

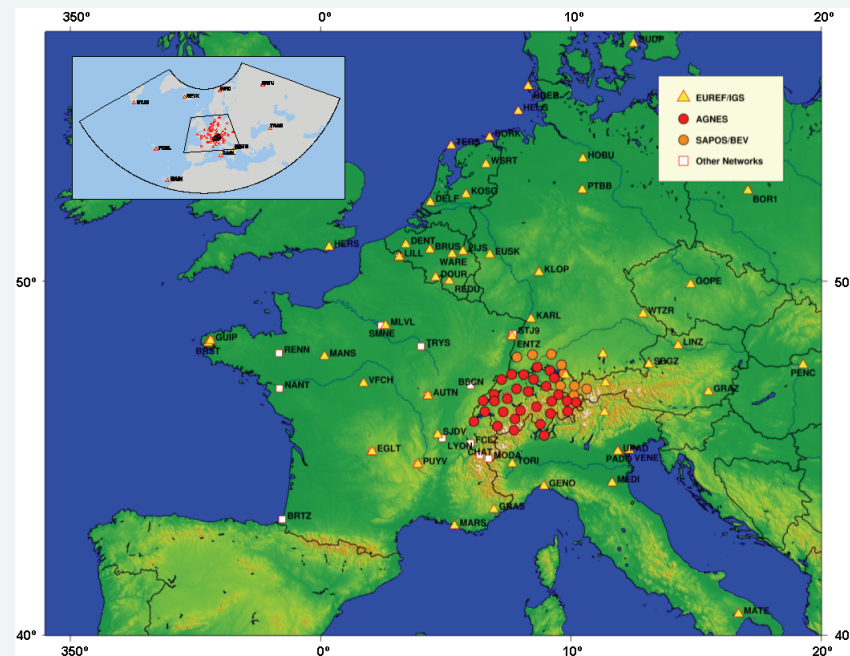
Bundesamt für Landestopografie
Office fédéral de topographie
Ufficio federale di topografia
Uffizi federal da topografia

Monitoring the Automated GPS Network of Switzerland AGNES

E. Brockmann, S. Grünig, D. Ineichen, S. Schaer

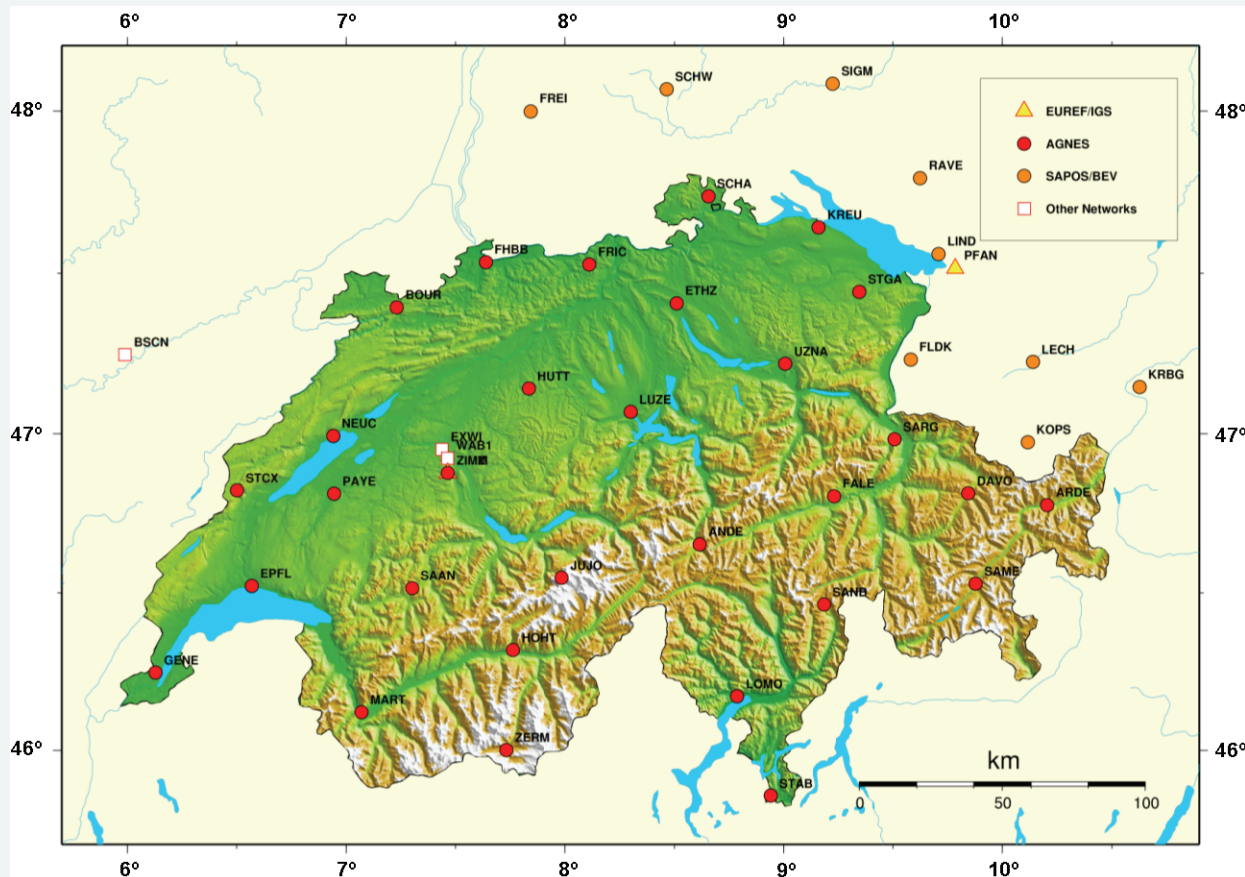
GPS analyses using Bernese GPS Software

network (#stations)	availability	comments
EUREF sub-network (30)	100 % daily	reference frame Europe 
AGNES + sub-network EUREF (80)	100 % daily	reference frame Switzerland  + + +
AGNES + sub-network EUREF (75)	98 % hourly	numerical weather prediction + monitoring 



GPS analyses using Trimble GPSNET

network (# stations)	availability	comments
AGNES + D-A stations (40)	95 % real-time	positioning service + monitoring   + + + swisstopo



AGNES
monitoring

28.06.2006

slide 3

swisstopo

+ + +

Monitoring tools (Bernese)

- (simple!) Web pages
- SMS / e-mail warnings
 - Problems in data transfer (ftp / scp)
 - Problems in coordinate repeatability
 - Cross check of AIUB and swisstopo computer
- Detailed log and plot files from the processing
- Monitoring real-time (GPSNET) not treated here

Status and available plots



swisstopo

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[geocat](#)
[Geodatenportal](#)
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AGNES-Status / Zeitreihen

Aktuell

+ Über uns

– Grundlagen

- Geodäsie
- + Referenzsysteme
- + Geostation Zimmerwald
- + Messverfahren
- + Fixpunktnetze
- Permanentnetze
- AGNES
- Auswertezentrum
- AGNES-Tagesauswertungen
- EUREF-Tagesauswertungen
- PNAC monitoring

+ AGNES-Status / Zeitreihen

+ Landesgrenze

FAQ

+ Topografie

+ Landesgeologie

+ Kartografie

+ Rechtliches

+ Produkte

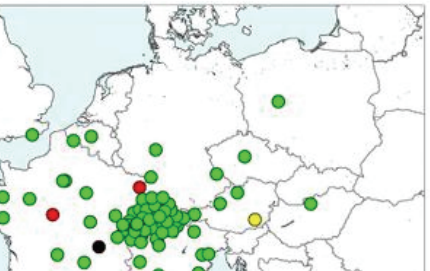
+ Dienstleistungen

+ Downloads

+ Online-Dienste

+ Links

RINEX Status in Europe



swisstopo PNAC status: RINEX Thu May 4 05:55:58 UTC 2006

Select region

Europe

Switzerland

PNAC status by subject

RINEX

NRT-Meteo

Coordinate Monitoring

swipos status by subject

swipos (not yet implemented)

Legend

- No data
- data o.k.
- 3<5 h miss./last h late
- > 5 h missing

RINEX status by site

ARTU	ANDE	ARDE	AUTN	BOR1	BOR2	BRST	BRTZ	BRUS	BSCN
BZRG	CAGL	DAVO	EGLT	EPFL	ETHZ	ETHZ	FALE	FHBB	FLDK
FREI	FRIC	GENE	GENO	GOPE	GRAZ	GUIP	HERS	HFLK	HOHT
HUTT	JUJO	KARL	KIRO	KLOP	KOPS	KRBO	KREU	LECH	LILL
LIND	LINZ	LOMO	LUZE	LYON	MANS	MART	MAS1	MATE	MEDI
MLVL	NANT	NEUC	PADO	PAYE	PDEL	PENC	PFAN	PUYV	RAVE
RENN	REYK	SAAN	SAME	SANB	SARG	SBGZ	SCHA	SCHW	SIGM
SMNE	STAB	STCX	STGA	STJO	TQRI	TRAB	TRYB	UZNA	VEHE
WFCM	WTZR	ZERM	ZIMU	ZIMM					

Analysis monitoring

[swisstopo: PNAC status and time series web page](#)

[swisstopo: PNAC processing web page](#)

[swisstopo: AMET processing summary file](#)

[swisstopo: AMET hourly helmert to official crd](#)

[swisstopo: AMET NRT and RRT solution statistics](#)

[swisstopo: AMET NRT and RRT validation w.r.t Post-Proc.](#)

[ACRI: AMET delivery](#)

[EUMETNET: AMET monitoring page](#)

[EUMETNET: GPSNET monitoring page](#)

[swisstopo: AGNES processing summary file](#)

[swisstopo: AGNES weekly helmert to official crd](#)

[swisstopo: AGNES weekly ADDNEQ output](#)

[swisstopo: AGNES processing web page](#)

[swisstopo: AGNES data availability in postprocessing](#)

[swisstopo: AGNES history](#)

[swisstopo: EUREF processing summary file](#)

[swisstopo: EUREF processing web page](#)

[swisstopo: MULTI helmert to official crd](#)

[swisstopo: MULTI helmert to CHTRF04 coordinates](#)

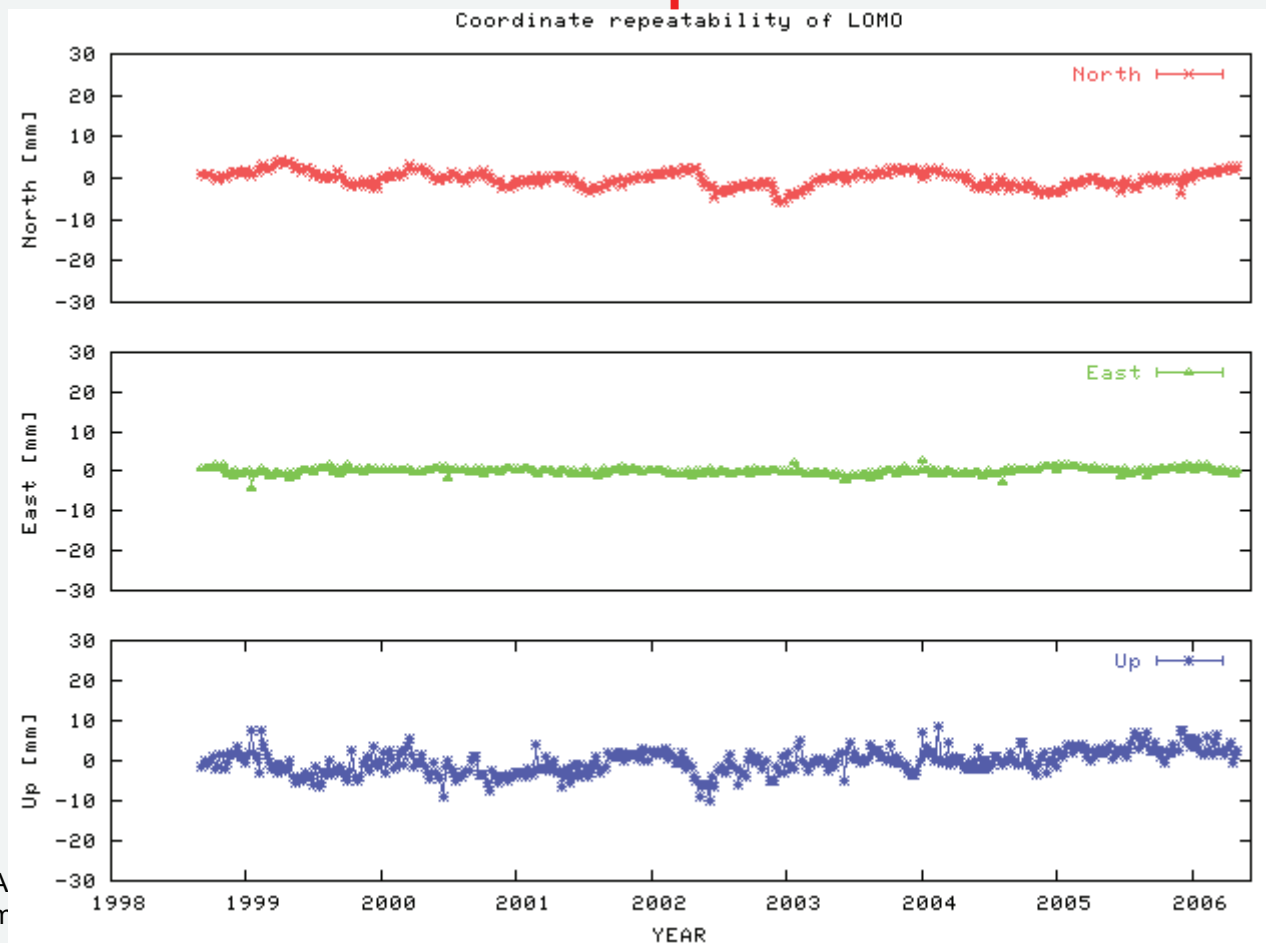
[swisstopo: MULTI velocity plot for CH](#)

Available plots by site

Station	Network / Info	Coordinate repeatability	Meteo	7 days 1h-Monitor	3 days 30s-Monitor
ARTU	Other				
ANDE	Agnes				
ARDE	Agnes				
AUTN	Other				

Example: Locarno Monti

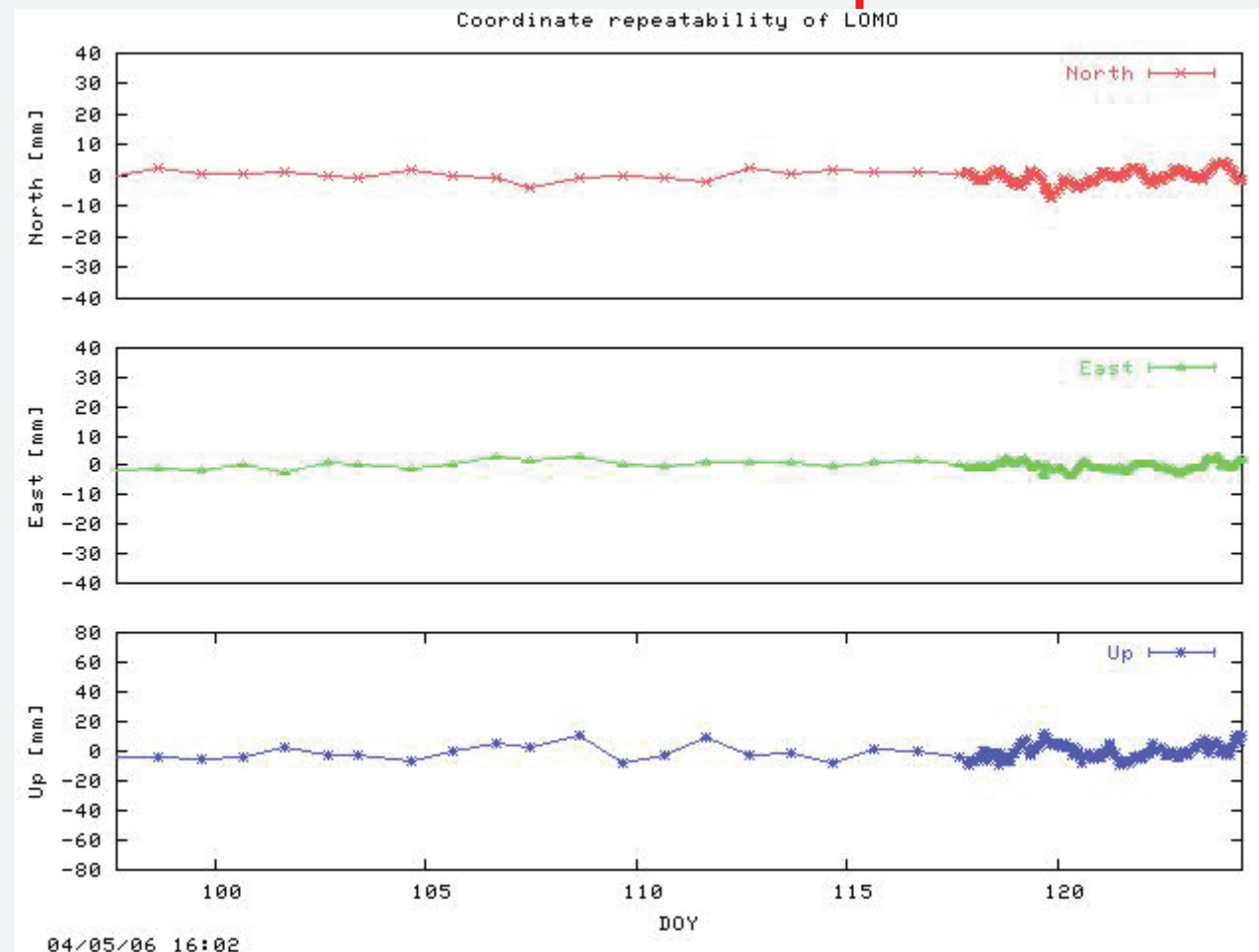
Station	Network / Info	Coordinate repeatability	Meteo	7 days 1h-Monitor	3 days 30s-Monitor
LOMO	Agnes				



02/05/06 03:16

Example: Locarno Monti

Station	Network / Info	Coordinate repeatability	Meteo	7 days 1h-Monitor	3 days 30s-Monitor
LOMO	Agnes				



Example: Locarno Monti

Station	Network / Info	Coordinate repeatability	Meteo	7 days 1h-Monitor	3 days 30s-Monitor
LOMO	Agnes				

Bernese 1h
kinematic: 30
seconds
coordinates!

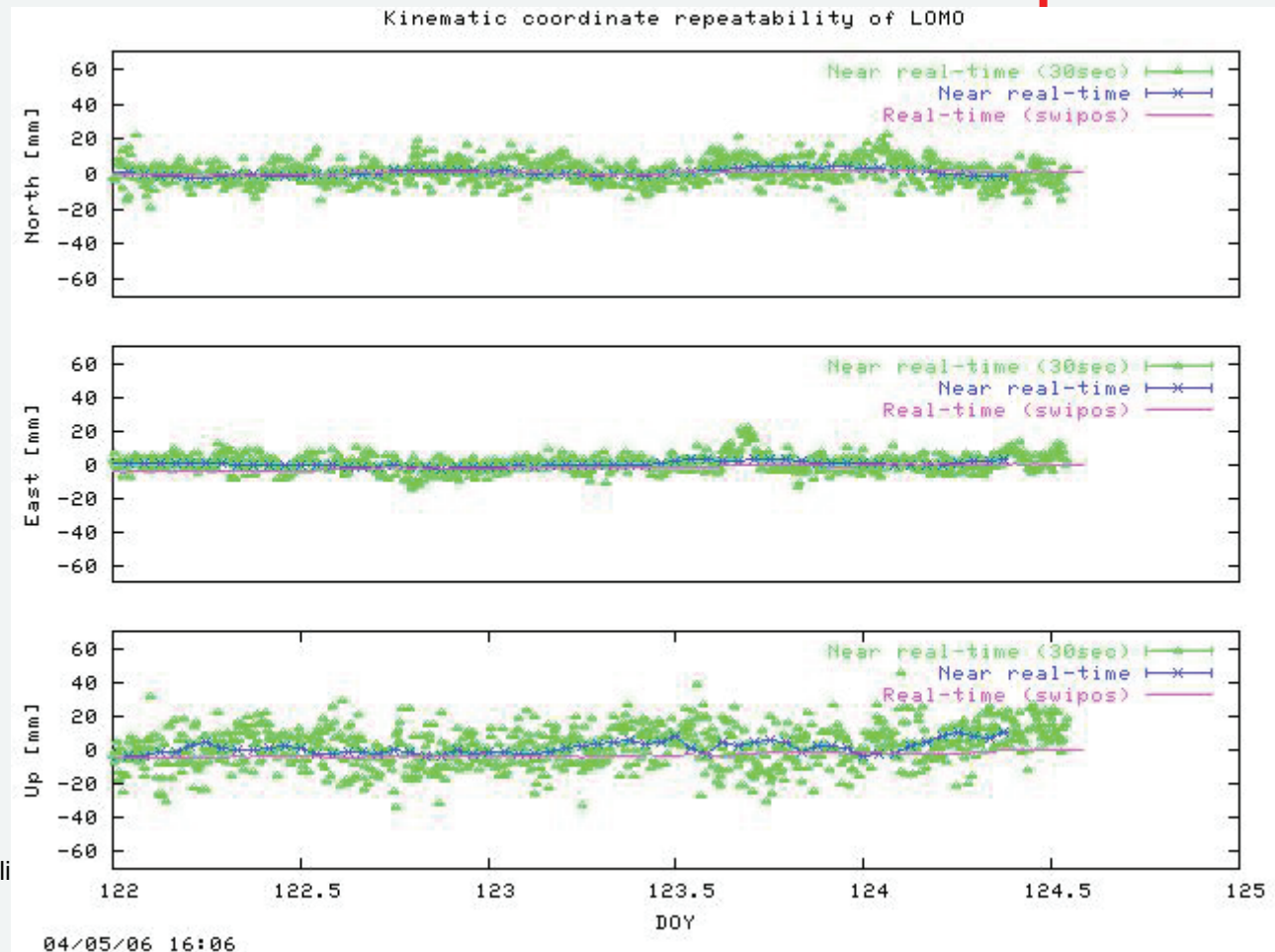
Bernese 1h NRT

GPSNet Kalman
filtering

AGNES
monitoring

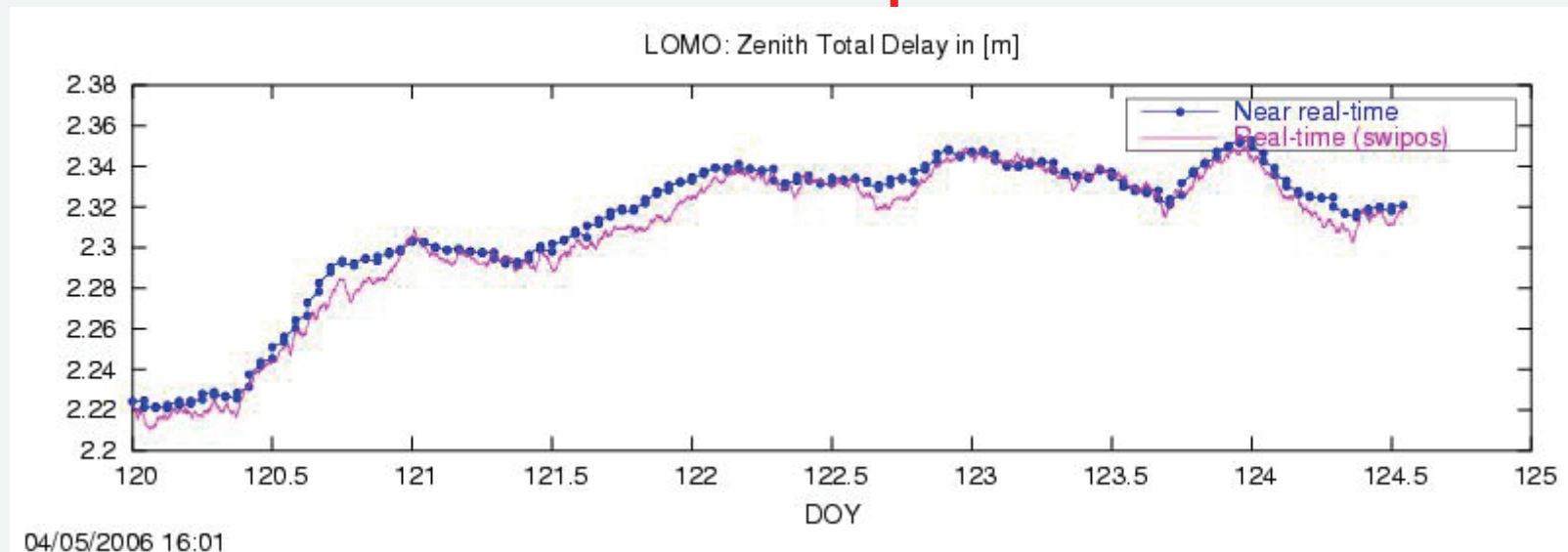
28.06.2006

sli



Example: Locarno Monti

Station	Network / Info	Coordinate repeatability	Meteo	7 days 1h-Monitor	3 days 30s-Monitor
LOMO	Agnes				

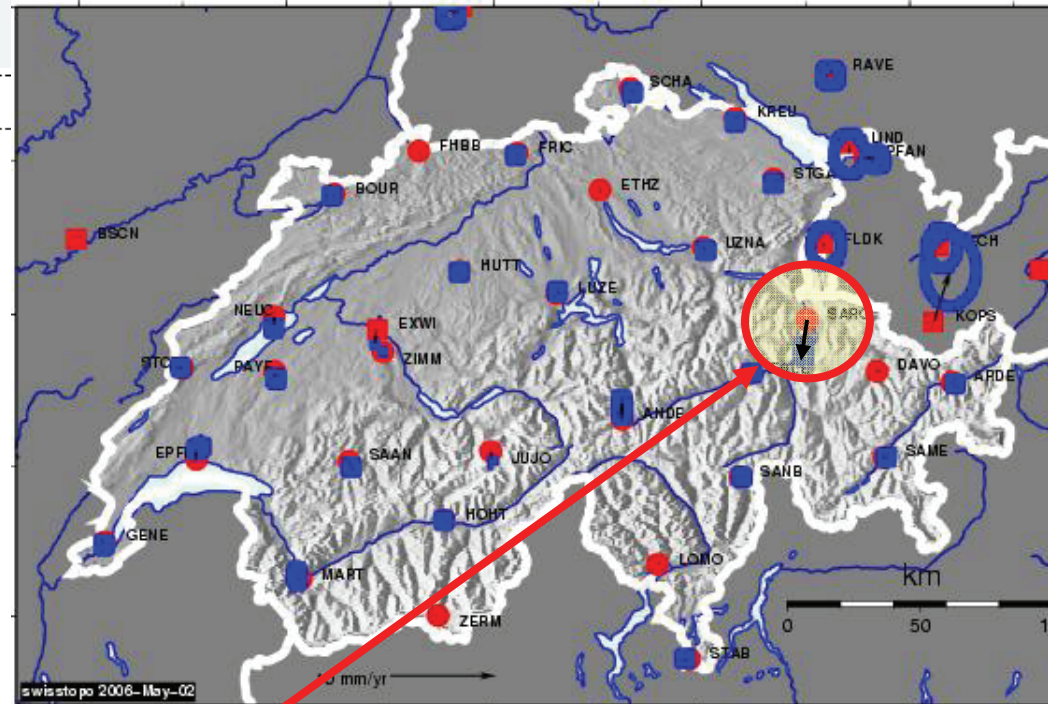


Bernese 1h NRT

GPSNet Kalman
filtering

Coordinate comparison last week with off. coor.

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
3	ANDE	N A	-7.9	1.5	-3.2
4	ARDE	N A	-1.3	4.7	-7.9
5	BOUR	N A	-4.7	-3.4	3.8
6	DAVO	N A	2.5	5.4	-3.2
7	EPFL	N A	-0.1	7.1	12.5
8	ETHZ	N A	-1.3	-0.8	0.8
9	FALE	N A	1.6	-3.6	-8.4
10	FHBB	N A	7.0	1.3	8.5
11	FLDK	N A	1.9	0.8	4.3
12	FREI	N A	-0.9	-5.7	7.8
13	FRIC	N A	-4.3	-4.2	7.1
14	GENE	N A	-4.0	2.0	8.6
15	HOHT	N A	-7.8	-0.2	-3.7
16	HUTT	N A	-0.7	-5.8	0.5
17	JUJO	N A	1.4	3.9	-14.5
18	KOPS	N A	-3.3	0.7	6.3
19	KRBG 11043S001	N A	2.7	1.0	-21.2
20	KREU	N A	5.3	-7.5	-0.9
21	LECH	N A	4.0	2.1	-7.2
22	LIND	N A	0.1	3.4	-6.9
23	LOMO	N A	0.4	6.6	1.5
24	LUZE	N A	-3.6	0.2	-0.9
25	MART	N A	-7.2	-0.1	1.4
26	NEUC	N A	-2.3	-3.3	6.6
27	PAYE	N A	1.1	1.0	7.3
28	PFAN 11005S002	N W	-4.4	-1.9	-9.2
29	RAVE	N A	4.1	2.6	-1.0
30	SAAN	N A	-4.1	1.7	3.2
31	SAME	N A	-1.3	5.3	-7.2
32	SANB	N A	1.0	1.1	-0.4
33	SARG	N A	15.3	-1.7	-3.5
34	SCHA	N A	4.1	-5.2	-1.1
35	SCHW	N A	2.5	-1.7	2.9
36	SIGM	N A	3.0	-4.4	-2.7
37	STAB	N A	5.2	7.1	6.8
38	STCX	N A	0.7	-2.1	9.3
39	STGA	N A	-1.0	-4.2	-2.6
40	UZNA	N A	2.9	-2.2	-0.8
41	ZERM	N A	-2.3	2.2	0.8
42	ZIMM 14001M004	N W	-4.0	-3.2	6.6
RMS / COMPONENT			4.4	3.8	6.9



[swisstopo: AGNES weekly helmert to official crd](#)
[swisstopo: AGNES weekly ADDNEQ output](#)
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[swisstopo: MULTI velocity plot for CH](#)

swisstopo

+ + +

2 Examples – caused by snow

1. April 2006: very wet snow
2. Jan. -Feb. 2006 Test in San Bernardino
 - Monitoring
 - + VRS measurements

Example 1: Snow in April 2006

swisstopo
+ + +

Aktuell

+ Über uns

- Grundlagen

- Geodäsie
 - + Referenzsysteme
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 - + Fixpunktnetze
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- Auswertezentrum
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 - PNAC monitoring
 - AGNES-Status / Zeitreihen**

+ Landesgrenze
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toposhop

→ Amtliche Vermessung

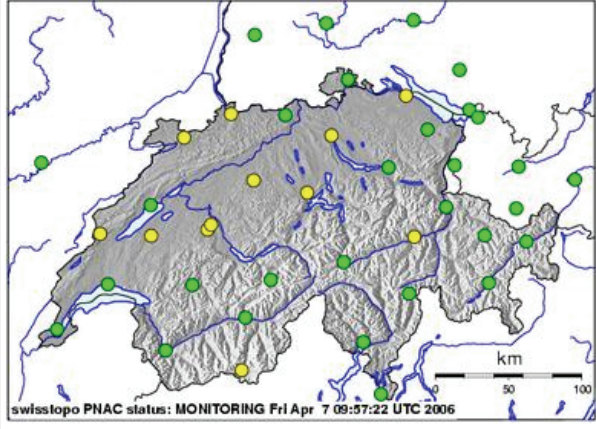
→ KOGIS

→ e-geo.ch

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AGNES-Status / Zeitreihen

Coordinate Monitoring status in Switzerland 07-Apr-2006 11:57:28 (DOY 097)



Select region

Europe

Switzerland

PNAC status by subject

RINEX

Coordinate Monitoring

swipos status by subject

swipos (not yet implemented)

Legend

-

o.k.

Alarm found

No monitoring

swisstopo PNAC status: MONITORING Fri Apr 7 09:57:22 UTC 2006

Coordinate Monitoring status by site

ARTU	ANDE	ARDE	AUTN	BOR1	BOUR	BRST	BRTZ	BRUS	BSCN
BZRO	CAGL	DAVO	EGLT	EPFL	ENTZ				
FREI	FRIC	GENE	GENO	GOPE	GRAZ				
HUTT	JUJO	KARL	KIRO	KLOP	KOPS				
LIND	LINZ	LOMO	LUZE	LYON	MANS				
MLVL	NANT	NEUC	PADO	PAYE	PDEL				
RENN	REYK	SAAN	SAME	SANB	SARG				
SMNE	STAB	STCX	STGA	STJO	TORI				
VFCH	WTZR	ZERM	ZIMJ	ZIMM					

Available plots by site

Station	Netzwerk / Info	Koordinaten-Wiederholbarkeit	Mete
ARTU	Other		
ANDE	Agnes		
ARDE	Agnes		
AUTN	Other		
BOR1	Other		

STA/05/09:55: ALARM_OUTLIER_ZIMJ:

Mi 05.04.2006 09:55

STA/05/11:55: ALARM_OUTLIER_HUTT:

Mi 05.04.2006 11:55

STA/05/12:55: ALARM_OUTLIER_FALE: I

Mi 05.04.2006 12:55

STA/05/13:55: ALARM_OUTLIER_LUZE: I

Mi 05.04.2006 13:56

STA/05/15:55: ALARM_OUTLIER_ZIMM:

Mi 05.04.2006 15:55

STA/05/18:55: ALARM_OUTLIER_PAYE:

Mi 05.04.2006 18:55

STA/05/19:55: ALARM_OUTLIER_FHBB:

Mi 05.04.2006 19:55

STA/05/20:55: ALARM_OUTLIER_ETHZ:

Mi 05.04.2006 20:55

STA/06/00:55: ALARM_OUTLIER_KREU:

Do 06.04.2006 00:55

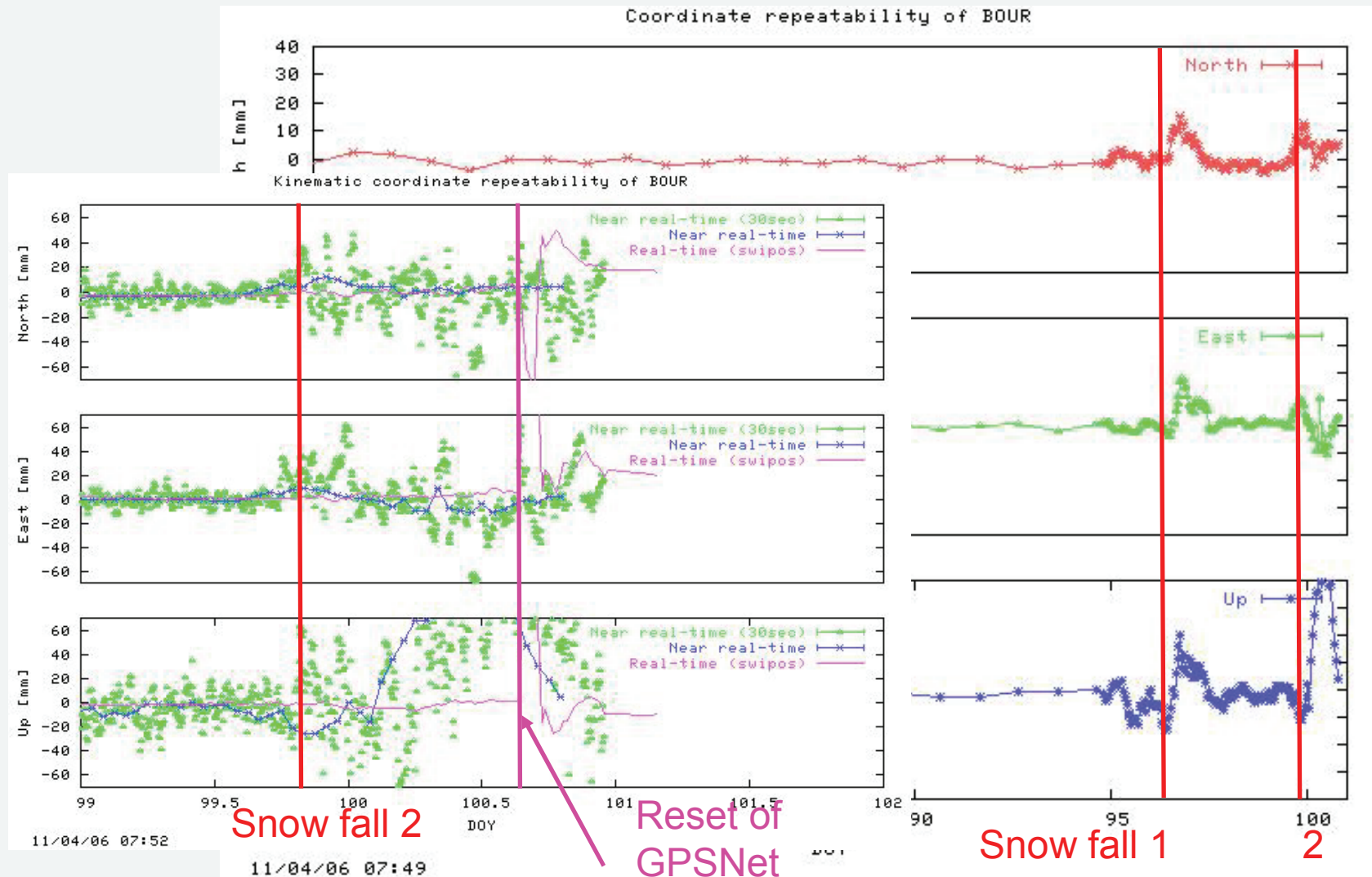
STA/06/03:55: ALARM_OUTLIER_STCX:

Do 06.04.2006 03:55

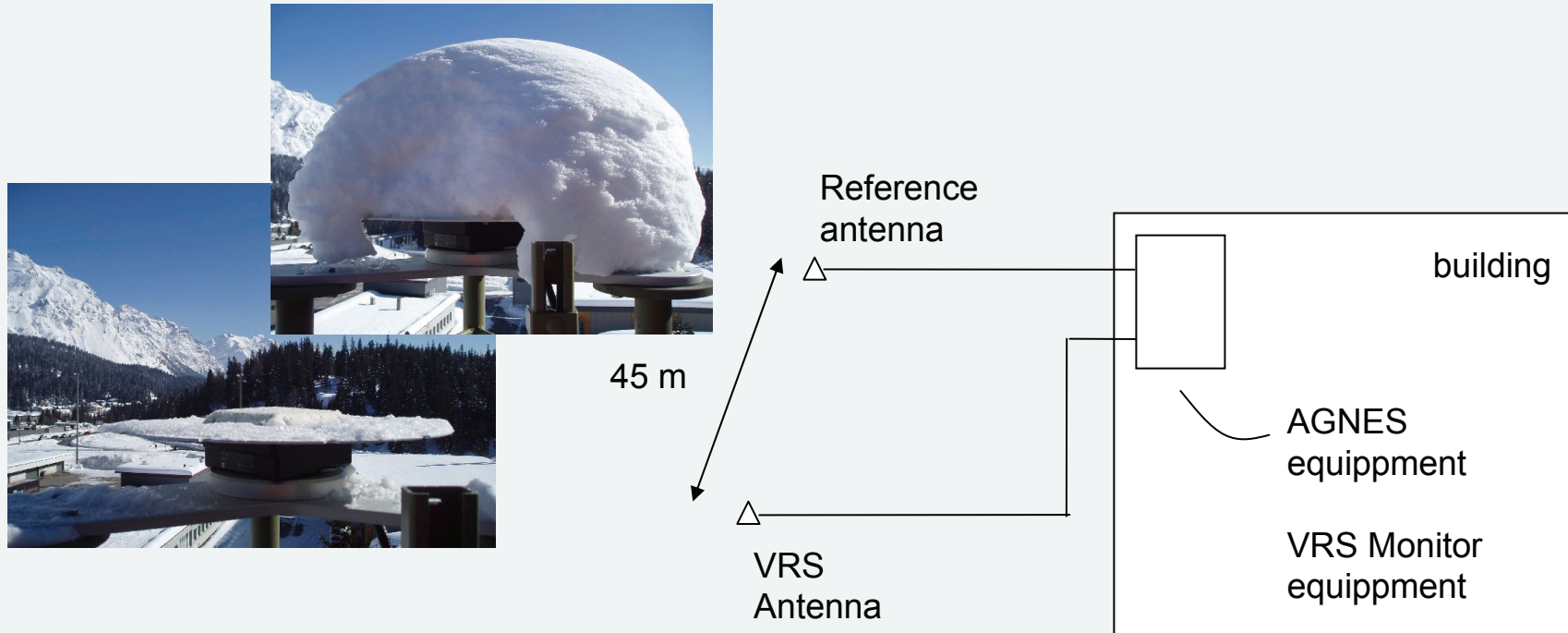
STA/07/02:55: ALARM_OUTLIER_BOUR:

Fr 07.04.2006 02:55

Example 1: impact on site Bourignon



Example 2: San Bernardino Snow Tests



Jan. - Feb. 06:
VRS measurements

AGNES
monitoring

po

VRS Monitor

- RTCM
- NMEA GGA
- Raw data

Swipos/GPSNet

GSM/
GPRS

GPS Trimble 5700

GPS

VRS-Monitor

RTKMON

- redirects RTCM
- analyses NMEA-GGA
- writes statistic Files
- creates graphics

GPSBase

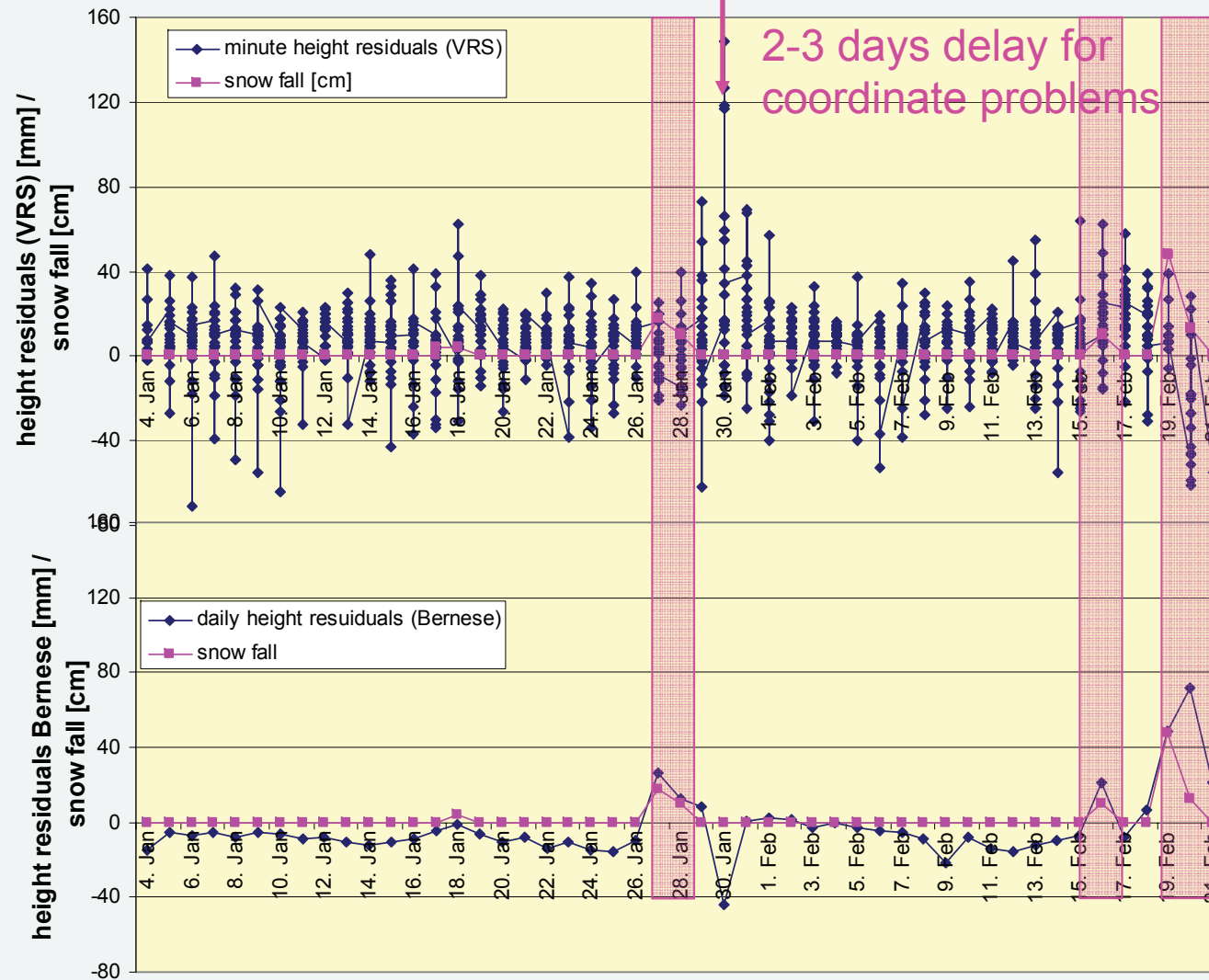
- stores raw data

Mail sender

- checks RTKMON for alarms and sends E-mail



VRS results versus Bernese Monitoring



„30 Sec.“
coordinates

daily
coordinates

Summary

- Monitoring is an essential tool for the operation of the permanent AGNES network
 - hourly, daily, weekly, multi-yearly
- Similar activities are on the way within EPN:
 - Coordinate monitoring
 - ZTD contribution for numerical weather prediction
- Snow problems are not yet solved - but it is not only snow...

Other examples: MEDI

