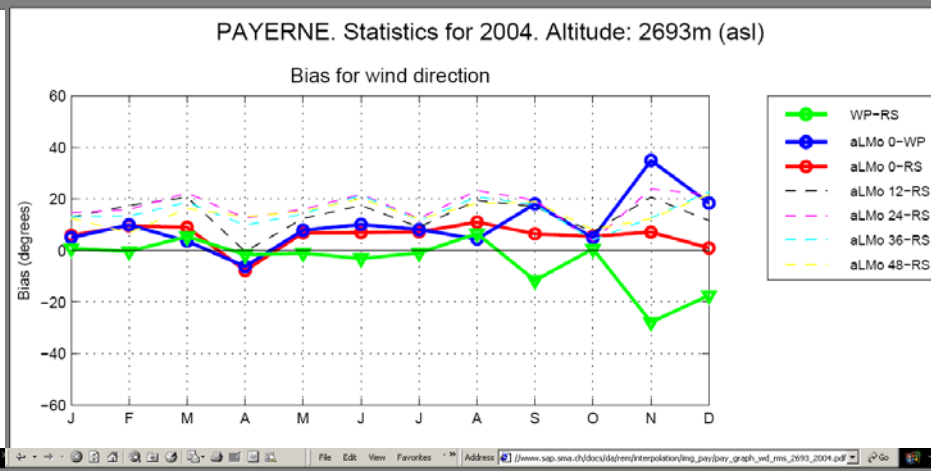
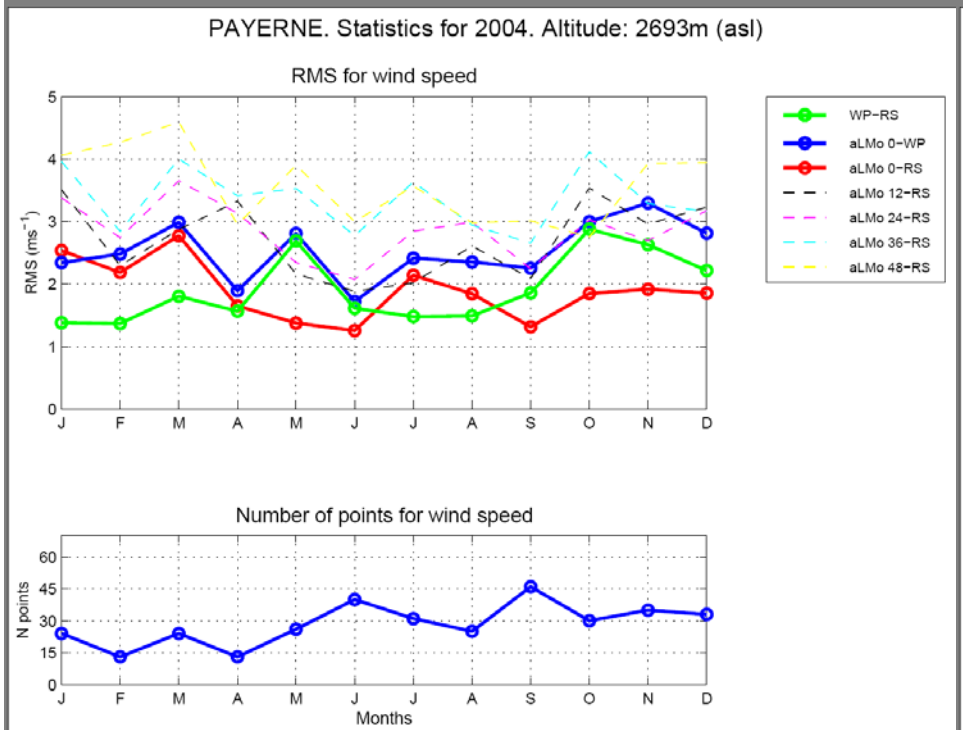
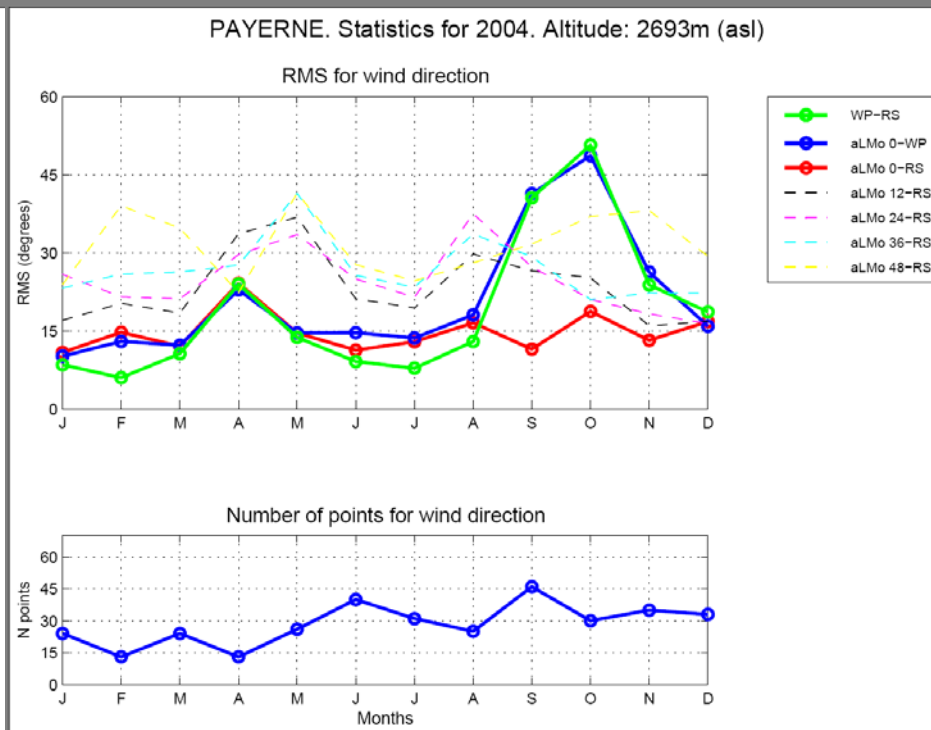

PAYERNE. Statistics for 2004. Altitude: 2693m (asl)
Bias for wind speed
Bias (ms$^{-1}$)
J F M A M J J A S O N D
WP-RS
aLMo 0-WP
aLMo 0-RS
aLMo 12-RS
aLMo 24-RS
aLMo 36-RS
aLMo 48-RS


PAYERNE. Statistics for 2004. Altitude: 2693m (asl)
Bias for wind direction
Bias (degrees)
J F M A M J J A S O N D
WP-RS
aLMo 0-WP
aLMo 0-RS
aLMo 12-RS
aLMo 24-RS
aLMo 36-RS
aLMo 48-RS


PAYERNE. Statistics for 2004. Altitude: 2693m (asl)
RMS for wind speed
RMS (ms$^{-1}$)
J F M A M J J A S O N D
WP-RS
aLMo 0-WP
aLMo 0-RS
aLMo 12-RS
aLMo 24-RS
aLMo 36-RS
aLMo 48-RS
Number of points for wind speed
N points
Months


PAYERNE. Statistics for 2004. Altitude: 2693m (asl)
RMS for wind direction
RMS (degrees)
J F M A M J J A S O N D
WP-RS
aLMo 0-WP
aLMo 0-RS
aLMo 12-RS
aLMo 24-RS
aLMo 36-RS
aLMo 48-RS
Number of points for wind direction
N points
Months

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# Summary (1)

- The wind profiler is an active ground-based remote sensing
  - ➔ wind determination as the results of a signal analysis
  - ➔ possible contaminations
  - ➔ variable vertical coverage
- The wind profiler is a very efficient active ground-based remote sensing for operational and experimental applications
  - ➔fully automated/unattended system
  - ➔high temporal resolution (30 minutes)
  - ➔analysis of a signal
- There is a necessity to control the data quality for an adequate operational use of wind profilers

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# Summary (2)

- NOAA network
  Japanese network

- EUMETNET-WINPROF
- COST720 Action on “Integrated ground-based remote-sensing stations for atmospheric profiling”
- National Meteorological and Hydrological Services main uses
  - NWP model assimilation (ECMWF, UK Met Office, LM, Arpege)
  - weather forecasters (nowcasting)
  - integration for improvement of free atmosphere measurements (temperature, humidity)
  - airport and special installation survey

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