Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Status of GRUAN Data Flow

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GRUAN Lead Centre, DWD

4th GRUAN Implementation and Coordination Meeting (ICM-4)
Tokyo, Japan
6 March 2012

Outline

- Overview of GRUAN data flow
- GRUAN data product
- Monitoring of data flow
- Reports
- Conclusion

Overview of GRUAN data handling

→ current status (radiosondes only)

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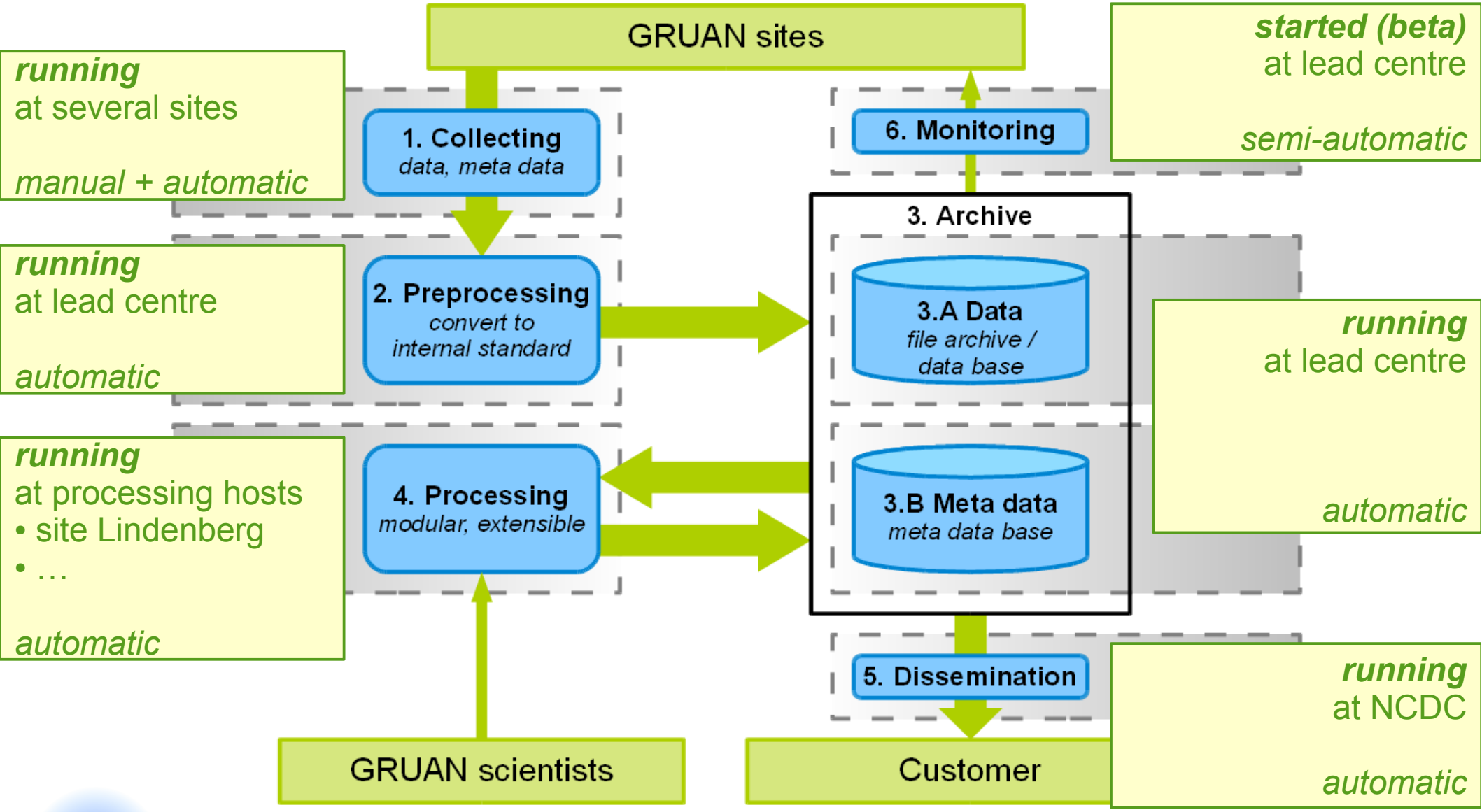

RS92 GRUAN Data Product

- RS92-GDP Version 1
  - First release version of first GRUAN data product
  - Processing started in September 2011
  - All archived RS92 launches are re-processed
- Documentation
  - GRUAN website → www.gruan.org/data
  - GRUAN-TD-4, v1.1 (2011-12-07) – Brief Description of RS92-GDP
  - Peer-reviewed article → writing in progress
- Dissemination at NCDC
  - ftp://ftp.ncdc.noaa.gov/pub/data/gruan/level2/RS92-GDP/version-001

RS92 GRUAN Data Product – 2

- Processing of a RS92 GRUAN data product
  - Based on raw data of RS92 and meta-data of specific launch
  - Use ground checks (if available)
  - Correct measurement data and estimate uncertainty
  - QA/QC included
  - Logging of all processing steps
- Status of result (*main quality level*)
  - **Approved data** → result for whole community (at NCDC)
  - **Checked data** → result only for GRUAN-internal use (at DWD)
  - **(Garbage) data** → result not usable
  - **Processing error** → no result

RS92 GRUAN Data Product – 3

- Improvements
  - Thresholds of QA/QC sometimes too tight → no ‘approved’ stamp
  - Difficult cases, e.g. contamination with liquid water or ice
  - Store additional meta-data in product files
  - Some bugs in software → failure of processing
- Development of RS92-GDP – version 2
  - Development phase (till April 2012)
  - Beta phase (till June 2012) – comparison
    - between v1 and v2
    - with Vaisala product
    - with other sondes, e.g. CFH
    - with other measurement technique, e.g. GNSS-PW

Monitoring – What steps of GRUAN data flow can be monitored?

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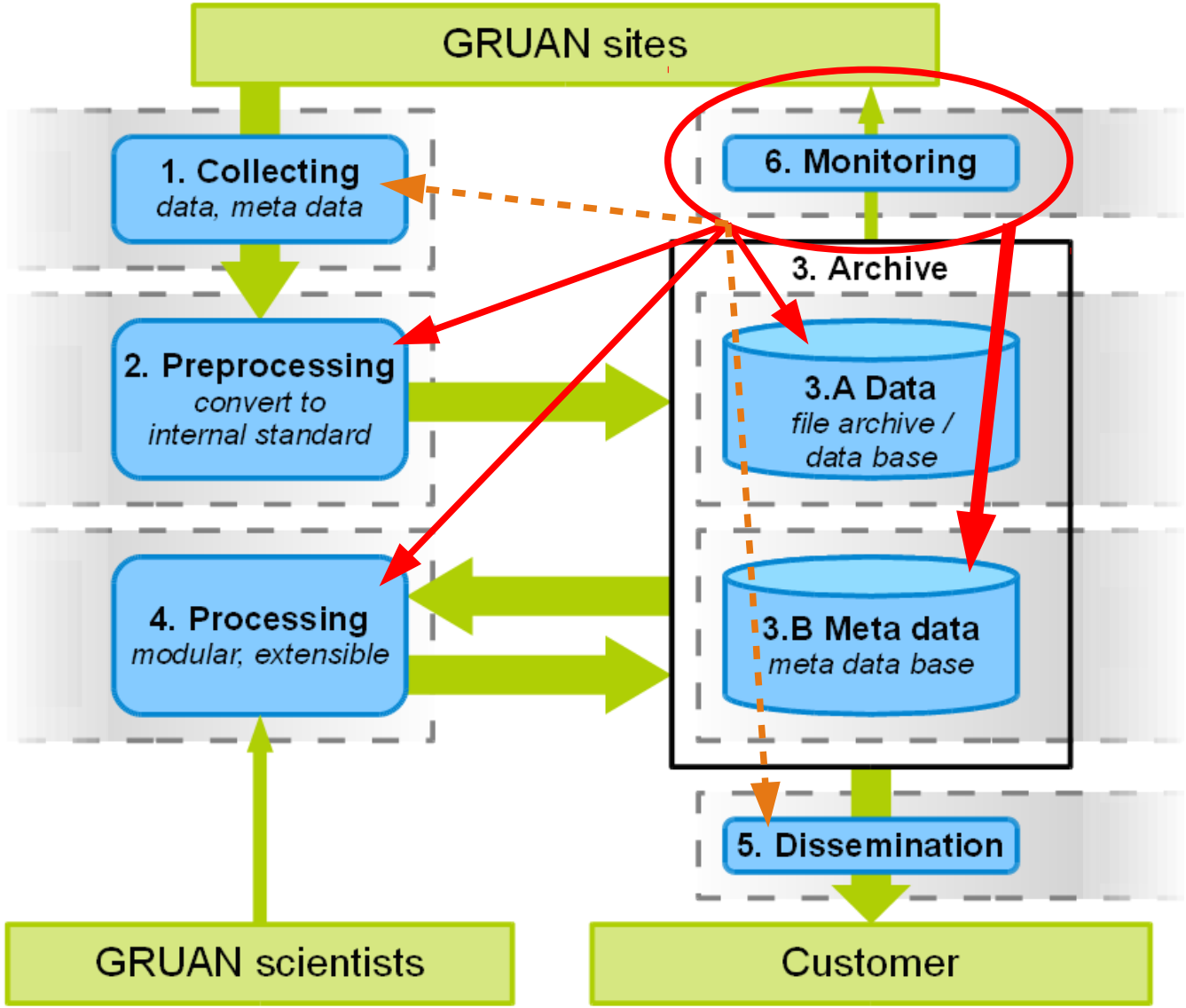

Radiosonde launches 2011

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- Including all launches archived by GRUAN
  - Different frequencies → 4/day, 2/day, weekly, bi-weekly, monthly
  - Barrow, Lamont (SGP) → processing in preparation [2011 coming soon]
  - Darwin → currently no raw data available
  - Remaining sites → data flow not started yet (various reasons)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Month's Quota
Boulder						1	1	1	5	2	4	4	4
Cabauw	61	55	61	60	61	58	62	61	60	61	60	62	60
Lindenberg	125	113	125	120	126	120	126	124	122	124	120	124	120
Manus	61	55	62	58	62	59	61	62	60	63	57	62	60
Nauru	61	58	67	66	64	51	0	50	65	61	60	58	60
Payerne									1	2	2	0	4
Potenza		1	3	4	4	4	2	3	3	0	3	4	4
Sodankylä	2	1	0	0	0	0	0	2	0	0	2	3	4
Tateno						60	64	62	62	62	60	62	60

Reports

- Specific reports for each GRUAN site
  - LC can publish it
  - Automatic creation → two weeks after end of month [planned]
- Current possible reports
  - Yearly summary report
    - Time table of launches
  - Monthly report
    - Detailed information about all launches → data flow
    - List of specific set-ups
    - List of used equipment
- Additional reports
  - *What do we need?*

Summary report of radiosounding

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Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	4	4	4	4	4	4	4	4	4	4	4	4
02	4	4	4	4	4	4	4	4	4	4	4	4
03	4	4	4	4	4	4	4	4	4	4	4	4
04	4	4	4	4	4	4	4	4	4	4	4	4
05	4	4	4	4	4	4	4	4	4	4	4	4
06	4	5	4	4	4	4	4	4	4	4	4	4
07	4	4	4	4	4	4	4	4	4	4	4	4
08	4	4	4	4	4	4	5	4	4	4	4	4
09	4	4	4	4	5	4	4	4	4	4	4	4
10	4	4	4	4	4	4	4	4	4	4	4	4
11	4	4	4	4	4	4	4	4	4	4	4	4
12	4	4	4	4	4	4	4	4	4	4	4	4
13	4	4	4	4	4	4	5	4	4	4	4	4
14	5	4	4	4	4	4	4	4	5	4	4	4
15	4	4	4	4	4	4	4	4	4	4	4	4
16	4	4	4	4	4	4	4	4	4	4	4	4
17	4	4	4	4	4	4	4	4	4	4	4	4
18	4	4	4	4	4	4	4	4	5	4	4	4
19	4	4	4	4	4	4	4	4	4	4	4	4
20	4	4	4	4	4	4						
21	4	4	4	4	4	4						
22	4	4	4	4	4	4						
23	4	4	5	4	4	4						
24	4	4	4	4	4	4						
25	4	4	4	4	5	4						
26	4	4	4	4	4	4						
27	4	4	4	4	4	4						
28	4	4	4	4	4	4						
29	4		4	4	4	4						
30	4		4	4	4	4						
31	4		4		4							
	125	113	125	120	126	120						

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01						1			1			1
02												
03											1	
04								1				
05				1	1							
06												
07												
08									1			1
09						1						
10											1	
11								1				
12					1							
13												
14				1								
15			1									1
16						1						
17											1	
18												
19					1							
20												
21												
22									1			1
23												
24												
25												
26												
27												
28												
29												
30												
31												
									3		3	4

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1	2	2	2	2	2			2	2	2	2
02	2	2	2	2	2	2			2	2	2	2
03	2	2	2	3	2	2			2	2	2	2
04	2	2	2	3	2	2			2	2	2	2
05	2	2	2	3	2	2			2	2	2	2
06	2	2	2	2	2	2			2	2	2	2
07	2	2	2	2	2	4			3	2	2	1
08	2	2	2	2	2	2		1	1	2	2	
09	2	2	2	2	2	2		2	2	2	2	
10	2	3	2	2	2	2		2	3	2	2	1
11	2	3	2	2	2	2		2	3	2	2	3
12	2	2	2	2	2	2		2	2	2	2	2
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18	2	2	3	2	2	1		3	2	2	2	2
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26	2	2	2	2	2			2	2	2	2	2
27	2	2	2	2	2			2	2	2	2	2
28	2	2	2	2	2			2	3	2	2	3
29	2		2	2	1			2	2	1	2	2
30	2		2	2	2			2	2	2	2	2
31	2		3		2			3		2		2
	61	58	67	66	64	51		50	65	61	60	58

Year 2011

- Launch scheduling
- Double launches
- After starts
- Missing launches
- Failures

GRUAN Lead Centre

Lindenberg Meteorological Observatory
Richard Aßmann Observatory

Monthly detailed launch report

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	Time	B-No.	Type	Set-up	DPS	Sondes RS92-SGP	RS92 Products RAW-001	RS92 Products GDP-001	
2011-12-14									
	00:00	1	ROUTINE	S01	DC3-MW31	G2614047	✓	✓	
	12:00	1	ROUTINE	S02	DC3-MW31	G2633395	✓	✓	
2011-12-15									
	00:00	1	ROUTINE	S05	DC3-MW31	G2624767	✓	✓	
	12:00	1	ROUTINE	S02	DC3-MW31	G2633396	✗	✗	
2011-12-16									
	00:00	1	ROUTINE	S05	DC3-MW31	G2624772	✓	✓	
	12:00	1	ROUTINE	S02	DC3-MW31	G2624759	✓	✓	← 4a
2011-12-17									
	00:00	1	ROUTINE	S05	DC3-MW31	G2633393	✓	✓	
	12:00	1	ROUTINE	S02	DC3-MW31	G2624789	✓	✗	← 4c
2011-12-18									
	00:00	1	ROUTINE	S06	DC3-MW31	G2613235	✗	✗	← 4d
	12:00	1	ROUTINE	S02	DC3-MW31	G2533967	✓	✓	
2011-12-19									
	00:00	1	ROUTINE	S05	DC3-MW31	G2624778	✓	✓	
	12:00	1	ROUTINE	S02	DC3-MW31	G2613493	✓	✓	
2011-12-20									
	00:00	1	ROUTINE	S05	DC3-MW31	G2624758	✓	✓	← 4b
	12:00	1	ROUTINE	S02	DC3-MW31	G2614045	✓	✓	
2011-12-21									
	00:00	1	ROUTINE	S05	DC3-MW31	G2614040	✓	✓	
	12:00	1	ROUTINE	S02	DC3-MW31	G2624771	✓	✓	

1 2 3 4

➔ List of all launches

1) Scheduled date + balloon number
2) Set-up: pre-defined + actual
3) Data processing system (DPS) + Sonde serial number
4) Data products: converted raw + release data product
   a) All OK
   b) Processed, but not QA/QC approved
   c) Not processed
   d) Raw not converted

Monthly detailed launch report – 2

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	Time	B-No.	Type	Set-up	DSPs	Sondes							RS92 Products	
					DSP	RS92-SGPD	SPC-6a	RS92-FN	CFH-IMET	ENSCI-Z	IMET-1	COBALD	RAW-001	GDP-001
2011-11-21														
	00:00	1	ROUTINE	S01	DC3-MW31	F3640579							✓	✓
	06:00	1	ROUTINE	S02	DC3-MW31	F3641360							✓	✓
	12:00	1	ROUTINE	S01	DC3-MW31	F3710648							✓	✓
	18:00	1	ROUTINE	S02	DC3-MW31	F3641116							✓	✓
2011-11-22														
	00:00	1	ROUTINE	S01	DC3-MW31	F3640865							✓	✓
	06:00	1	ROUTINE	S02	DC3-MW31	F3642184							✓	✓
	12:00	1	RESEARCH	S05	DC3-MW31			F2241104					✓	✓
	12:00	1	RESEARCH	S05	DC3-MW31			F2241104					✓	✓
	12:00	1	RESEARCH	S05	FN92-SUITE			F2241104						
	18:00	1	ROUTINE	S02	DC3-MW31	F3640603							✓	✓
2011-11-23														
	00:00	1	RESEARCH	S09	DC3-MW31	F3640577							✓	✓
	00:00	1	RESEARCH	S09	STRATO				2L2517	2Z5793	S16325	143		
	06:00	1	ROUTINE	S02	DC3-MW31	G3253066							✓	✓
	12:00	1	OZONE	S08	DC3-MW31	G3243639	6a20333						✓	✓
	12:00	1	OZONE	S08	LIN-O3-SUITE		6a20333							
	18:00	1	ROUTINE	S02	DC3-MW31	G3243634							✓	✓
2011-11-24														
	00:00	1	ROUTINE	S01	DC3-MW31	G3033750								✗
	06:00	1	ROUTINE	S02	DC3-MW31	G3243629								✓
	12:00	1	ROUTINE	S01	DC3-MW31	G3253164								✓
	18:00	1	ROUTINE	S02	DC3-MW31	G3033746								✗
2011-11-25														
	00:00	1	ROUTINE	S01	DC3-MW31	G3243605								✓
	06:00	1	ROUTINE	S02	DC3-MW31	G3153628								✓
	12:00	1	ROUTINE	S01	DC3-MW31	G3243627								✓
	18:00	1	ROUTINE	S02	DC3-MW31	G3033743								✗

1

2

3

Station & System: LIN-RS-01

Month: 2011-11

➔ Launches with diff. complexity

1) Routine launch with RS92 only
2) Launch with RS92 and SPC-6a (ECC)
3) Launch with RS92 + iMet-1, CFH, ENSCI-Z (ECC) and COBALD

Report – Launch set-ups

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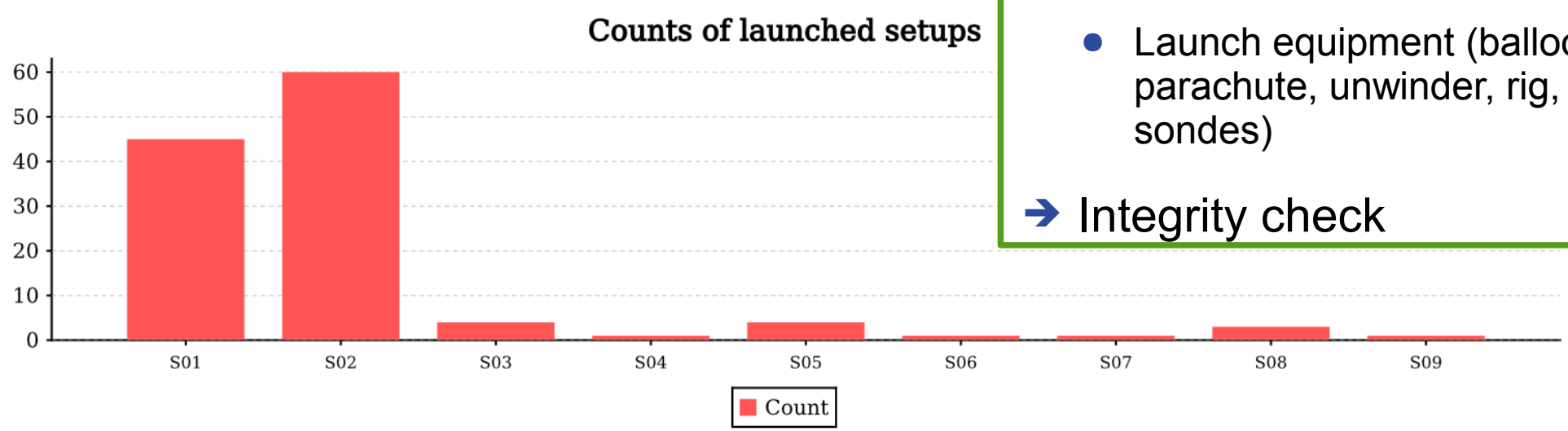
List of setups

Code	Count	Description
S01	45	DC3-MW31, DC3-GC25, POT100-B, TA800, TP-088, UW-V30, SOLO, RS92-SGPD
S02	60	DC3-MW31, DC3-GC25, POT100-B, TA600, TP-088, UW-V30, SOLO, RS92-SGPD
S03	4	DC3-MW31, DC3-GC25, POT100-B, TA800, TP-088, UW-V30, UW-V30, SOLO, RS92-SGPD
S04	1	DC3-MW31, DC3-GC25, POT100-B, LIN-O3-SUITE, TA2000, PL-4, UW1, SOLO, RS92-SGPD, SPC-6a
S05	4	DC3-MW31, DC3-MW31, DC3-GC25, POT100-B, FN92-SUITE, TA800, TP-088, UW-V30, SOLO, RS92-FN
S06	1	DC3-MW31, DC3-GC25, POT100-B, LIN-O3-SUITE, STRATO, TX3000, TP-160V-05, UW1, BAR, RS92-SGPD, SPC-6a, CFH-IMET, ENSCI-Z, IMET-1, TWIG-LOC-GLE
S07	1	DC3-MW31, DC3-GC25, POT100-B, TX800, TP-088, UW-V30, SOLO, RS92-SGPD
S08	3	DC3-MW31, DC3-GC25, POT100-B, LIN-O3-SUITE, TA2000, PC110, UW1, SOLO, R
S09	1	DC3-MW31, DC3-GC25, POT100-B, STRATO, TX3000, TP-160V-05, UW1, BAR, RS IMET-1, TWIG-LOC-GLE

- ➔ List of actual set-ups
  - Ground equipment (DPSs, GC tools)
  - Launch equipment (balloon, parachute, unwinder, rig, sondes)
- ➔ Integrity check



Report – Equipment

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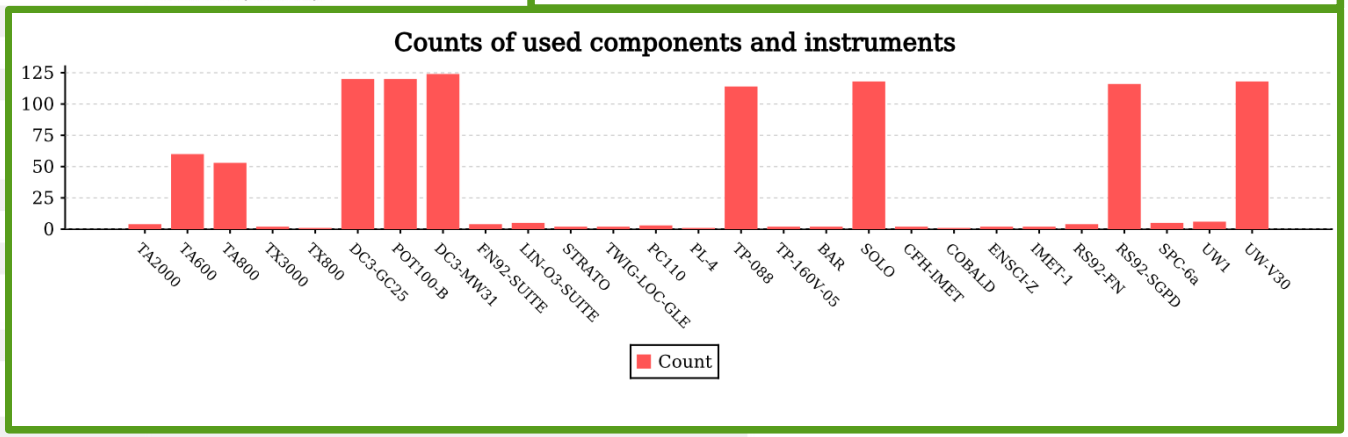
List of components and instruments

Code	Count	Name	Manufacturer
Balloon			
TA2000	4	Totex TA2000 Balloon	TOTEX (Totex)
TA600	60	Totex TA600 Balloon	TOTEX (Totex)
TA800	53	Totex TA800 Balloon	TOTEX (Totex)
TX3000	2	Totex TX3000 Balloon	TOTEX (Totex)
TX800	1	Totex TX800 Balloon	TOTEX (Totex)
CheckTool			
DC3-GC25	120	Vaisala DigiCora III - GC25	VAISALA (Vaisala)
POT100-B	120	GroundCheck 100%-Pot - Version B	
DPS			
DC3-MW31	124	Vaisala DigiCora III - MW31	VAISALA (Vaisala)
FN92-SUITE	4	Fn92 Program Suite	
LIN-O3-SUITE	5	Ozone Program Suite of Lindenberg	
STRATO	2	Strato-Computer	
Locator			
TWIG-LOC-GLE	2	TWIG Locator G LE	
Parachute			
PC110	3	Aeromet Parachute PC 110	
PL-4	1	PL-4/R95	
TP-088	114	Totex Parachute No. 088	
TP-160V-05	2	Totex Parachute No. 160V-05 (1.6 m) for Ozone	
Rig			
BAR	2	Bar-Rig	
SOLO	118	Solo-Rig	
Sonde			
CFH-IMET	2	Cryogenic Frostpoint Hygrometer (linked to IMET)	
COBALD	1	Compact Optical Backscatter AeroloL Detector (COBALD)	ETH (Eidgenössische Technische Hochschule (ETH) Zürich)
ENSCI-Z	2	ECC EnSci-Z	ENSCI (EN-SCI Corporation)
IMET-1	2	iMET-1	IMETUS (InterMet Systems (US))
RS92-FN	4	Vaisala RS92-FN	VAISALA (Vaisala)
RS92-SGPD	116	Vaisala RS92-SGPD	VAISALA (Vaisala)
SPC-6a	5	Science Pump ECC SPC-6a	SPC (Science Pump Corporation)
Unwinder			
UW1	6	60m Graw Unwinder	GRAW (GRAW Radiosondes GmbH & Co. KG)
UW-V30	118	30m Vaisala Unwinder	VAISALA (Vaisala)

- ➔ Instrument overview
  - Code, name, manufacturer
  - Count of uses
- ➔ Integrity check



Additional reports

- Proposals for additional reports
  - Monthly time series
  - Launch based
- Time series (monthly?)
  - Diagrams of monthly time series
    - Variables: temperature, relative humidity, wind direction, wind speed, …
    - Uncertainties for all variables
  - Map of balloon trajectories
- Launch based
  - Protocol with all relevant meta-data
  - Diagram of variable profiles with uncertainties
  - Comparisons, if redundant measurements / products

Additional reports – Example 1

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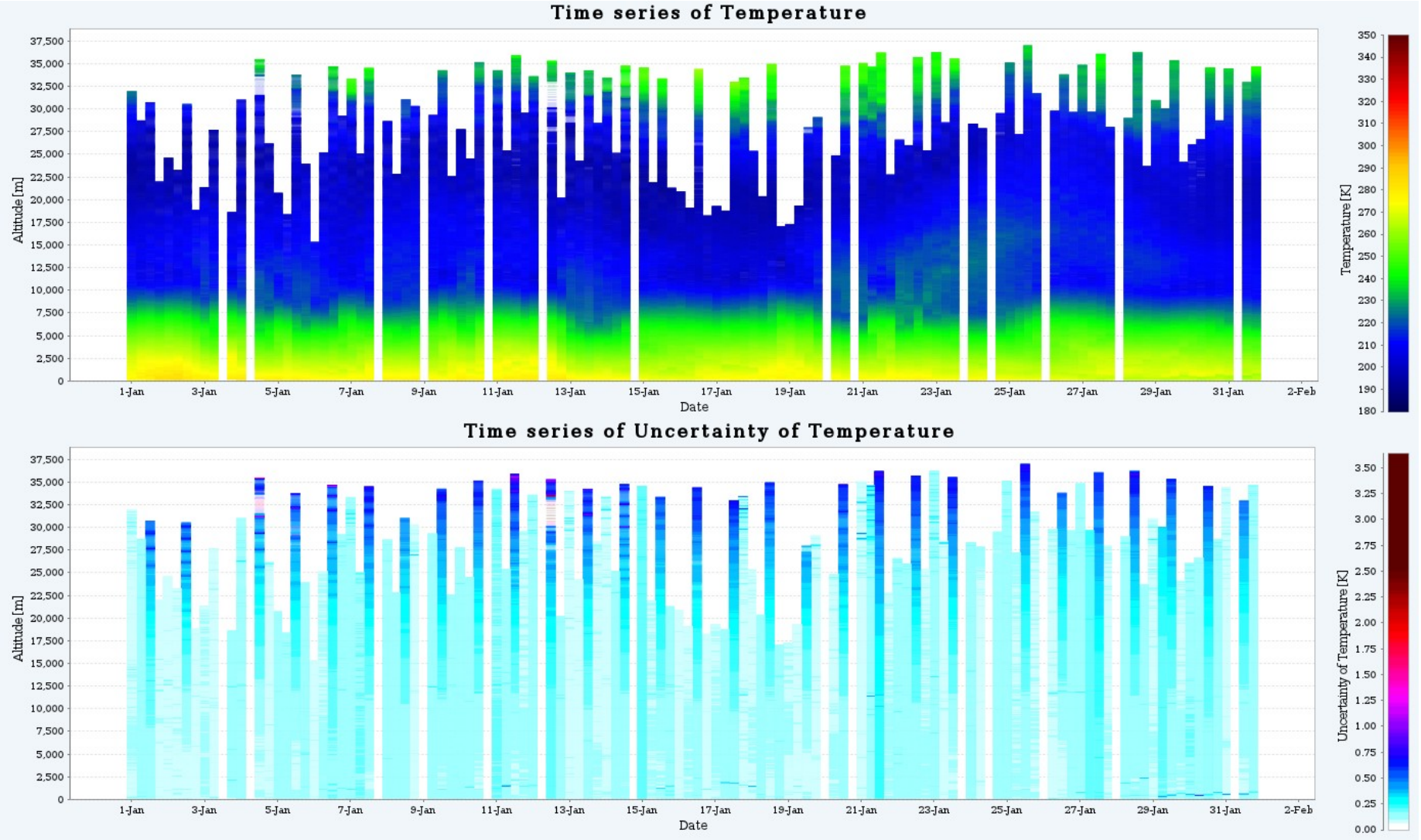

Temperature with uncertainty (2012-01 at LIN-RS-01)

Additional reports – Example 2

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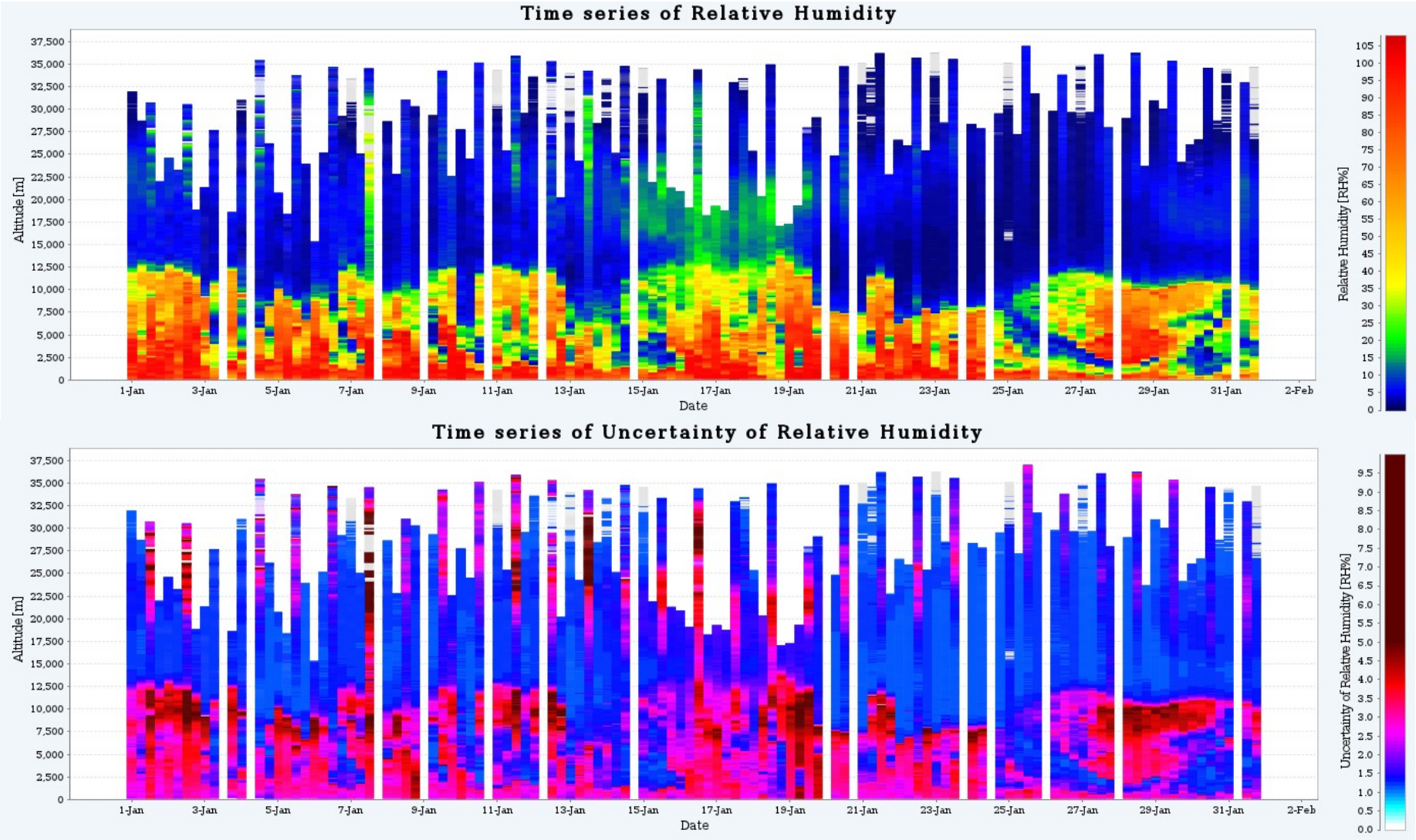

Relative humidity with uncertainty (2012-01 at LIN-RS-01)

Additional reports – Example 3

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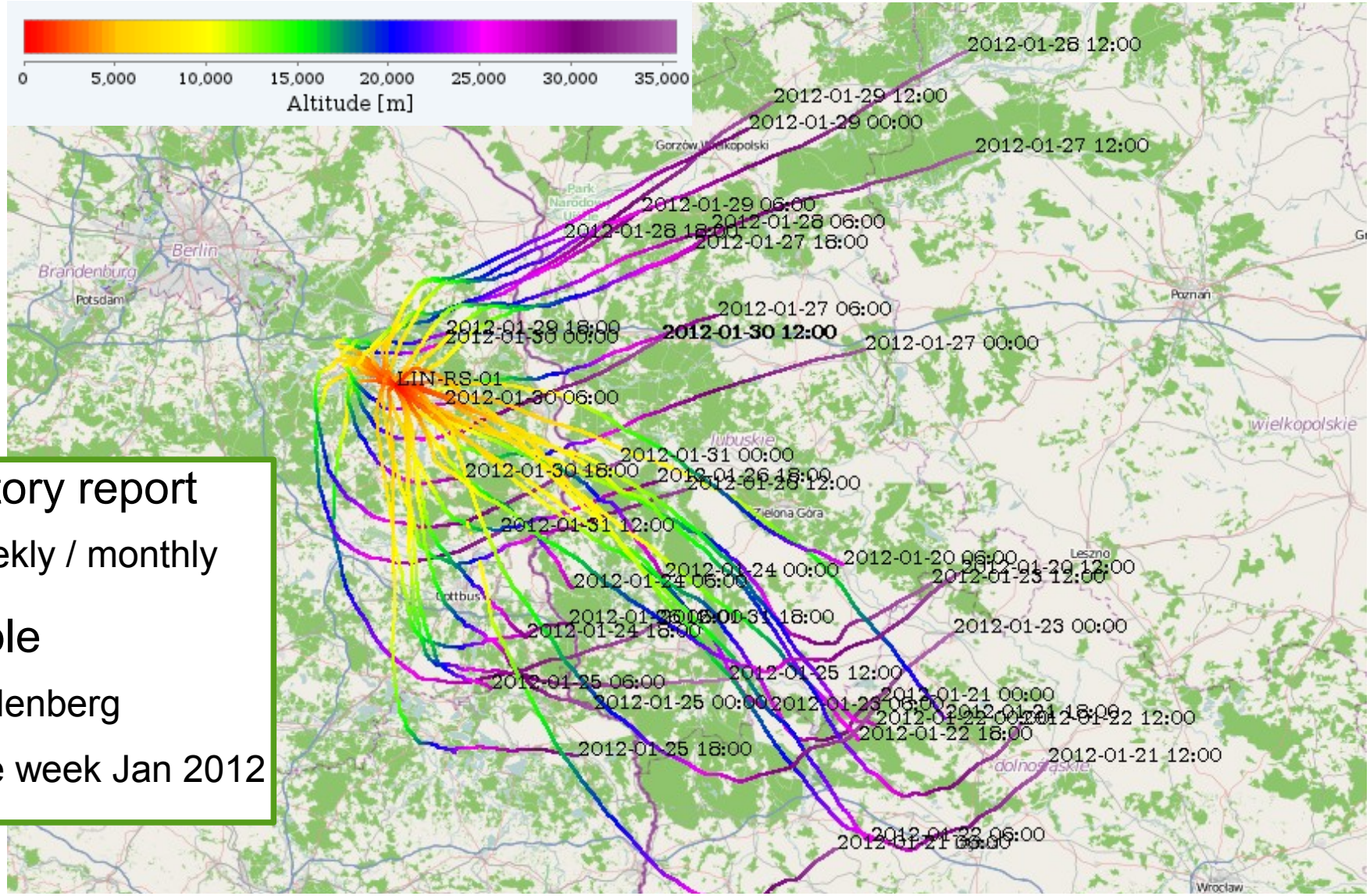

- ➔ Trajectory report
  - Weekly / monthly
- ➔ Example
  - Lindenberg
  - One week Jan 2012

Additional reports – Example 4

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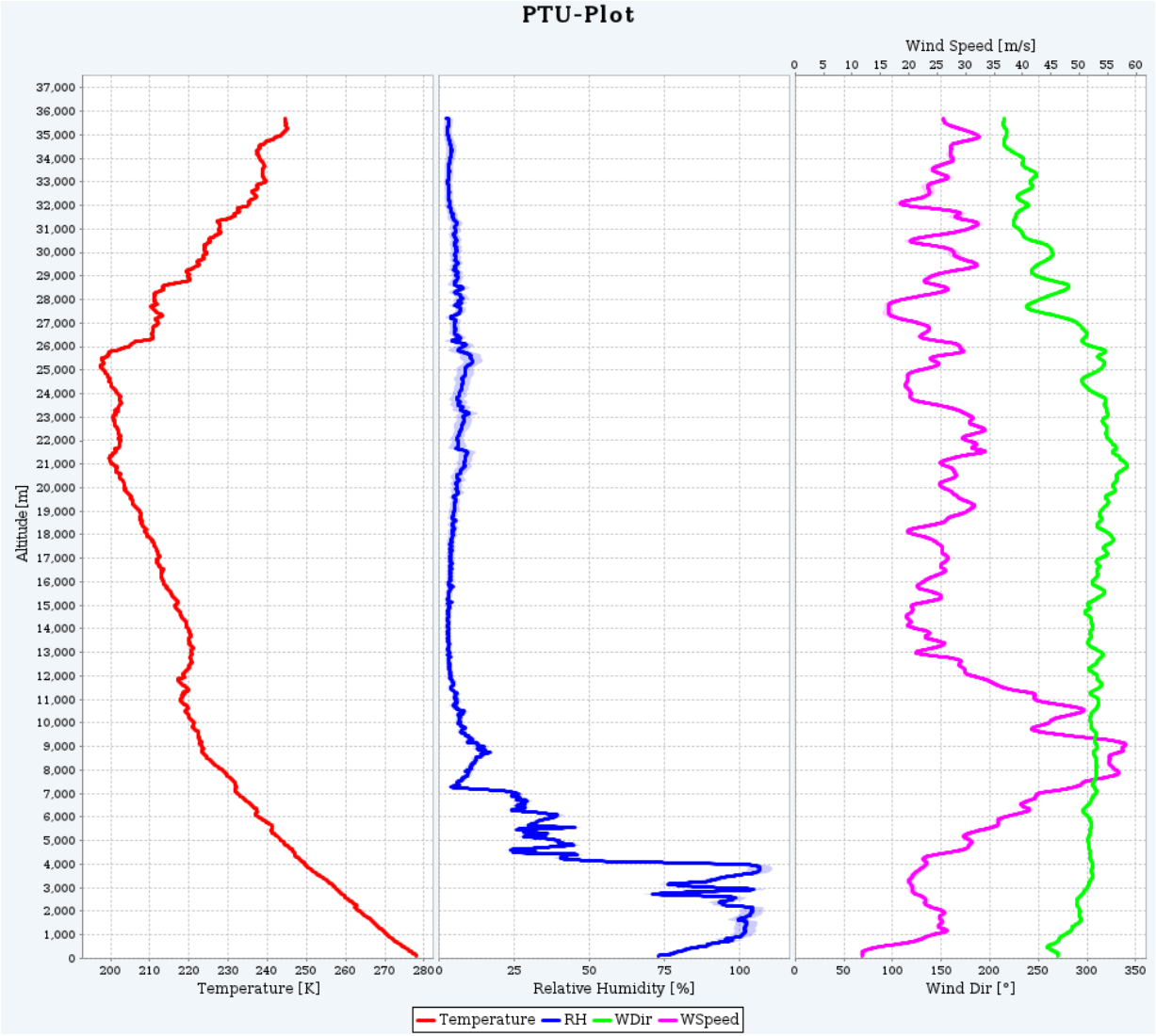

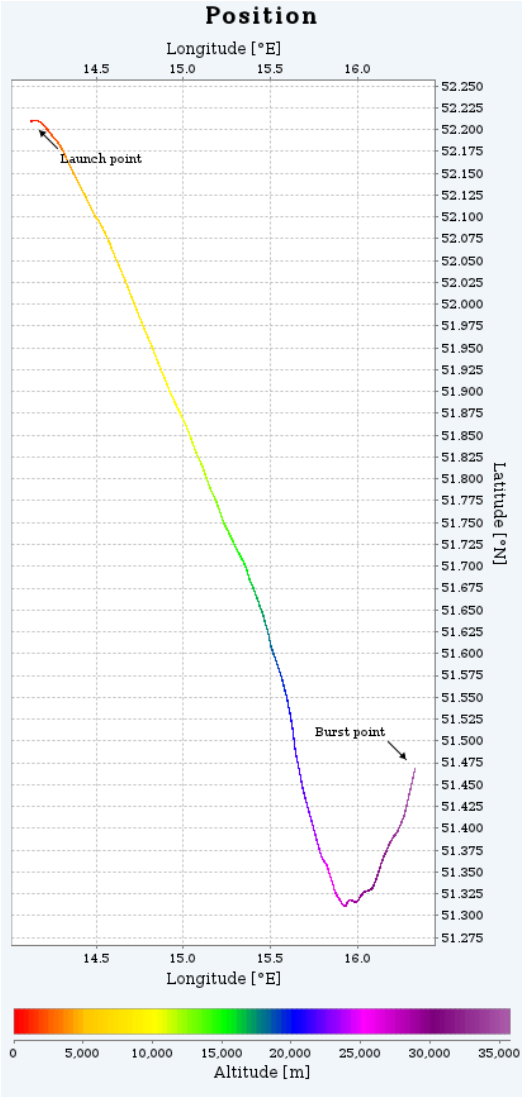

PTU with uncertainty and position (2012-01-26 12UTC at LIN-RS-01)

Conclusion

- **All parts** of GRUAN data-flow are running
- Currently data-flow includes **only** radiosounding
  - → **Next step** is broaden to other instruments (GNSS-PW, Lidar, CFH, …)
- **Release** version of first GRUAN data product (RS92) is available
- Monitoring is running at LC
  - → **Next step** is the automated creation and sending of reports to stations
  - → Your input is needed to extend and optimize reports

Thank you for your attention.