Switzerland

Commissioning Report of site of Weissfluhjoch

December 2014

Site Manager : Yves-Alain Roulet Yves-Alain.Roulet@meteoswiss.ch
Research Assistant : Audrey Reverdin Audrey.Reverdin@meteoswiss.ch
Assistant Intern : Floor van den Heuvel Floortje.Heuvel@meteoswiss.ch

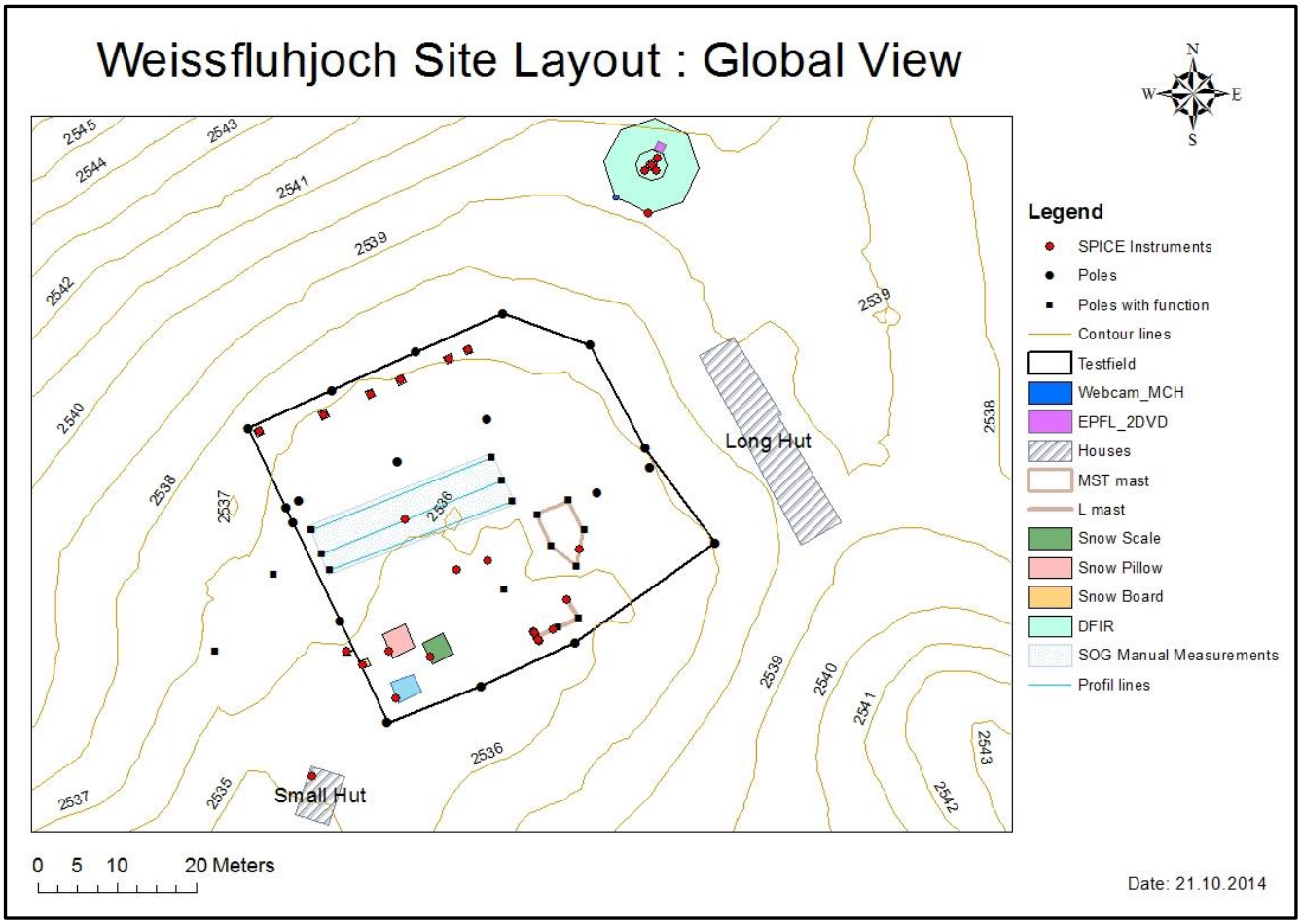
Federal Office of Meteorology and Climatology MeteoSwiss
Ch. de l'Aérologie 1, P.O. Box 316, CH-1530 Payerne
Tel : +41 26 662 62 58 Fax : +41 26 662 62 12

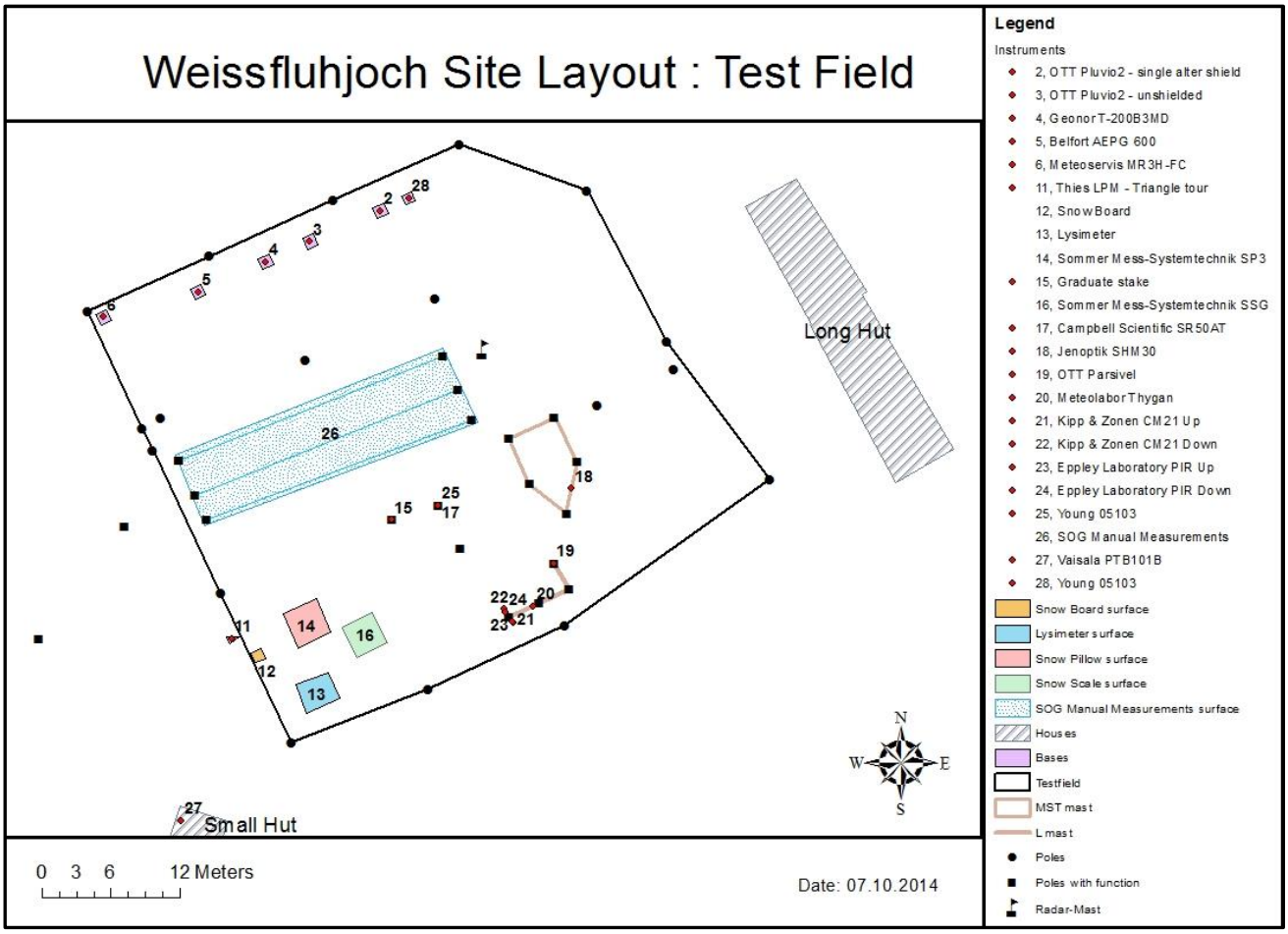
APPENDIX A: PROOF OF PERFORMANCE (POP) FORMS

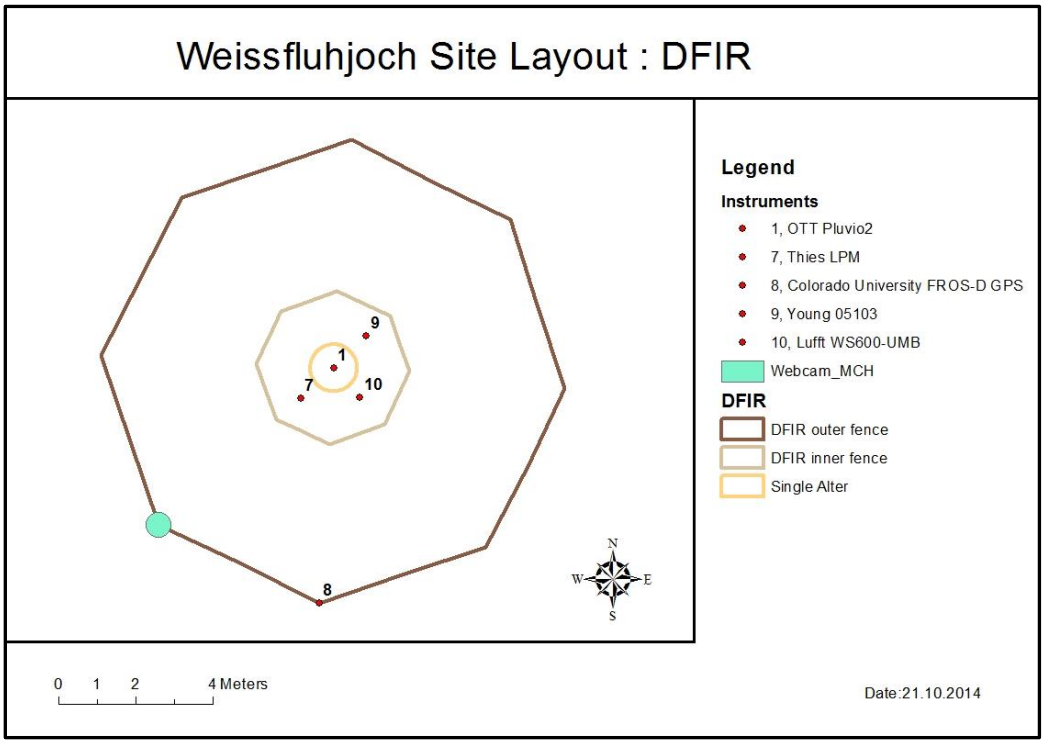
SECTION A1: STATION INFORMATION

Station name	Weissfluhjoch
Reference town	Davos, Switzerland
Station latitude	46°49'47.16'' N
Station longitude	9°48'33.51''E
Station elevation in metres	2537 m

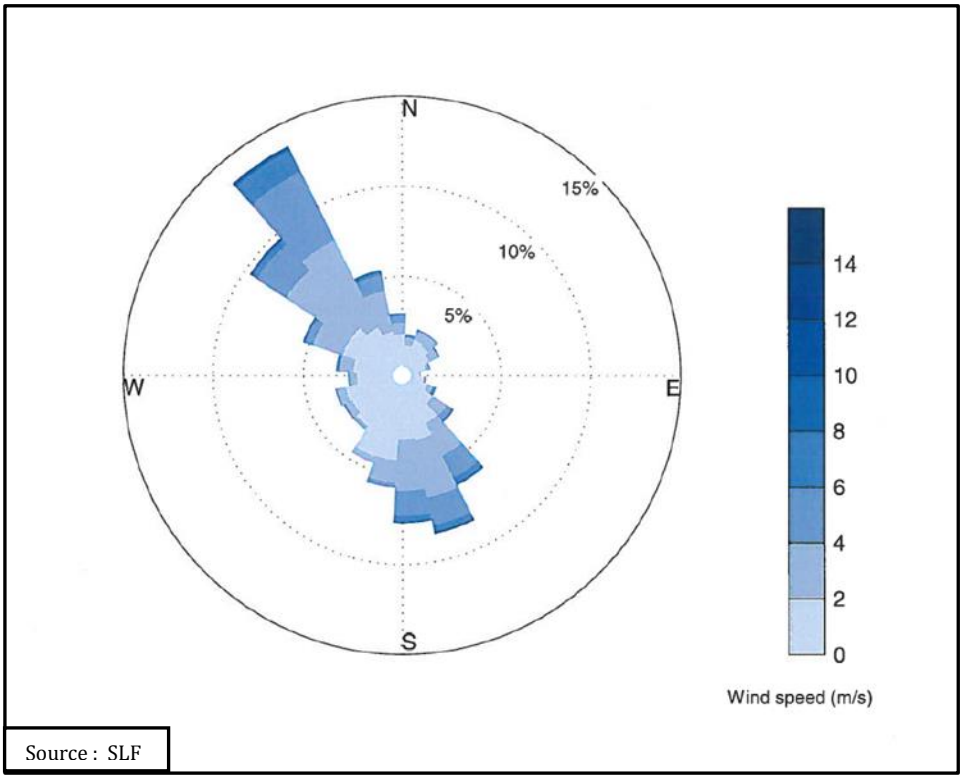
The Weissfluhjoch site layouts are the following :




Weissfluhjoch Site Layout : Test Field
Long Hut
Small Hut
0 3 6 12 Meters
Date: 07.10.2014
N
W
E
S
Legend
Instruments
2, OTT Pluvio2 - single alter shield
3, OTT Pluvio2 - unshielded
4, Geonor T-200B3MD
5, Belfort AEPG 600
6, Meteoservis MR3H-FC
11, Thies LPM - Triangle tour
12, Snow Board
13, Lysimeter
14, Sommer Mess-Systemtechnik SP3
15, Graduate stake
16, Sommer Mess-Systemtechnik SSG
17, Campbell Scientific SR50AT
18, Jenoptik SHM30
19, OTT Parsivel
20, Meteolabor Thygan
21, Kipp & Zonen CM21 Up
22, Kipp & Zonen CM21 Down
23, Eppley Laboratory PIR Up
24, Eppley Laboratory PIR Down
25, Young 05103
26, SOG Manual Measurements
27, Vaisala PTB101B
28, Young 05103
Snow Board surface
Lysimeter surface
Snow Pillow surface
Snow Scale surface
SOG Manual Measurements surface
Houses
Bases
Testfield
MST mast
L mast
Poles
Poles with function
Radar-Mast


Weissfluhjoch Site Layout : DFIR
0 1 2 4 Meters
Date:21.10.2014
N
W
E
S
Legend
Instruments
1, OTT Pluvio2
7, Thies LPM
8, Colorado University FROS-D GPS
9, Young 05103
10, Lufft WS600-UMB
Webcam_MCH
DFIR
DFIR outer fence
DFIR inner fence
Single Alter

The main wind directions of the site for the winter period (October - May) over 10 years (2001- 2011) :



Source : SLF

Site installation pictures (1 of 4)

From North :

Site installation pictures (2 of 4)

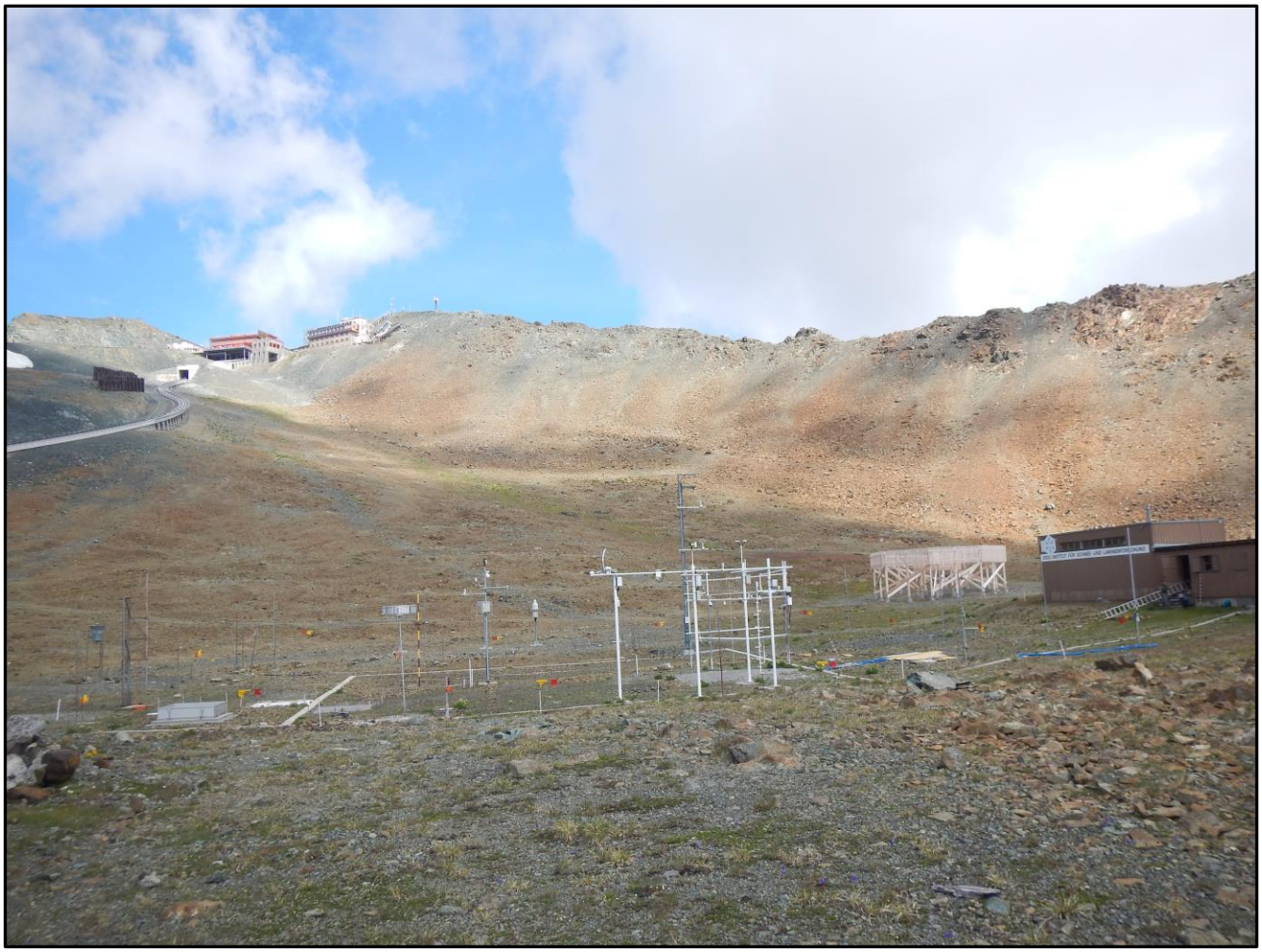
From East :

- Behind the building :

- In front of the building :

Site installation pictures (3 of 4)

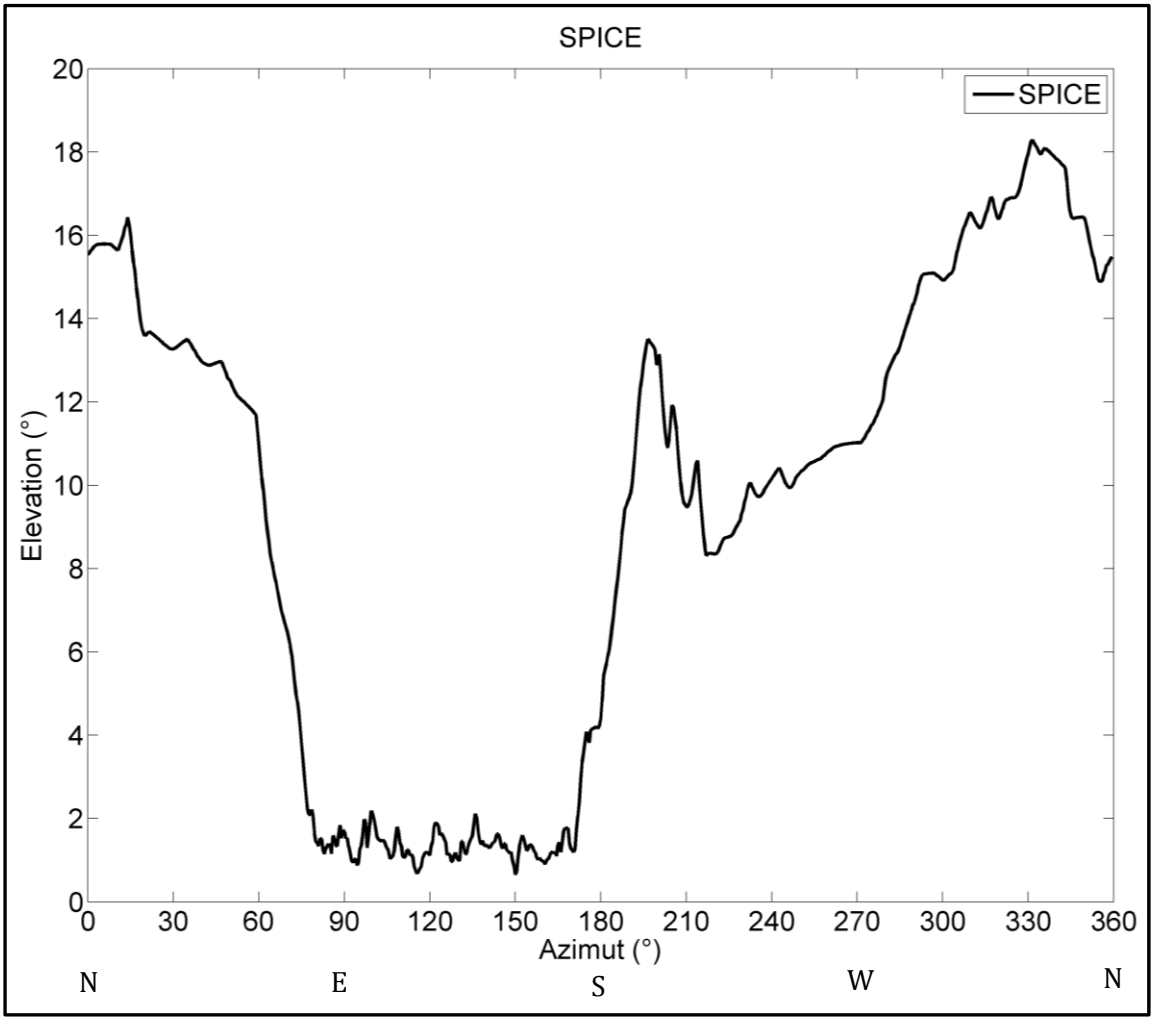
From South :



Site installation pictures (4 of 4)

From West

The horizon (drawn by the mountains surrounding) of the site is as follows :



A pictured horizon of the site :

SECTION A2: SPICE FIELD WORKING REFERENCE SYSTEM CONFIGURATION

Field Reference Type R2 (Automatic)

Configuration of the DFIR fence

Description of surrounding obstacles (including distance/direction from, height, and type)	A **building** of 27.5 x 5.20 x 4.30 (length x width x height) meters is on the surrounding area of the DFIR. - **Distance** between the center of the DFIR and the building is : • 25 m for North-East corner of the building • 25.5 m for North-West corner of the building - **Azimuthal angle** of the building from the center of the DFIR : 148°– 160°
Diameter	12 m
Height of the outer fence (measured at the top)	4 m
Height of the inner fence (measured at the top)	3.5 m
Length of slats	1500 mm
Width of slats	50 mm
Slat material	Spruce

Single Alter shield

According to the SPICE instructions?	☒ Yes ☐ No
Attached to the post of the weighing gauge?	☒ Yes ☐ No
If different, provide details:	

Weighing gauge (WG)

Location on site	Position n°1 (Please refer to site layout)
Make and model	OTT Pluvio², 200 cm², 1500 mm

Serial number	321206
Firmware version (if applicable)	V1.30.1
Number of transducers (if applicable)	N/A
Height of installation (measured from the top of the gauge)	3.5 m
Heater configuration and algorithm	**Heater Location** Heating is applied to the rim. **Heating description** The orifice rim heating consists of a ring-shaped heating element integrated in the pipe housing with temperature sensor and an electronic rim heating module for controlling and monitoring the heating function. Only the orifice ring rim is heated so as to avoid unwanted losses from evaporation. The rim heating module measures the ambient temperature and the orifice ring rim temperature and calculates the impulse/pause relationship of the heating control from these values together with the target temperature (+8 °C). Depending on their level, the rim heating module supplies the heating element with electricity for 1 to 60 seconds. **Temperature Measurement** The temperature of the load cell and the rim temperature are measured using OTT's built-in temperature sensors. **Heating Control** The heating control has been designed such that it is active over an ambient temperature range of -40 … +8 °C. The orifice rim heating heats the orifice ring rim until the set target temperature of +8 °C is reached. **Heating Power** The nominal supply voltage for operating the orifice rim heating is 24 V DC, and the maximum heating capacity with very low ambient temperature is approximately 53 watts.
Output data message format	[Intensity RT] [Accumulated RT/NRT] [Accumulated NRT] [Accumulated total NRT] [Bucket RT] [Bucket NRT]

	[Temperature load cell] [Heating status] [Status] [Temperature electronics unit] [Supply voltage] [Temperature orifice ring rim]
Data sampling rate	Impulse output frequency of 5 Hz. Bucket content calculated every 6 sec.
Data acquisition interval	1 min

Precipitation detector

Location on site	Position n°7 (Please refer to site layout)
Make and model	THIES LPM disdrometer, 5.4110.xx.x00, V2.5x STD
Serial number	1055
output data message format	[1M SYNOP Tab.4677] [1M SYNOP Tab.4680] [1M METAR Tab.4678] [1M Intensity (mm/h) total precipitation] [1M Intensity (mm/h) liquid precipitation] [1M intensity (mm/h) solid precipitation] [Precipitation amount (mm)] [1M Visibility in precipitation] [1M Measuring quality] [Status Laser] [Static signal] [Status Laser temperature (digital)] [Status Laser current (digital)] [Status Sensor supply] [Status Current pane heating laser head] [Status Current pane heating receiver head] [Status Temperature sensor] [Status Heating supply] [Status Current heating housing] [Status Current heating heads] [Status Current heating carriers] [Status Control output laser power] [Interior temperature (°C)] [Temperature of laser driver] [Mean value laser current 1/100(mA)] [Control voltage (mV)] [Voltage sensor supply (1/10V)] [Current pane heating laser head (mA)] [Current pane heating receiver head (mA)] [Ambient temperature (°C)] [Voltage Heating supply (1/10V)] [Current heating housing (mA)] [Current heating heads (mA)] [Current heating carriers (mA)] [Number of all measured particles]
Data sampling rate	Laser beam : 109 kHz. Resulting precipitation events collected each minute
Data acquisition interval	1 min
Height of installation. *DAT team recommend the following place for an optical precipitation detector or precipitation type sensor inside the DFIR:* • *Inside the inner fence*	4 m

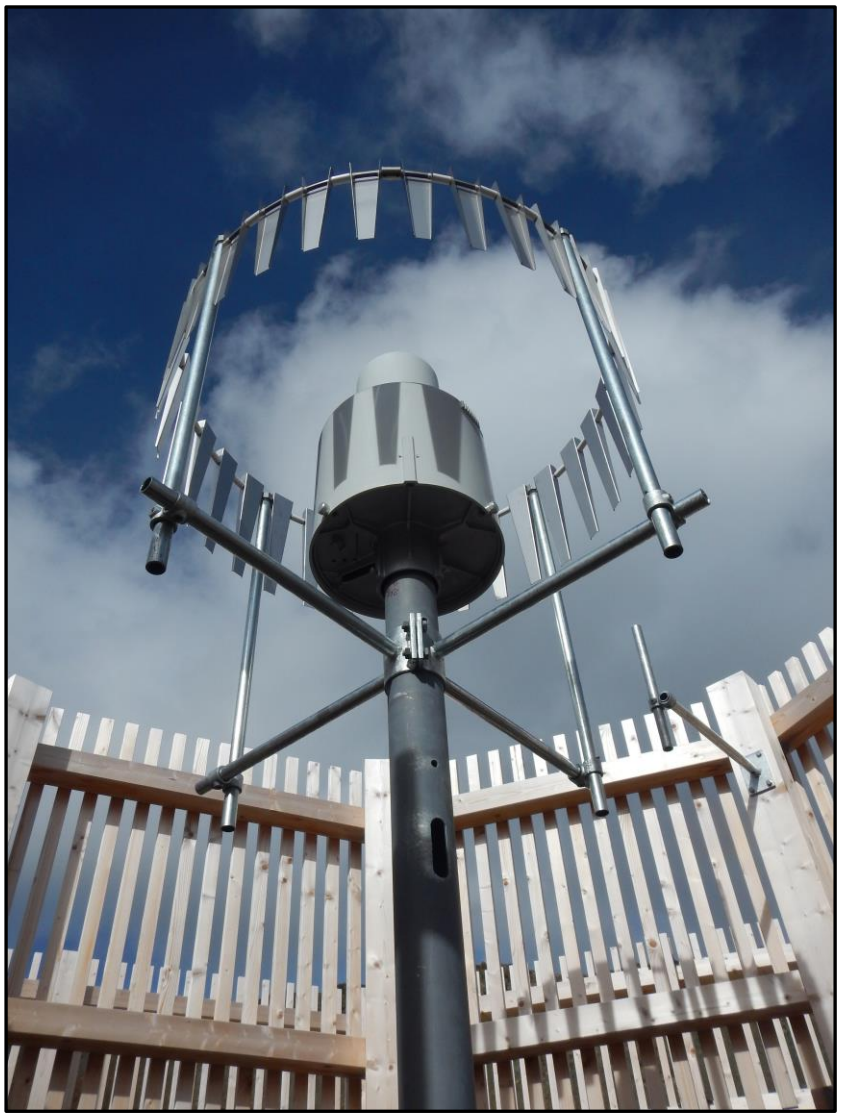
• *75 cm below the gauge opening, corresponds to half way down the inner fence*	
Location of installation relative to WG in reference system. *DAT team recommend to locate the optical precipitation detector or precipitation type:* • *perpendicular to the main wind direction* • *if possible using two precipitation sensors at different places to account for different wind directions.* • *in the middle between Alter and inner fence*	Perpendicular to the main wind direction and in the middle between Alter and inner fence.

Picture. Field Reference Type R2 (Automatic)

Picture of installation - DFIR shield

Picture taken from East

Picture of installation – Pluvio² gauge in single alter shield (Position n°1)



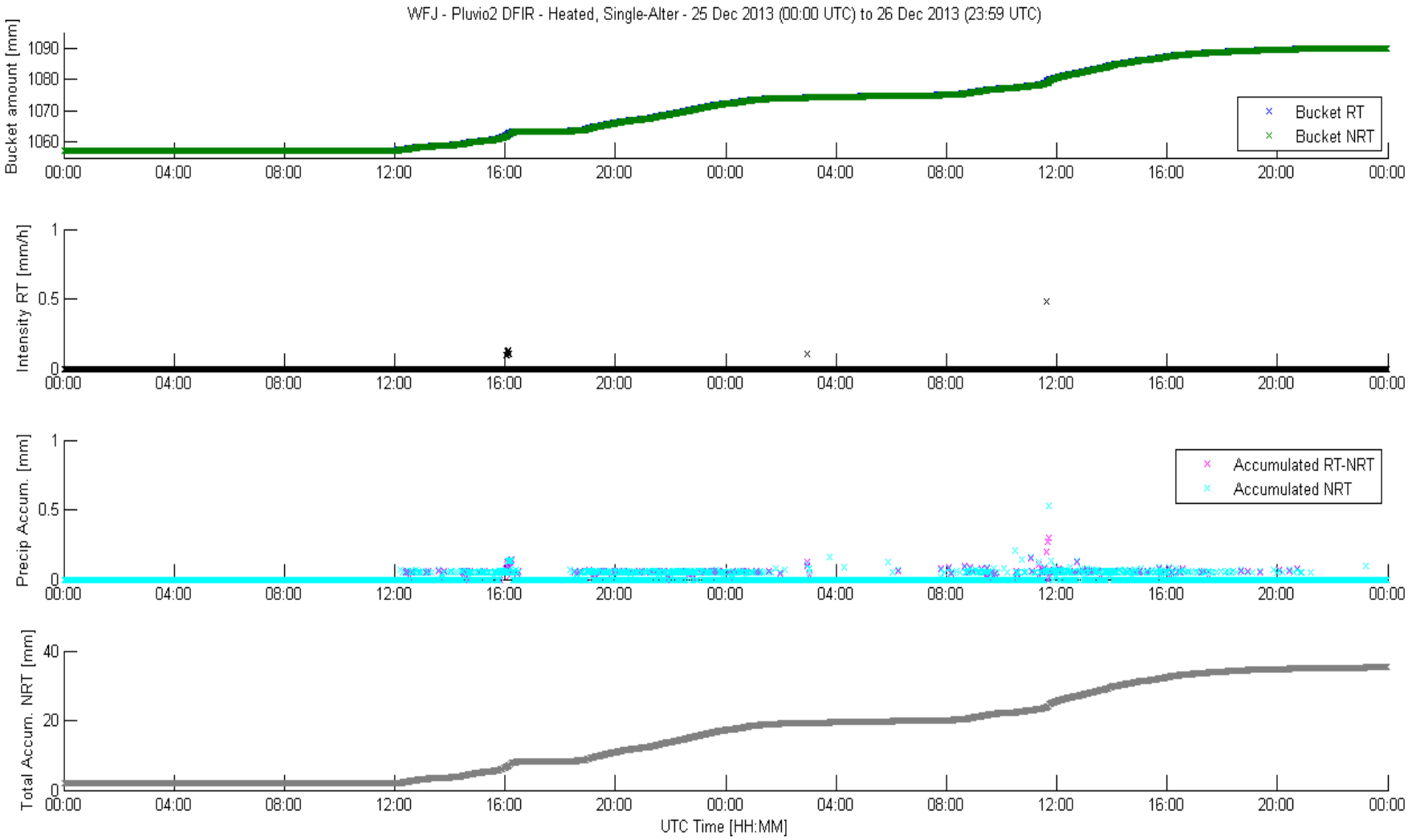
Picture taken from South

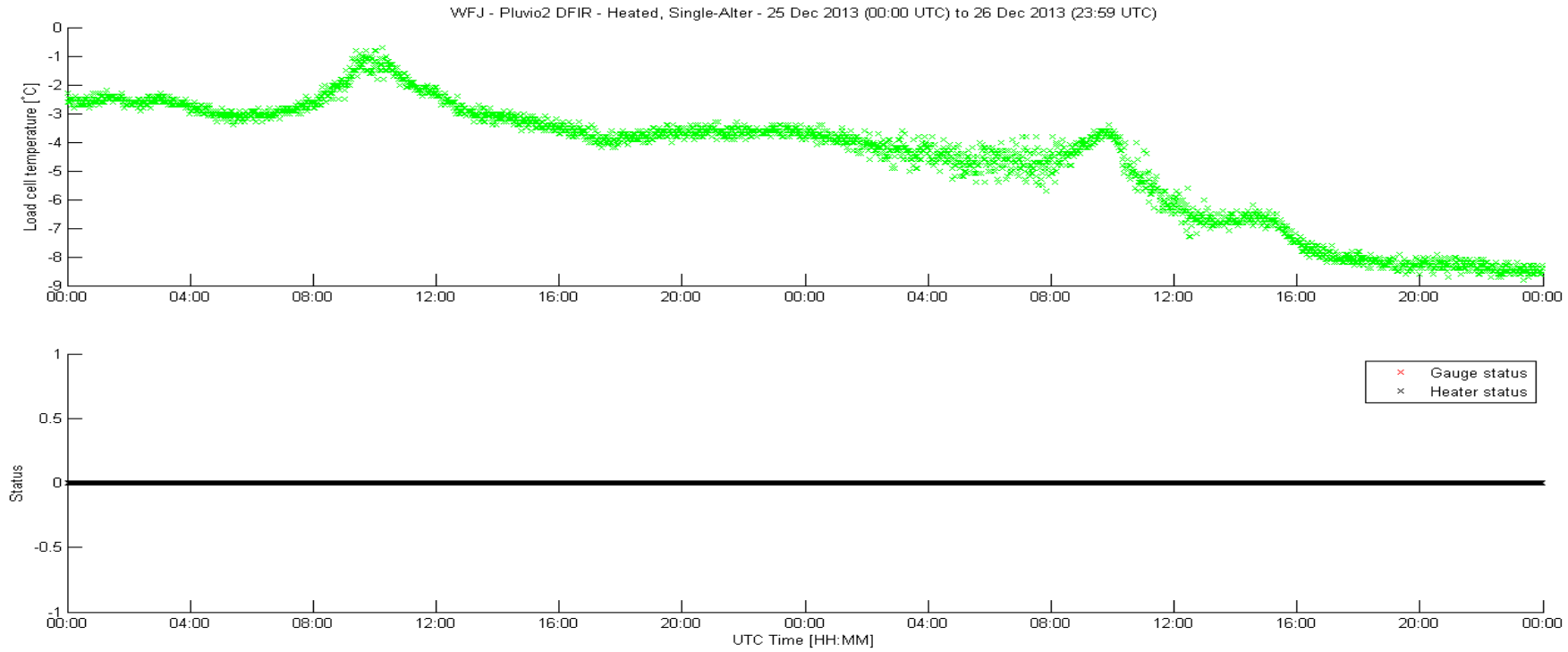
Table. Field Calibration of Reference Type R2 (Automatic) :

Standard calibration according to manufacturer's documentation with weights done on September 24, 2013. Filling of the gauge with a mix of propylene glycol (7.5L) and water (2.5L). Addition of a linseed oil layer (0.4L). Reset done after calibration on September 25, 2013.

Orientation of the gauge done on September 23, 2014, as well as standard calibration to get ready for next winter season. Filling of the gauge with a mix of propylene glycol (4.7L) and Methanol (7.1L). Addition of oil Isopar (800mL).

48h Plot. Field Reference Type R2 (Automatic)



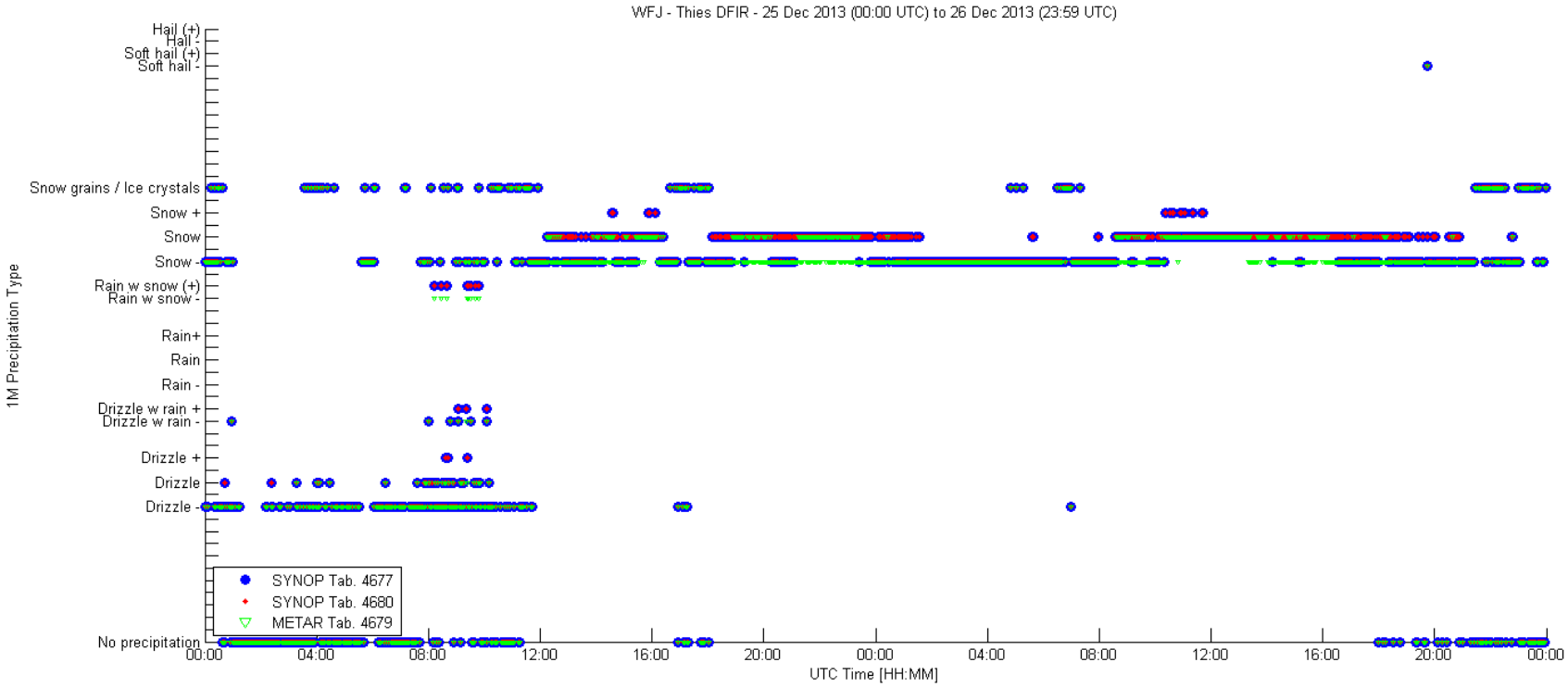

WFJ - Pluvio2 DFIR - Heated, Single-Alter - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Load cell temperature [°C]
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Status
1
0.5
0
-0.5
-1
Gauge status
Heater status
UTC Time [HH:MM]

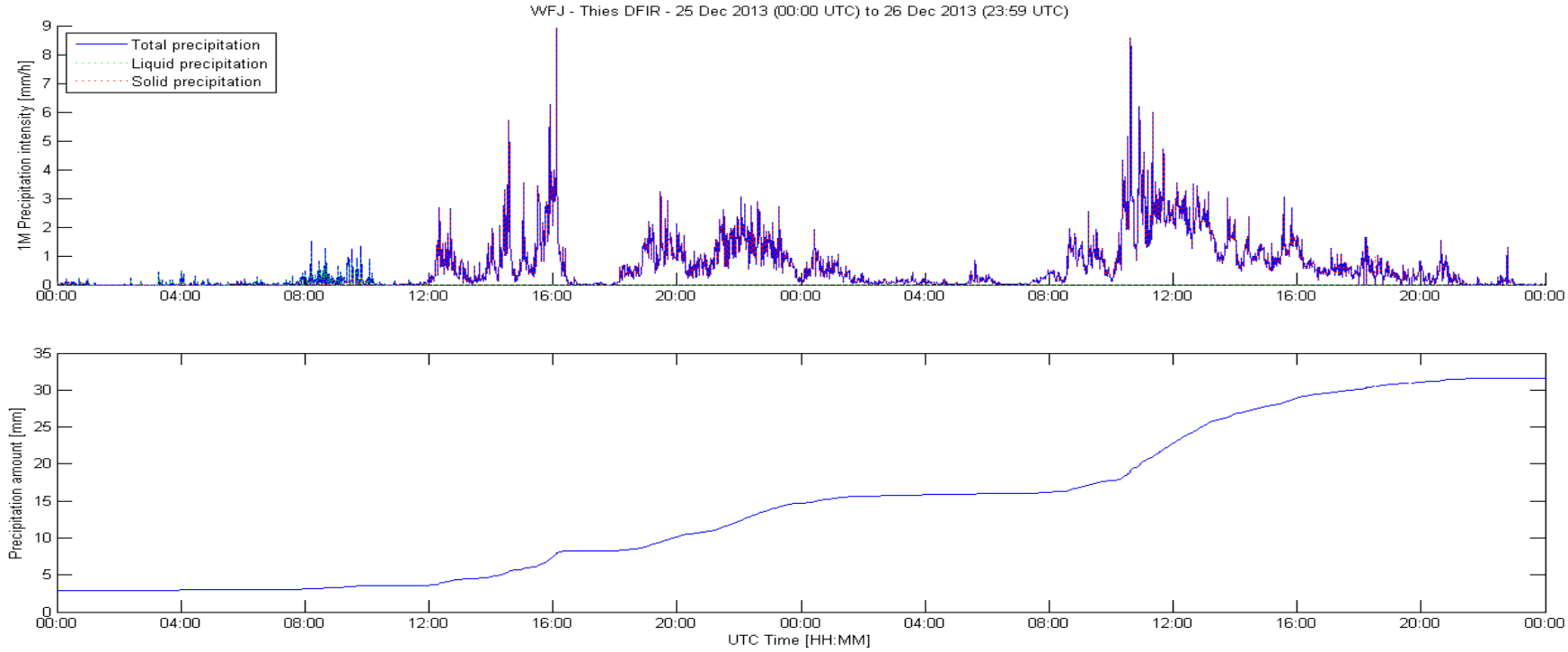
Picture of installation – Optical precipitation detector (Thies) (Position n°7)

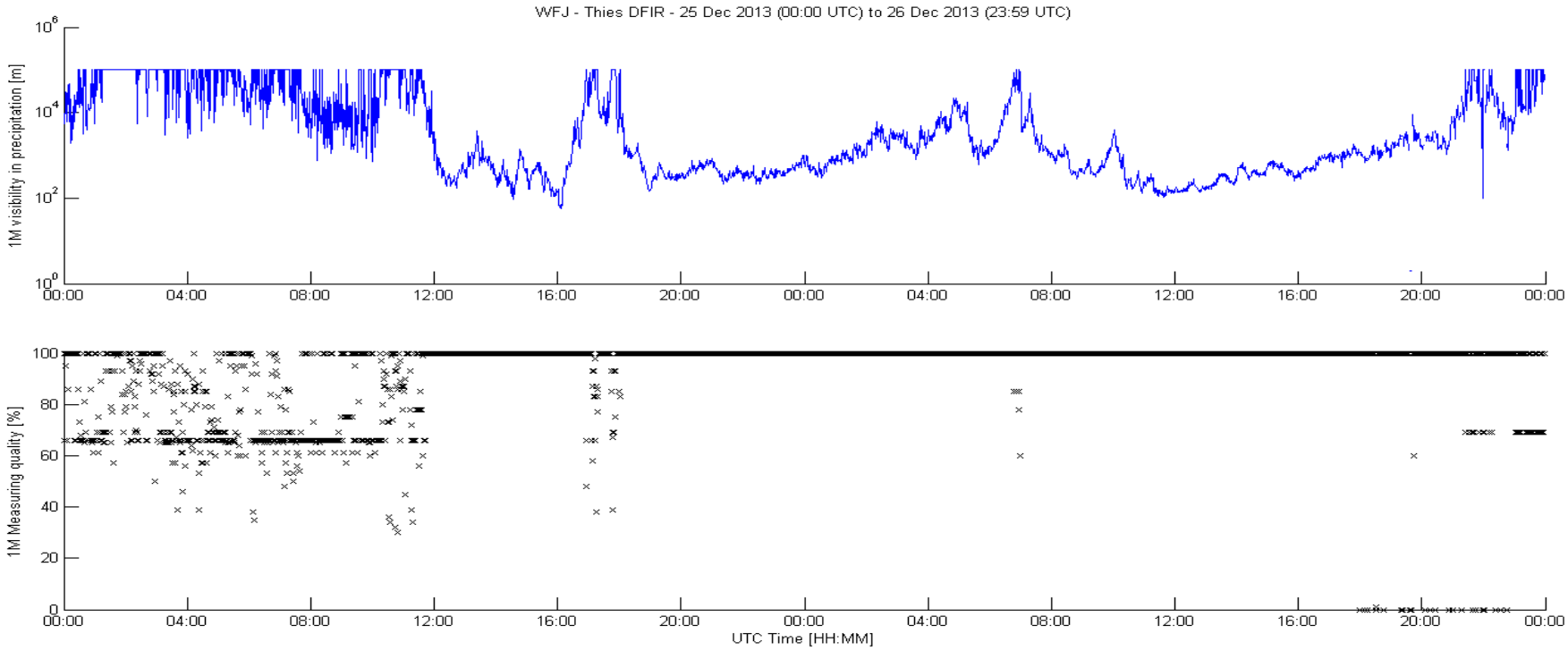
Picture taken from East

Field Calibration (Thies) : None.

48h Plot.


WFJ - Thies DFIR - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
1M Precipitation Type
Hail (+)
Hail -
Soft hail (+)
Soft hail -
Snow grains / Ice crystals
Snow +
Snow
Snow -
Rain w snow (+)
Rain w snow -
Rain+
Rain
Rain -
Drizzle w rain +
Drizzle w rain -
Drizzle +
Drizzle
Drizzle -
No precipitation
SYNOP Tab. 4677
SYNOP Tab. 4680
METAR Tab. 4679
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC Time [HH:MM]


WFJ - Thies DFIR - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Total precipitation
Liquid precipitation
Solid precipitation
1M Precipitation intensity [mm/h]
Precipitation amount [mm]
UTC Time [HH:MM]


WFJ - Thies DFIR - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
1M visibility in precipitation [m]
1M Measuring quality [%]
UTC Time [HH:MM]

Field Reference Type R3 (Automatic)

Presence of a WG with a single Alter shield?	☒ Yes ☐ No
Presence of a WG with no shield?	☒ Yes ☐ No
Description of surrounding obstacles (including distance/direction from, height, and type)	The surrounding obstacles in relation to Pluvio² gauge in **position n°2** (please refer to site layout) : Mast - Distance : 14 m - Azimut : 144° - Altitude : 36° Building - Distance : • 50.7 m for S-W corner • 31.8 m for N-W corner • 35.9 m for N-E corner - Azimut : 86° - 117.5° DFIR - Distance : 28.8 m - Azimuth : 37° - 56° The surrounding obstacles in relation to Pluvio² gauge in **position n°3** (please refer to site layout) : Mast - Distance : 16.6 m - Azimut : 123° - Altitude : 32° Building - Distance : • 42 m for N-E corner • 55 m for S-Wcorner - Azimut : 83° - 112.3° DFIR - Distance : 36 m - Azimuth : 42° - 58° Gauge in position n°4 - Distance : 4 m

Distance between WGs (as close as possible, but exceeding minimum distance between gauges for a Class 1 siting configuration (as per WMO guidelines): Generally a flat area within 10m of instrument. This area surrounded by generally open space with a slope of less than 1:3 (19°) that is considered to be representative of the large scale area.	**6.5 m**

Weighing gauge (1 of 2)

Location on site	Position n°2 (Please refer to site layout)
Make and model	OTT Pluvio², 200 cm2, 1500 mm
Serial number	250618
Firmware version (if applicable)	V1.30.0
Number of transducers (if applicable)	N/A
Height of installation (measured from the top of the gauge)	3.5 m
Heater configuration and algorithm	**Heater Location** Heating is applied to the rim. **Heating description** The orifice rim heating consists of a ring-shaped heating element integrated in the pipe housing with temperature sensor and an electronic rim heating module for controlling and monitoring the heating function. Only the orifice ring rim is heated so as to avoid unwanted losses from evaporation. The rim heating module measures the ambient temperature and the orifice ring rim temperature and calculates the impulse/pause relationship of the heating control from these values together with the target temperature (+8 °C). Depending on their level, the rim heating module supplies the heating element with electricity for 1 to 60 seconds. **Temperature Measurement** The temperature of the load cell and the rim temperature are measured using OTT's built-in temperature sensors.

	Heating Control The heating control has been designed such that it is active over an ambient temperature range of -40 … +8 °C. The orifice rim heating heats the orifice ring rim until the set target temperature of +8 °C is reached. **Heating Power** The nominal supply voltage for operating the orifice rim heating is 24 V DC, and the maximum heating capacity with very low ambient temperature is approximately 53 watts.
Output data message format	[Intensity RT] [Accumulated RT/NRT] [Accumulated NRT] [Accumulated total NRT] [Bucket RT] [Bucket NRT] [Temperature load cell] [Heating status] [Status] [Temperature electronics unit] [Supply voltage] [Temperature orifice ring rim]
Data sampling rate	Impulse output frequency of 5 Hz. Bucket content calculated every 6 sec.
Data acquisition interval	1 min

Weighing gauge (2 of 2)

This gauge was a unheated version since 17 June 2014 when it has been changed by a heated version.

Location on site	Position n°3 (Please refer to site layout)
Make and model	OTT Pluvio², 200 cm², 1500 mm
Serial number	250621, then 327532
Firmware version (if applicable)	V1.30.0
Number of transducers (if applicable)	N/A
Height of installation (measured from the top of the gauge)	3.5 m
Heater configuration and algorithm !! Heating gauge only after June 17, 2014 !! !! Before, no heating system !!	**Heater Location** Heating is applied to the rim. **Heating description** The orifice rim heating consists of a ring-shaped heating element integrated in the pipe housing with temperature sensor and an electronic rim heating module for controlling and monitoring the heating function. Only the orifice ring rim is heated so as to avoid unwanted losses from evaporation. The rim heating module measures the ambient

	temperature and the orifice ring rim temperature and calculates the impulse/pause relationship of the heating control from these values together with the target temperature (+8 °C). Depending on their level, the rim heating module supplies the heating element with electricity for 1 to 60 seconds. **Temperature Measurement** The temperature of the load cell and the rim temperature are measured using OTT's built-in temperature sensors. **Heating Control** The heating control has been designed such that it is active over an ambient temperature range of -40 … +8 °C. The orifice rim heating heats the orifice ring rim until the set target temperature of +8 °C is reached. **Heating Power** The nominal supply voltage for operating the orifice rim heating is 24 V DC, and the maximum heating capacity with very low ambient temperature is approximately 53 watts.
Output data message format	[Intensity RT] [Accumulated RT/NRT] [Accumulated NRT] [Accumulated total NRT] [Bucket RT] [Bucket NRT] [Temperature load cell] [Heating status] [Status] [Temperature electronics unit] [Supply voltage] [Temperature orifice ring rim]
Data sampling rate	Impulse output frequency of 5 Hz. Bucket content calculated every 6 sec.
Data acquisition interval	1 min

Single Alter shield

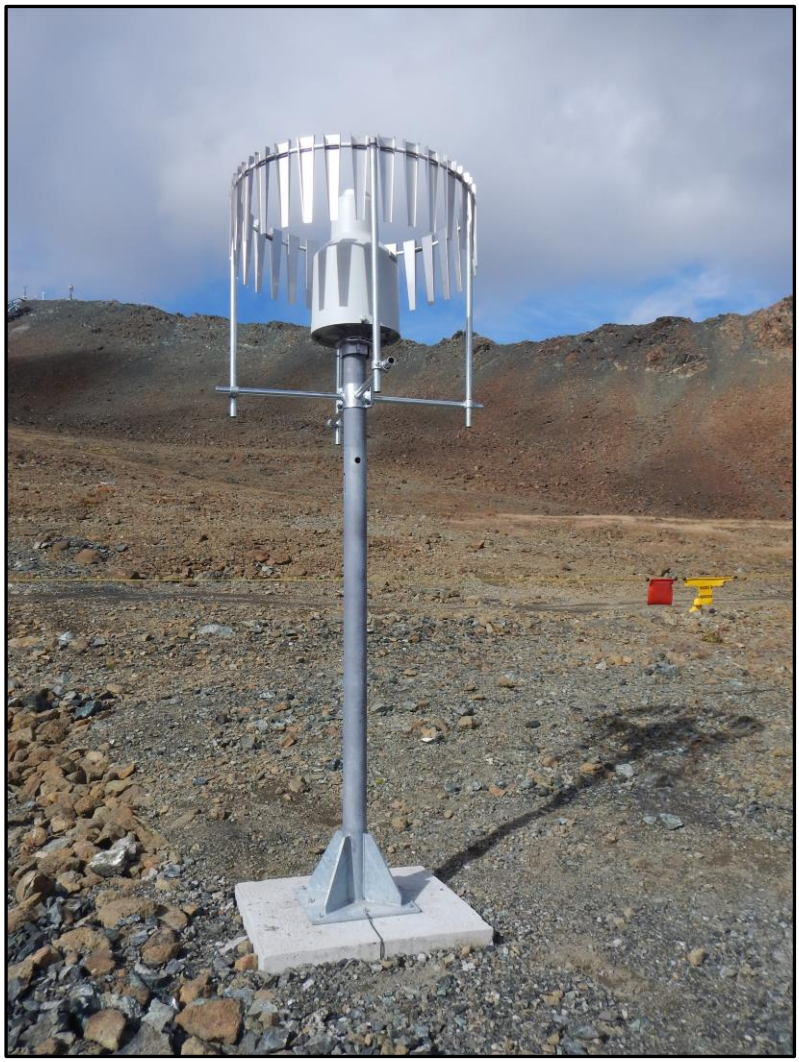
According to the SPICE instructions?	☒ Yes ☐ No
Attached to the post of the weighing gauge?	☒ Yes ☐ No
If different, provide details:	

Precipitation detector

Same as R2 reference precipitation detector, please refer to p.11

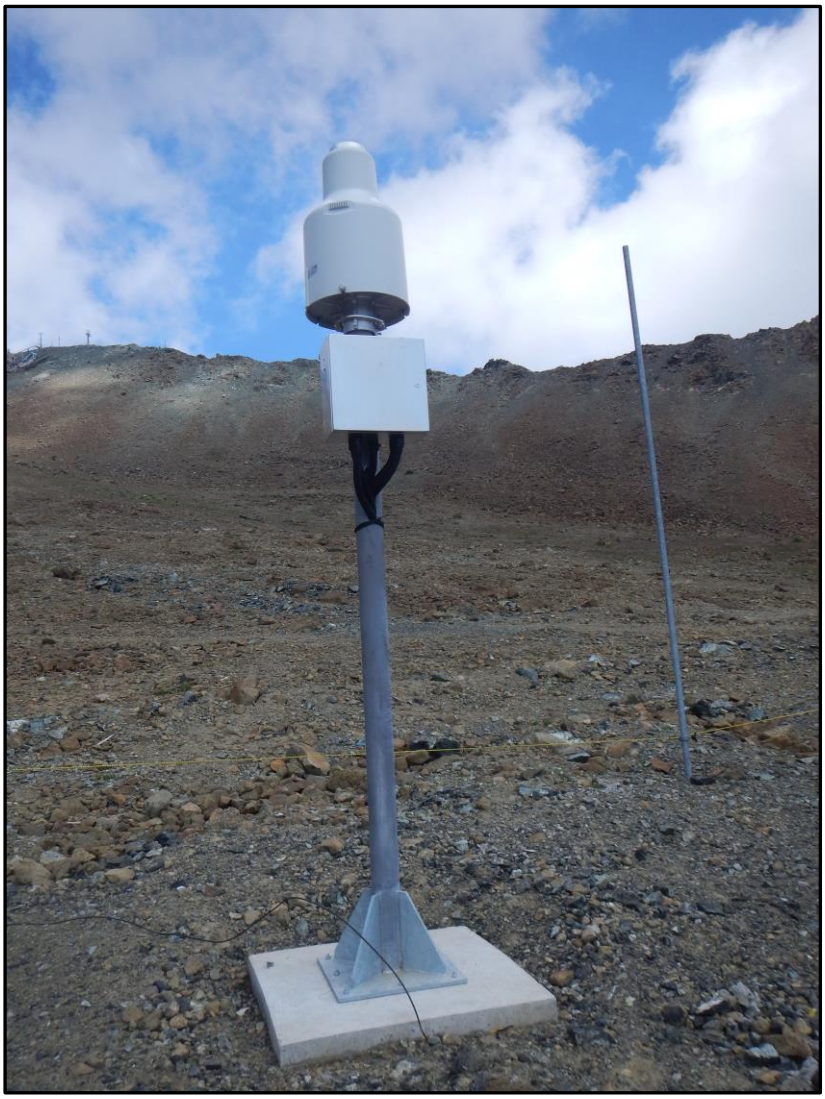
Pictures. Field Reference Type R3 (Automatic).

Picture of installation – Shielded Weighing Gauge Pluvio² (single alter) (Position n°2)



Picture taken from South

Picture of installation –Unshielded Weighing Gauge Pluvio² (Position n°3)



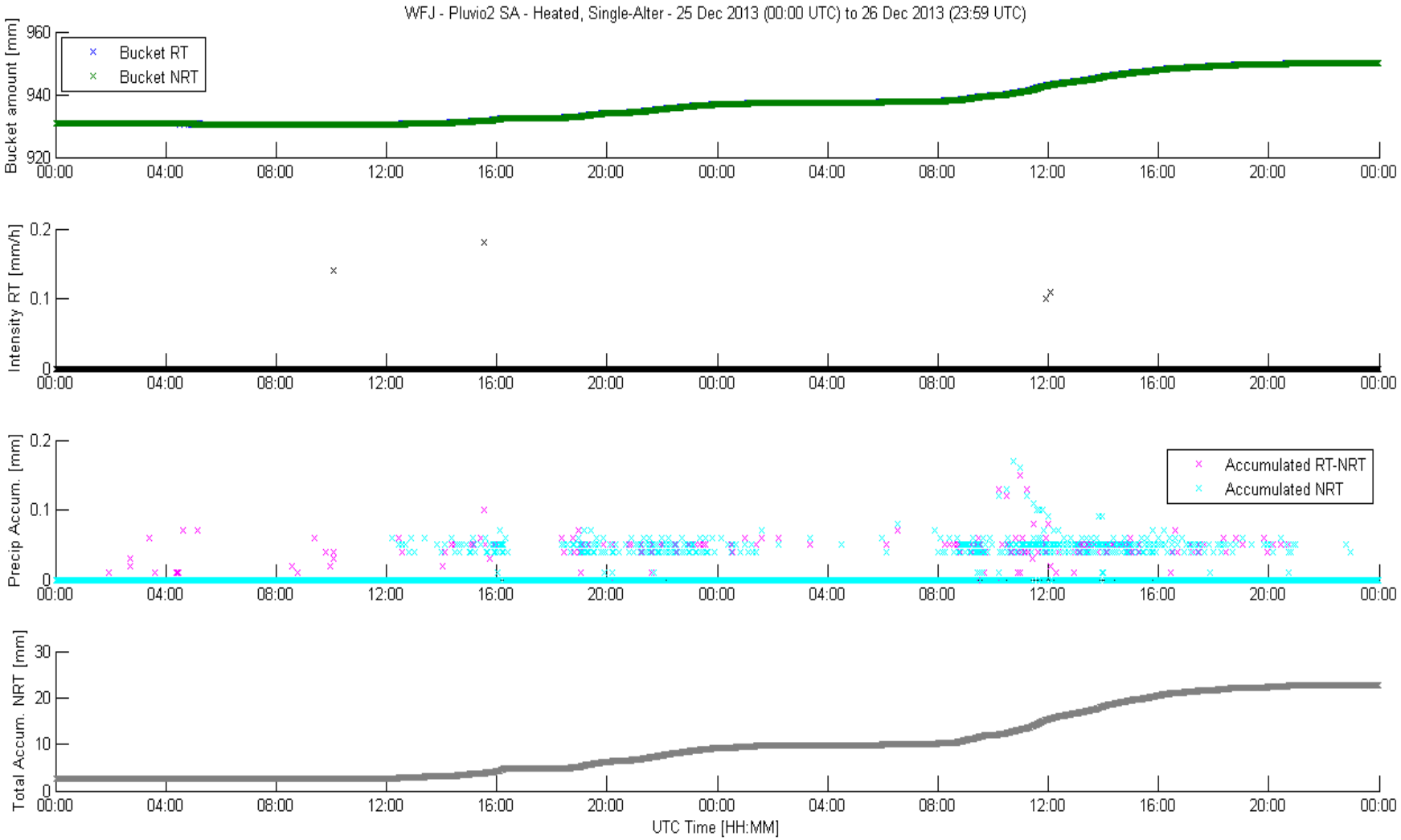
Picture taken from South

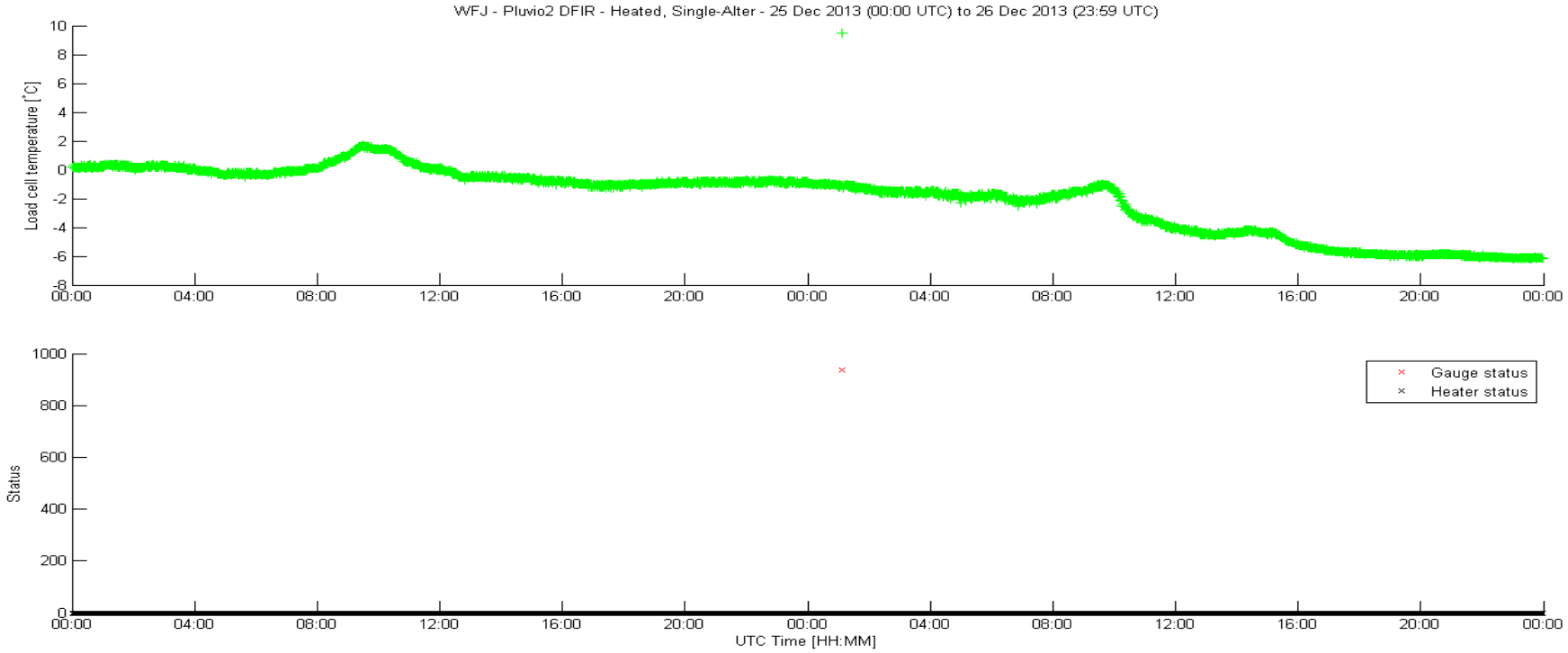
Table. Field Calibration of Reference Type R3 (Automatic) Weighing Gauges 1 and 2

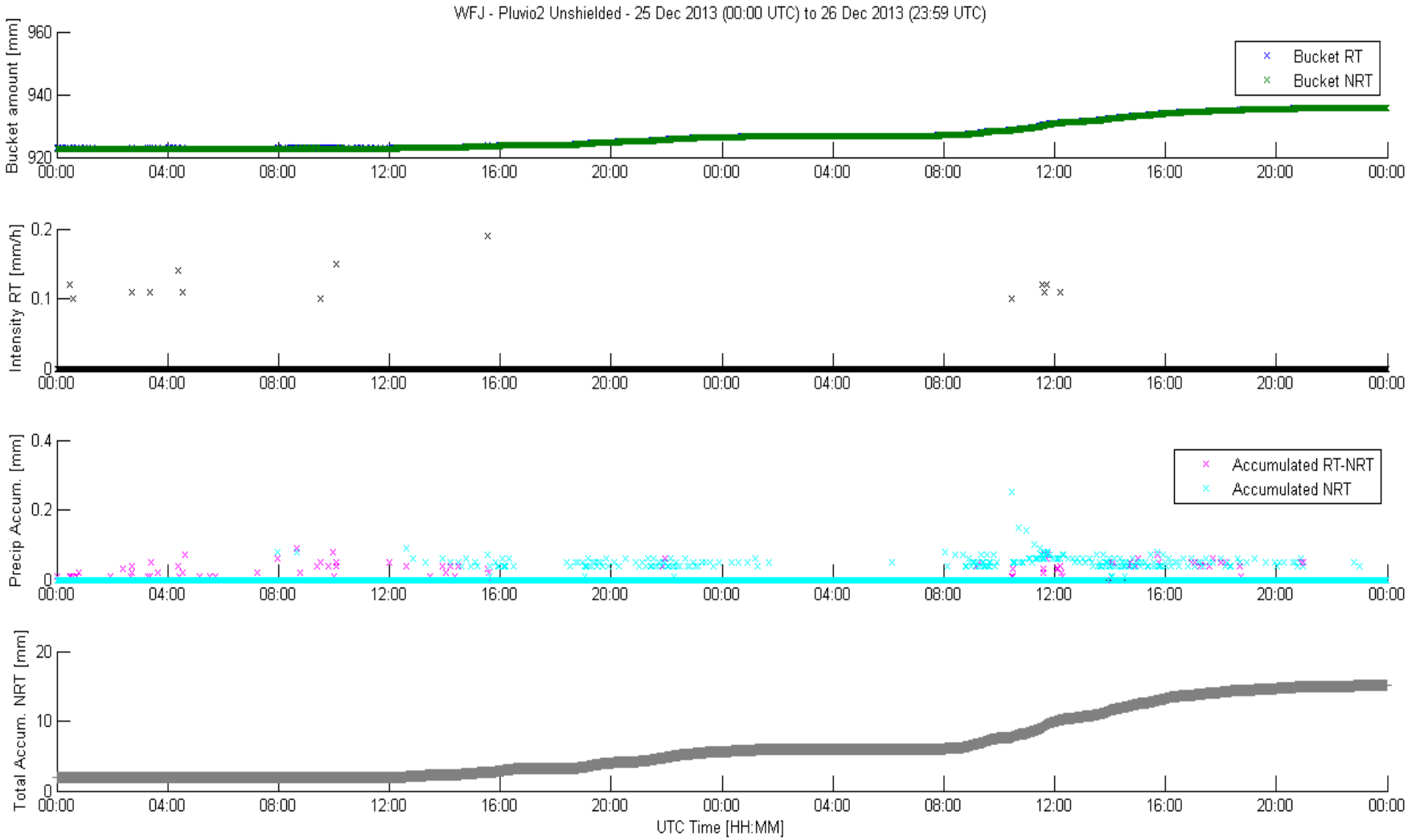
Standard calibration according to manufacturer's documentation with weights done on September 24, 2013. Filling of the gauge with a mix of propylene glycol (7.5L) and water (2.5L). Addition of a linseed oil layer (0.4L). Reset done after calibration on September 25, 2013.

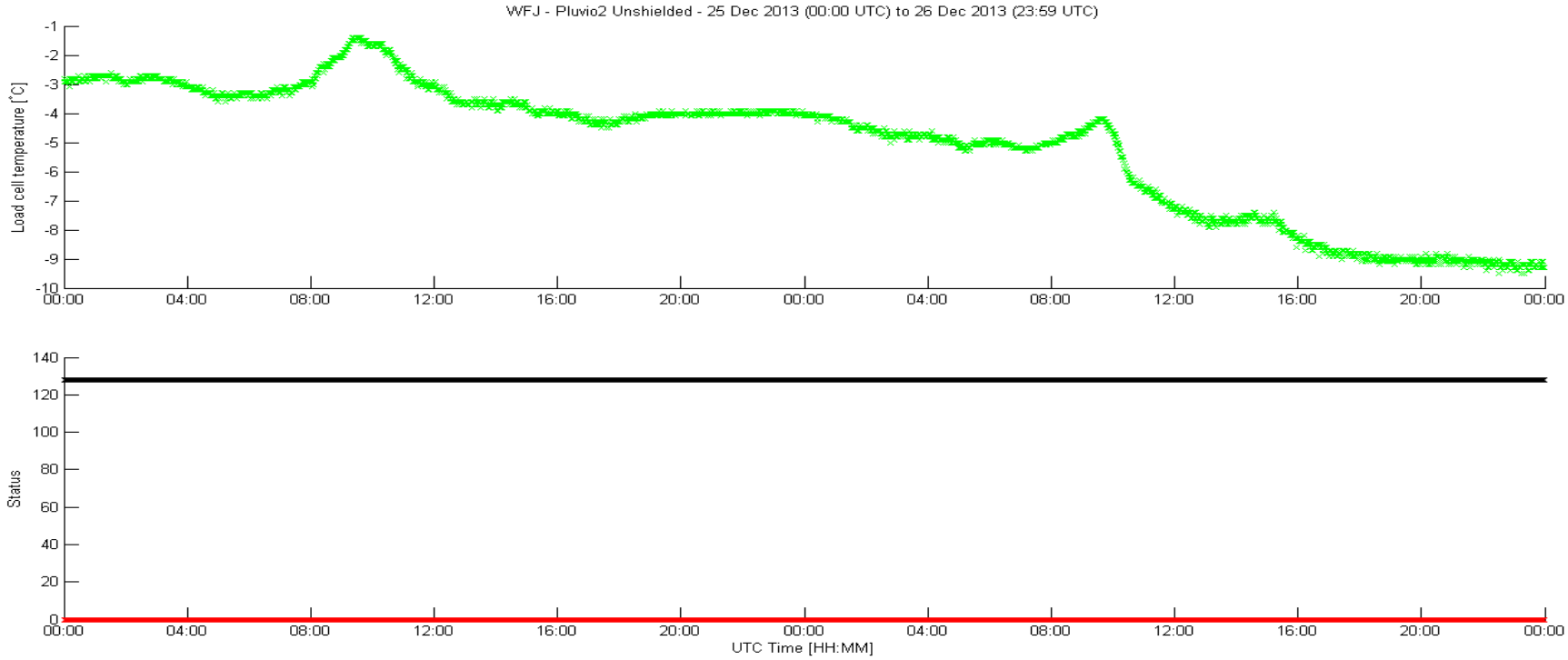
Orientation of the gauge done on September 23, 2014, as well as standard calibration to get ready for next winter season. Filling of the gauge with a mix of propylene glycol (4.7L) and Methanol (7.1L). Addition of oil Isopar (800mL).

48h Plots. Field Reference Type R3 (Automatic). Weighing Gauges 1 and 2




WFJ - Pluvio2 DFIR - Heated, Single-Alter - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Load cell temperature [°C]
10
8
6
4
2
0
-2
-4
-6
-8
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Status
1000
800
600
400
200
0
Gauge status
Heater status
UTC Time [HH:MM]


WFJ - Pluvio2 Unshielded - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Bucket amount [mm]
960
940
920
Bucket RT
Bucket NRT
Intensity RT [mm/h]
0.2
0.1
0
Precip Accum. [mm]
0.4
0.2
0
Accumulated RT-NRT
Accumulated NRT
Total Accum. NRT [mm]
20
10
0
00:00
04:00
08:00
12:00
16:00
20:00
UTC Time [HH:MM]


WFJ - Pluvio2 Unshielded - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Load cell temperature [°C]
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Status
140
120
100
80
60
40
20
0
UTC Time [HH:MM]

SECTION A3: INSTRUMENT METADATA REPORT

Instrument Metadata Report

Instrument Name: **Geonor T-200B3MD**
Instrument Status : Under test
Type of measurement : Automatic
Parameter measured : Precipitation rate, Accumulation
Instrument number 1 of 24

Manufacturer	Geonor
Model	T-200B3MD, 1500 mm
Serial number	Sensor 1 : 33912 Sensor 2 : 34112 → 96713 Sensor 3 : 34012
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°4 (Please refer to site layout)
Description of surrounding obstacles (including distance/direction from, height, and type)	The surrounding obstacles in relation to Pluvio² gauge in **position n°4** (please refer to site layout) : Mast - Distance : 19 m - Altitude : 30° - Azimut : 113.2° Building - Distance : • 57 m for S-W corner • 46 m for N-E corner - Azimut : 84.7° - 111.6° DFIR - Distance : 39 m - Azimut : 46.8° - 60.7° Gauges - Distance to Gauge in position n°3 : 4 m - Distance to Gauge in position n°5 : 6.5 m
Orientation	N/A
Height (measured at top)	3.5 m

Shield (if applicable)	Single-Alter provided by manufacturer
Heating (if applicable)	**Heater Location** A heater is fixed to the Geonor's orifice. It is located outside the orifice cylinder at the top. **Heating Control** A time switch enable the heating and turns it on during 10 minutes every hour.

Data output

Data communication protocol	Analog Output
Output data message format (include description of fields)	[Input Frequency sensor 1] [Input Frequency sensor 2] [Input Frequency sensor 3] [Instantaneous amount precipitation sensor 01] [Instantaneous amount precipitation sensor 02] [Instantaneous amount precipitation sensor 03] [Instantaneous amount precipitation sensor 1-3]
Data sampling rate	1 sec
Data acquisition interval	1 min

Field calibration : Control (of factory calibration) done in September 24, 2013 according to manufacturer's documentation. Filling of the gauge with a mix of propylene glycol (7.5L) and water (2.5L) with addition of a linseed oil layer (0.4L).

Sensors calibration factors :

Sensor 1 : A = 2.86645E-2
B = 1.60904E-5
f0 = 1098.0

Sensor 2 : A = 2.88693E-2
B = 1.63385E-5
f0 = 1085.0

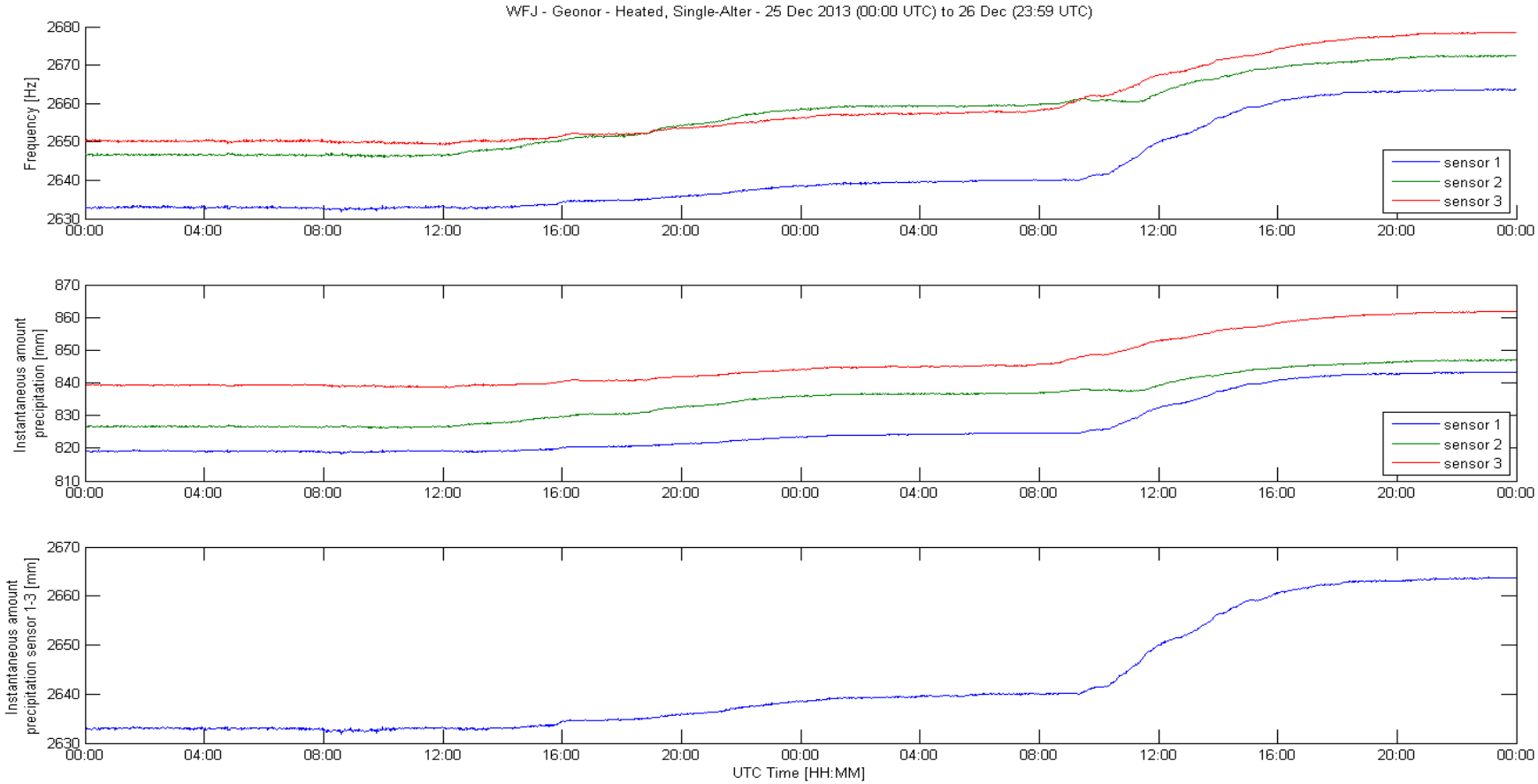
Sensor 3 : A = 2.94625E-2
B = 1.60335E-5
f0 = 1103.5

Formula : $P = A (f - f0) + B (f - f0)^2$

P = precipitation (in cm)
f = frequency reading (Hz)
A = Calibration constant
B = Calibration constant
f0 = frequency with empty bucket at calibration (Hz)

Control done on September 23, 2014, to get ready for next winter season. Filling of the gauge with a mix of propylene glycol (4.7L) and Methanol (7.1L). Addition of oil Isopar (500mL).

48h Plot.


WFJ - Geonor - Heated, Single-Alter - 25 Dec 2013 (00:00 UTC) to 26 Dec (23:59 UTC)
Frequency [Hz]
2680
2670
2660
2650
2640
2630
sensor 1
sensor 2
sensor 3
Instantaneous amount precipitation [mm]
870
860
850
840
830
820
810
Instantaneous amount precipitation sensor 1-3 [mm]
00:00
04:00
08:00
12:00
16:00
20:00
UTC Time [HH:MM]

Pictures of installation – Shielded Weighing Gauge Geonor (Position n°4)

Pictures taken from South

Instrument Metadata Report

Instrument Name: **Belfort AEPG 600**
Instrument Status : Under test
Type of measurement : Automatic
Parameter measured : Precipitation rate, Accumulation
Instrument number 2 of 24

Manufacturer	Belfort
Model	AEPG 600 Pluvio, 200cm², 600mm
Serial number	Unit serial number : 104 Sensor 1 : 0488 Sensor 2 : 0489 Sensor 3 : 0495
Firmware version (if applicable)	Mega-VWRG 4.4U (10/24/12) Sensor 1 : firmware version 4.01 Sensor 2 : firmware version 4.01 Sensor 3 : firmware version 4.01

Field configuration

Location on site	Position n°5 (Please refer to site layout)
Description of surrounding obstacles (including distance/direction from, height, and type)	The surrounding obstacles in relation to gauge in **position n° 5** (please refer to site layout) : Mast - Distance : 24 m - Altitude : 24° - Azimut : 111.3 Building - Distance : • 62 m for S-W corner • 52 m for N-E corner - Azimut : 81° - 105° DFIR - Distance : 45 m - Azimut : 46° - 59° Gauges - Distance to Gauge in position n°4 : 6.5 m - Distance to Gauge in position n°6: 8.5 m
Orientation	N/A

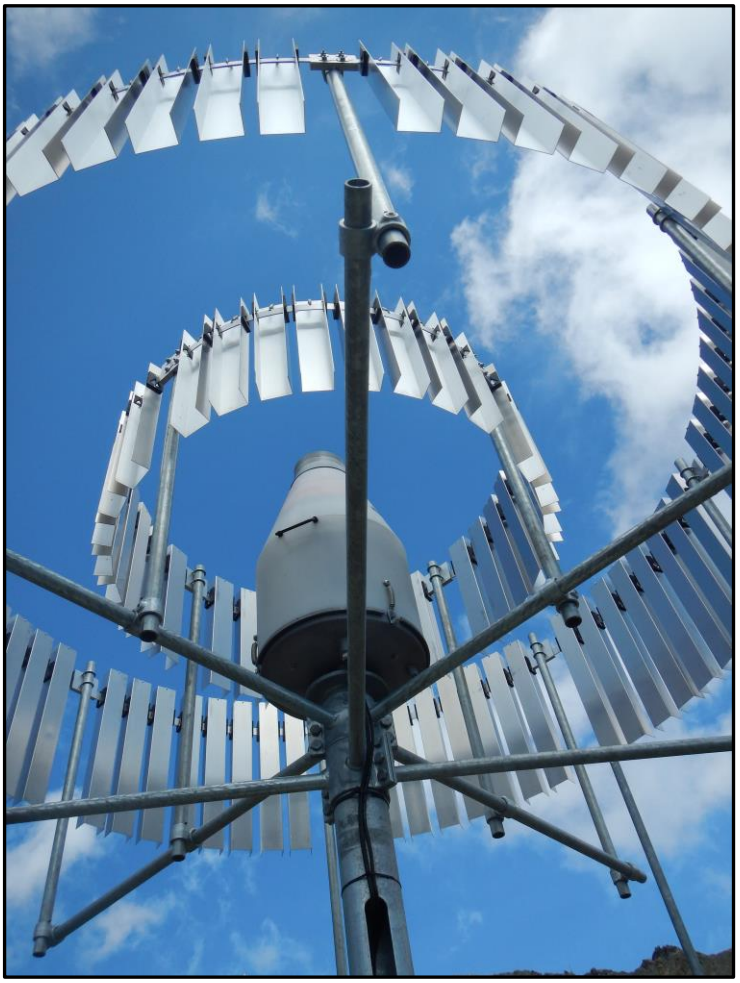
Height (measured at top)	3.5 m
Shield (if applicable)	Belfort double-Alter
Heating (if applicable)	**Heater Location** The heaters are located on the orifice tube located in the top of the exterior housing. **Heating Control** The orifice heaters are controlled by the orifice temperature sensor only and will be on or off based on the following temperatures : the heaters will be on whenever the Heater Relay Ambient Temperature is between -6.7°C and 3.3°C. If the ambient temperature is above or below the limits, the heaters will never come on. If the heaters are on, the orifice temperature is maintained between 1.7°C and 3.3°C. **Heating Power** Input Voltage Electronics: 8-15 Volts DC Input Voltage Heaters: 12VDC powered Nominal capacity from 25 to 75 watts (75 watt standard)

Data output

Data communication protocol	Digital Output
Output data message format (include description of fields)	[Ambient temperature] [Orifice temperature] [Sensor 1 temperature] [Sensor 2 temperature] [Sensor 3 temperature] [Sensor 1 frequency] [Sensor 2 frequency] [Sensor 3 frequency] [Sensor 1 weight] [Sensor 2 weight] [Sensor 3 weight] [Total weight] [Rain amount] [Heater status] [Transducer 1, 2, 3 Status]
Data sampling rate	???
Data acquisition interval	1 min

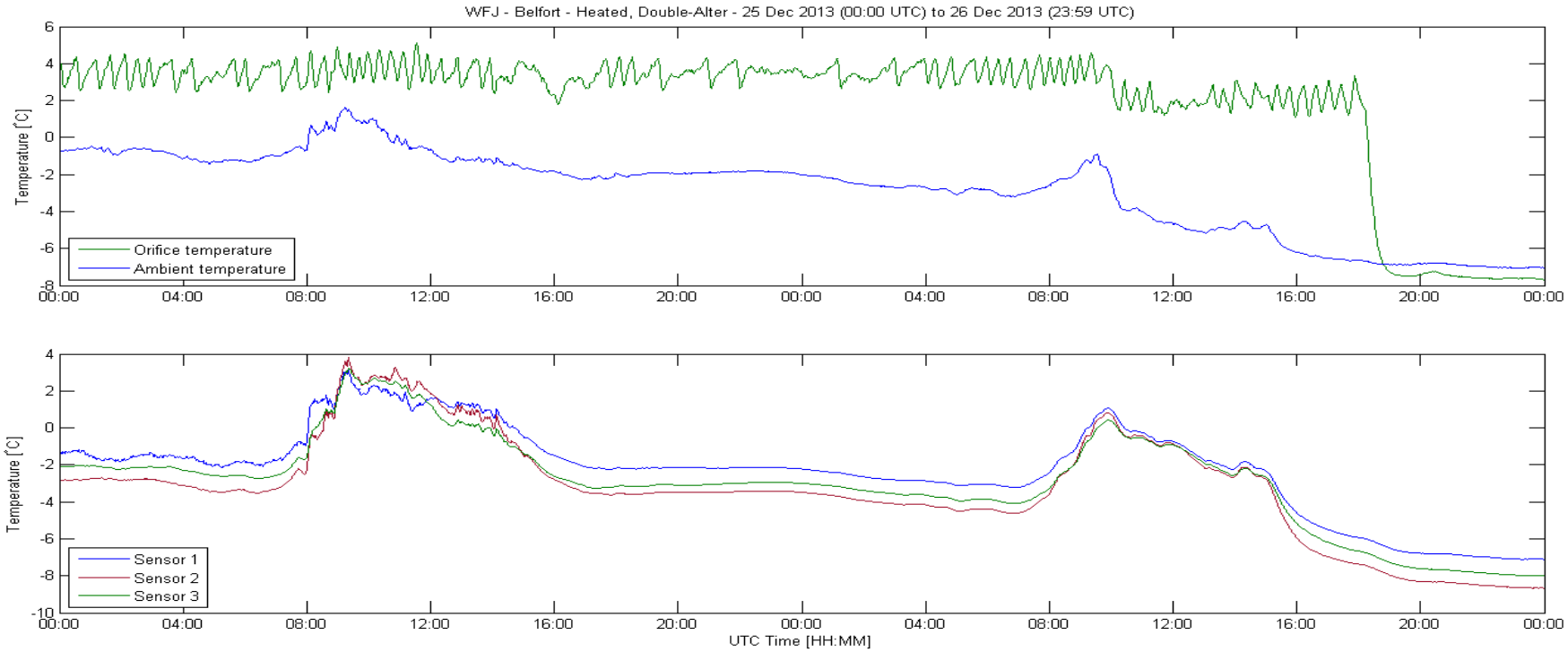
Field calibration : Calibration according to the manufacturer's documentation, done in September 24, 2013. Calibration factors are :
Calibration weight at empty (kgs) : 8.338405
Calibration weight at span (kgs) : 8.729795
Calibration weight at zero (kgs) : 15.875106
Reset done after calibration. Filling of the gauge with a mix of propylene glycol (7.5L) and water (2.5L) and a layer of linseed oil (0.4L).
Control done on September 23, 2014, to get ready for next winter season. Filling of the gauge with a mix of Propylene Glycol (3.12L) and Methanol (4.56L). Addition of oil Isopar (960mL).

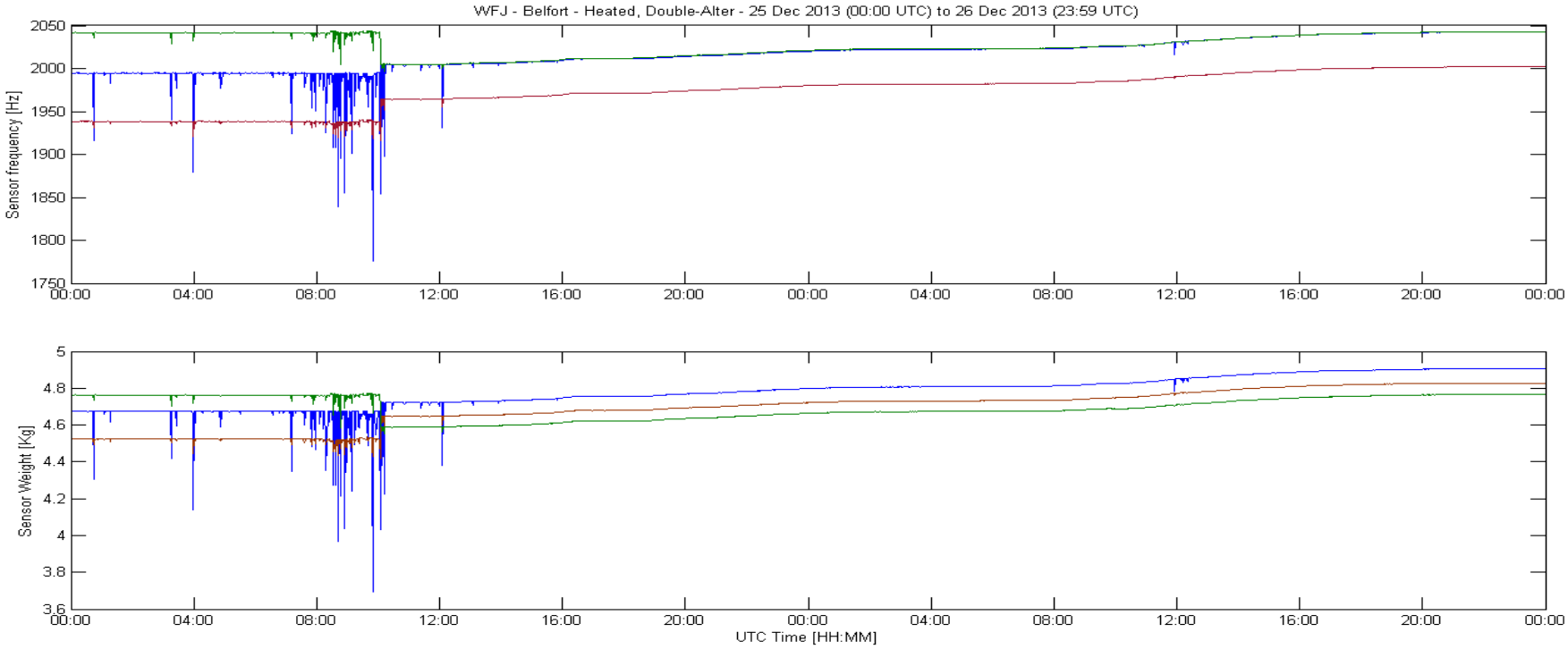
Pictures of installation – Shielded Weighing Gauge Belfort (Position n°5)

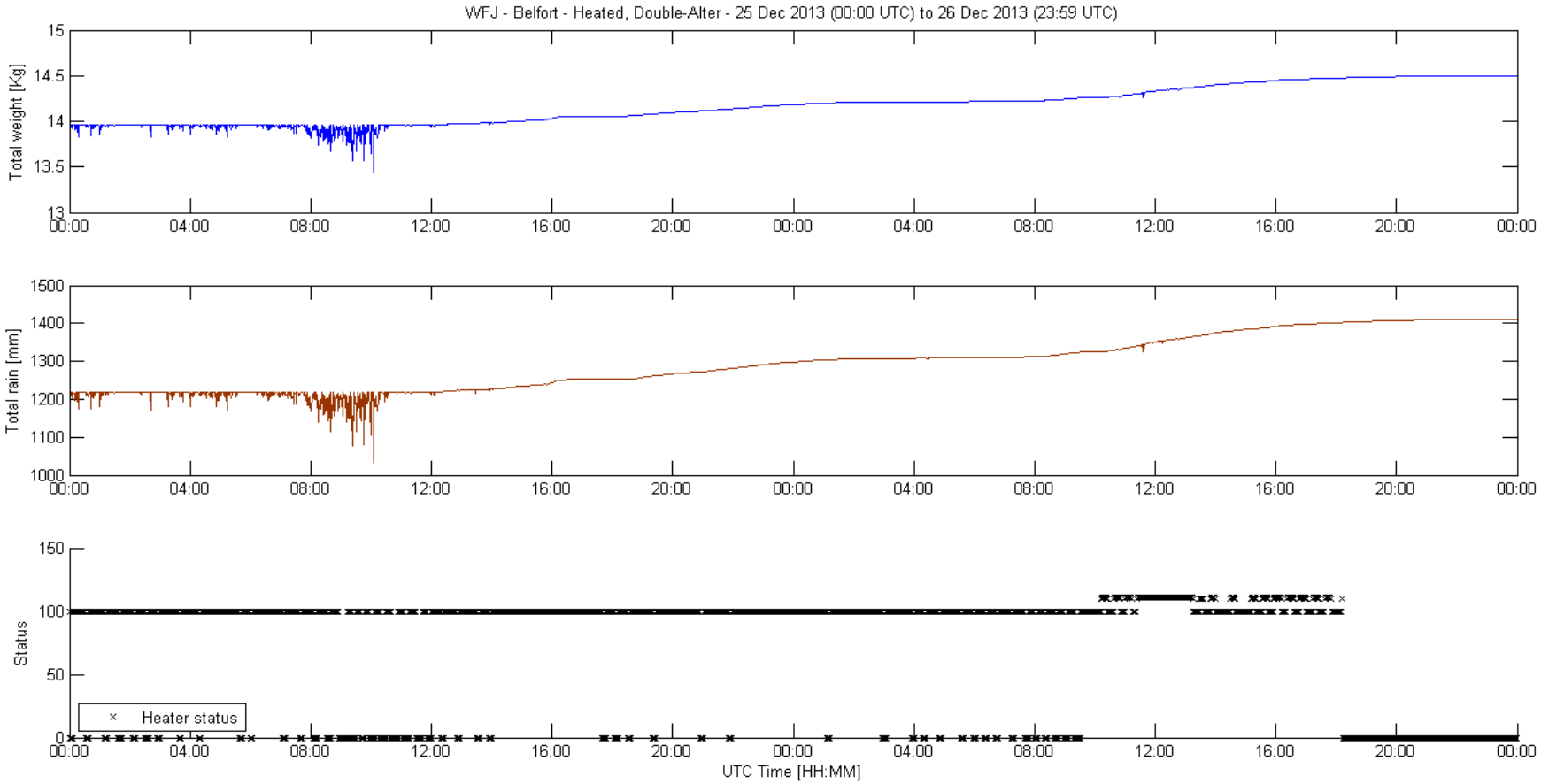


Pictures taken from South

48h Plot.


WFJ - Belfort - Heated, Double-Alter - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Temperature [°C]
Orifice temperature
Ambient temperature
Sensor 1
Sensor 2
Sensor 3
UTC Time [HH:MM]


WFJ - Belfort - Heated, Double-Alter - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Sensor frequency [Hz]
2050
2000
1950
1900
1850
1800
1750
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Sensor Weight [Kg]
5
4.8
4.6
4.4
4.2
4
3.8
3.6
UTC Time [HH:MM]


WFJ - Belfort - Heated, Double-Alter - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Total weight [Kg]
15
14.5
14
13.5
13
Total rain [mm]
1500
1400
1300
1200
1100
1000
Status
150
100
50
0
Heater status
00:00
04:00
08:00
12:00
16:00
20:00
UTC Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Meteoservis MR3H-FC (ZAMG version)**
Instrument Status : Under test
Type of measurement : Automatic
Parameter measured : Precipitation rate, Accumulation
Instrument number 3 of 24

Manufacturer	Meteoservis
Model	MR3H-FC
Serial number	762
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°6 (Please refer to site layout)
Description of surrounding obstacles (including distance/direction from, height, and type)	The surrounding obstacles in relation to gauge in **position n° 6** (please refer to site layout) : Mast - Distance : 32.4 m - Altitude : 17.6° - Azimut : 97.9° Building - Distance : • 70 m for S-W corner • 60.9 m for N-E corner - Azimut : 86° - 105.4° DFIR - Distance : 54 m - Azimut : 49.5° - 61° Gauges - Distance to Gauge in position n°5 : 8.5 m
Orientation	N/A
Height (measured at top)	3.5 m
Shield (if applicable)	None
Heating (if applicable)	**Heater Location** The heating system consist of three independent sections : - **Section A** – the upper part of the funnel and the area of the collar - **Section B** – middle and lower part of the funnel

- **Section C** – the space of the tipping bucket and the outlet holes.

In addition, there is an heating of outflows, AH-01 Additional Heating Unit (serial number 007), performed by a heating wire isolated in silicone. This autonomous working part is placed below rain gauge base.

Heating description

Heating of all the sections is controlled by a microprocessor.

Heating of the funnel (heating section A and B) is performed by a heating wire isolated in silicone as the additional outflows heating AH-01. Heating the space of the tipping bucket (heating section C) is performed by the heating resistors placed in the space of the tipping bucket on the rain gauge base. At the same time the outlet holes of the rain gauge are heated by heating resistors. Section C is heated first for 15 minutes and then heating in the other two sections of the funnel is also turned on. This means that the measuring part (the tipping bucket) is "put in operation" first and then snow starts melting in the funnel and water starts flowing to the tipping bucket.

Temperature Measurement

Measuring the temperature for heating regulation is performed independently for each section as follows :

- In section A the temperature is measured by three sensors placed on the periphery in the upper part of the funnel
- In section B it is the same as in section A, but measuring of the temperature is in the middle part of the funnel
- In section C the temperature is measured by one sensor at the level of the tipping bucket
- For the AH-01 Additional Heating Unit, the temperature sensor is placed under heating wire winding on one of the outflow tube

The outside temperature in the surroundings of the rain gauge is measured by one sensor. This sensor is placed on the inner side of the cylindrical shell of the rain gauge

	at a sufficient distance from its upper collar and is thermally insulated from the heated funnel and space of the tipping bucket. **Heating Control** The microprocessor turns the heating of the particular sections on and off according to the measured temperature in the given section. Heating turn on temperature are: - Section A : 10°C - Section B : 9°C - Section C : 6°C AND: if temperature in section C is above 6°C, heating in ALL sections is blocked. When heating is on, the temperature is maintained to 4°C. **Heating Power** Sections A and B are heated alternately with a switching interval of 2s so that the maximum current from the power supply is limited. In each measured period of 2s, the microprocessor measures the value of voltage for heating and corrects the heating output of all sections in dependence on this value of the voltage for heating so that the heating output was constant in the whole recommended range of the voltage for heating, i.e. from 36 V AC to 46 V AC. Almost the entire period of 2s is used for the lowest recommended voltage supply of 36 V AC for heating. When the voltage is higher, the heating output is kept constant by the microprocessor by shortening the switched on interval of the heat during the given period of 2s. When the voltage is lower than 36 V AC the system heats for the whole period of 2s and the heating output is lower according to the used voltage

Data output

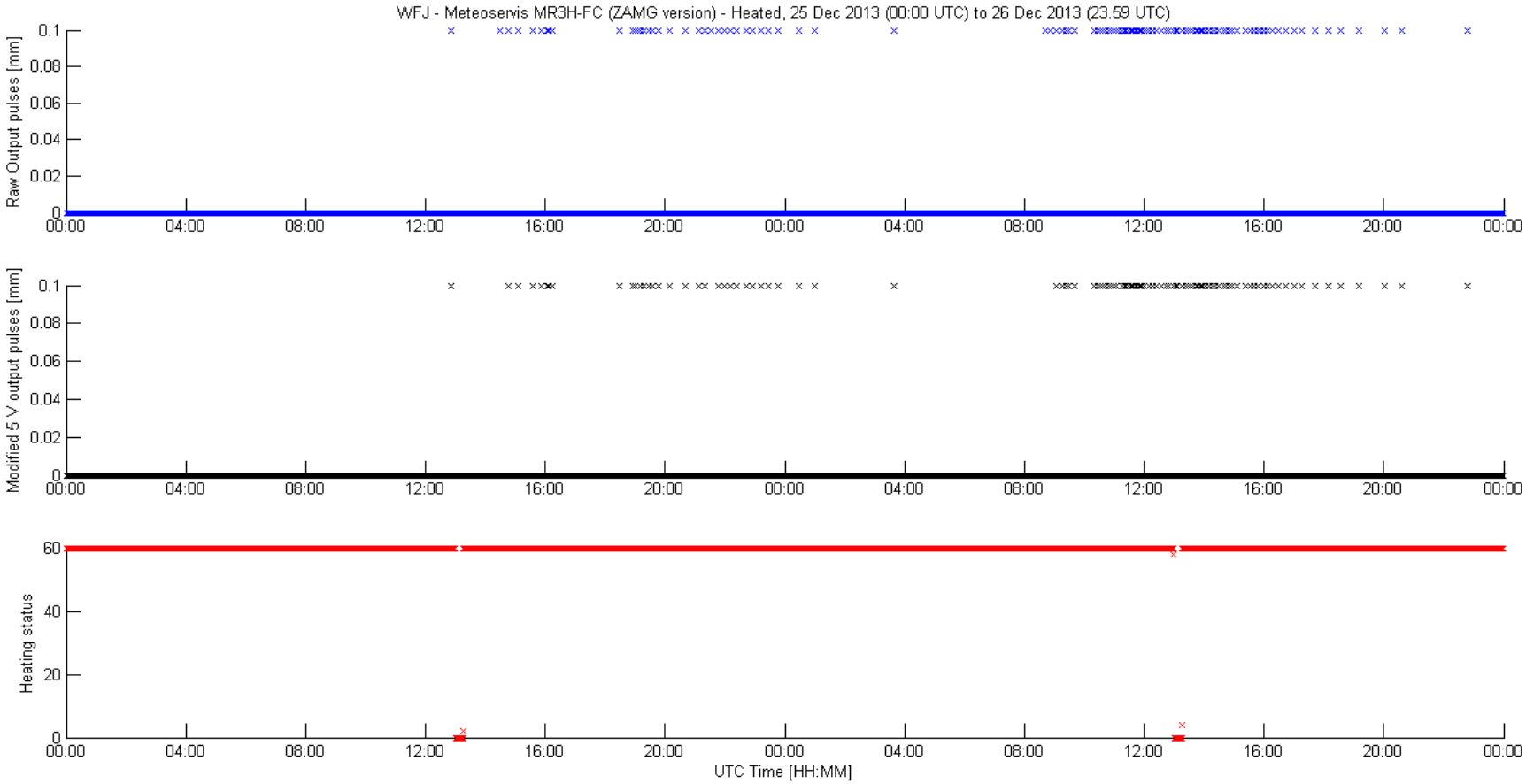
Data communication protocol	Analog Output
Output data message format (include description of fields)	1. "raw" output pulses from the reed contact 2. modified 5 V output pulses with a constant length of 100 ms and with dynamic correction according to rainfall intensity 3. Heating status
Data sampling rate	N/A
Data acquisition interval	1 min

Pictures of installation – Meteoservis Gauge MR3H-FC (Position n°6)

Pictures taken from East

Field calibration (if any): None.

48h Plot.


WFJ - Meteoservis MR3H-FC (ZAMG version) - Heated, 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23.59 UTC)
Raw Output pulses [mm]
Modified 5 V output pulses [mm]
Heating status
0
20
40
60
0.1
0.08
0.06
0.04
0.02
00:00
04:00
08:00
12:00
16:00
20:00
UTC Time [HH:MM]

Instrument Metadata Report

Instrument Name: **FROS-D GPS**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Automatic
Parameter measured : Snow depth
Instrument number 4 of 24

Manufacturer	Colorado University
Model	FROS-D GPS
Serial number	P01
Firmware version (if applicable)	V2013.9

Field configuration

Location on site	Position n°8 (Please refer to site layout)
Orientation	Antenna pointing South West
Height (measured at top)	4m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

Data communication protocol	Digital output (daily email)
Output data message format (include description of fields)	[measured snow depth]
Data sampling rate	Around 50 measurements per day
Data acquisition interval	One (averaged) measurement per day. Daily output files (can be increased)

Field calibration (if any) : Calibration done directly by the provider as he controls his instrument from Colorado.
48h Plot : No data available for 2013-2014 season.

Pictures of installation – FROS-D GPS sensor (Position n°8)

Picture taken from South

Picture taken from South-West

Instrument Metadata Report

Instrument Name: **Young Wind Monitor (1 of 3)**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Wind speed and direction
Instrument number 5 of 24

Manufacturer	R. M. Young
Model	05103
Serial number	112076
Firmware version (if applicable)	None

Field configuration

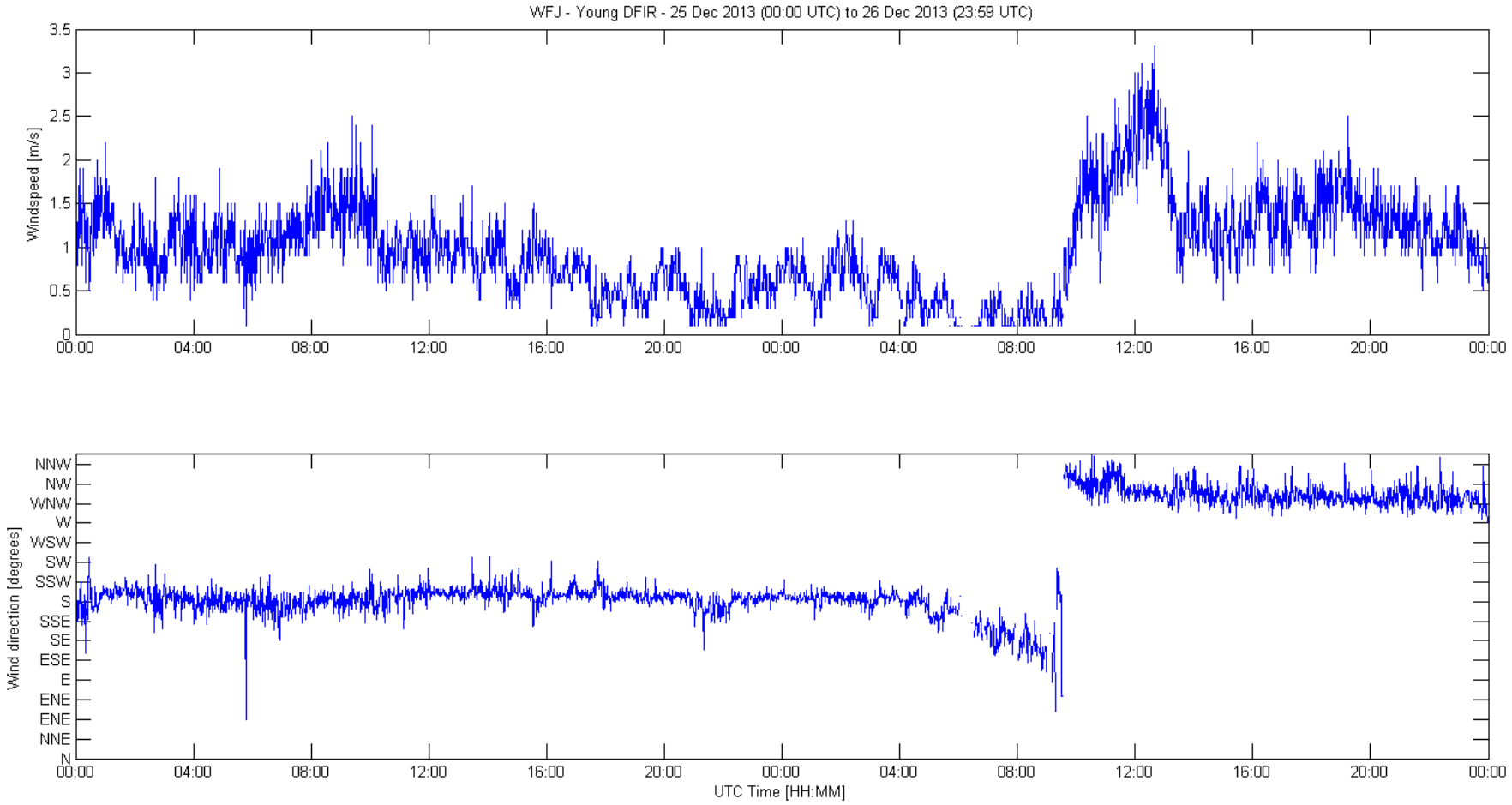
Location on site	Position n°9 (Please refer to site layout)
Orientation	Junction Box facing South
Height (measured at top)	4 m
Shield (if applicable)	N/A
Heating (if applicable)	None

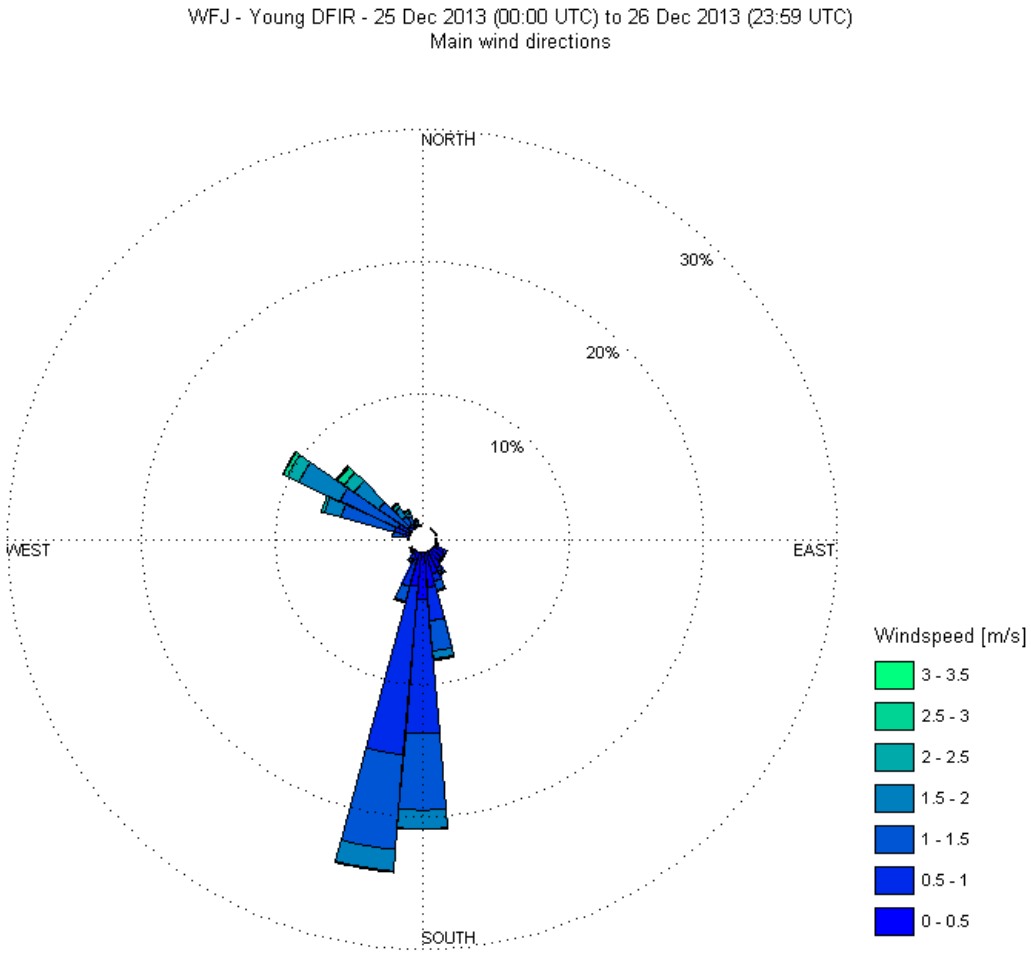
Data output

Data communication protocol	Analog Output
Output data message format (include description of fields)	[Wind speed] [Wind direction]
Data sampling rate	1 sec
Data acquisition interval	1 min

Field calibration (if any) : None.

48h Plot.


WFJ - Young DFIR - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Windspeed [m/s]
3.5
3
2.5
2
1.5
1
0.5
0
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Wind direction [degrees]
NNW
NW
WNW
W
WSW
SW
SSW
S
SSE
SE
ESE
E
ENE
ENE
NNE
N
UTC Time [HH:MM]


WFJ - Young DFIR - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Main wind directions
NORTH
30%
20%
10%
WEST
EAST
SOUTH
Windspeed [m/s]
3 - 3.5
2.5 - 3
2 - 2.5
1.5 - 2
1 - 1.5
0.5 - 1
0 - 0.5

Picture of installation – Young Wind Monitor (1 of 3) (Position n°9)

Picture taken from South

Instrument Metadata Report

Instrument Name: **WS600 – UMB weather station**
Instrument Status : Under test (MeteoSwiss objective)
Type of measurement : Automatic
Parameter measured : Air Temperature, Relative humidity, Precipitation intensity, Type of precipitation, Quantity of precipitation, Pressure, Direction and Speed of wind
Instrument number 6 of 24

Manufacturer	Lufft
Model	WS600-UMB
Serial number	127
Firmware version (if applicable)	044

Field configuration

Location on site	Position n°10 (Please refer to site layout)
Orientation	
Height (measured at top)	
Shield (if applicable)	None
Heating (if applicable)	

Data output

Data communication protocol	Digital output
Output data message format (include description of fields)	[Temperature] [Dew point temperature] [Wind chill temperature] [Relative humidity] [Relative air pressure] [Wind speed] [Wind direction] [Precipitation quantity] [Precipitation type] [Precipitation intensity] Temperature (°C) Dew point temperature (°C) Wind chill temperature (°C) Relative humidity (%) Relative air pressure (hPa) Wind speed (m/s) Wind direction (°) Precipitation quantity (mm) Precipitation type Precipitation intensity (mm/h)

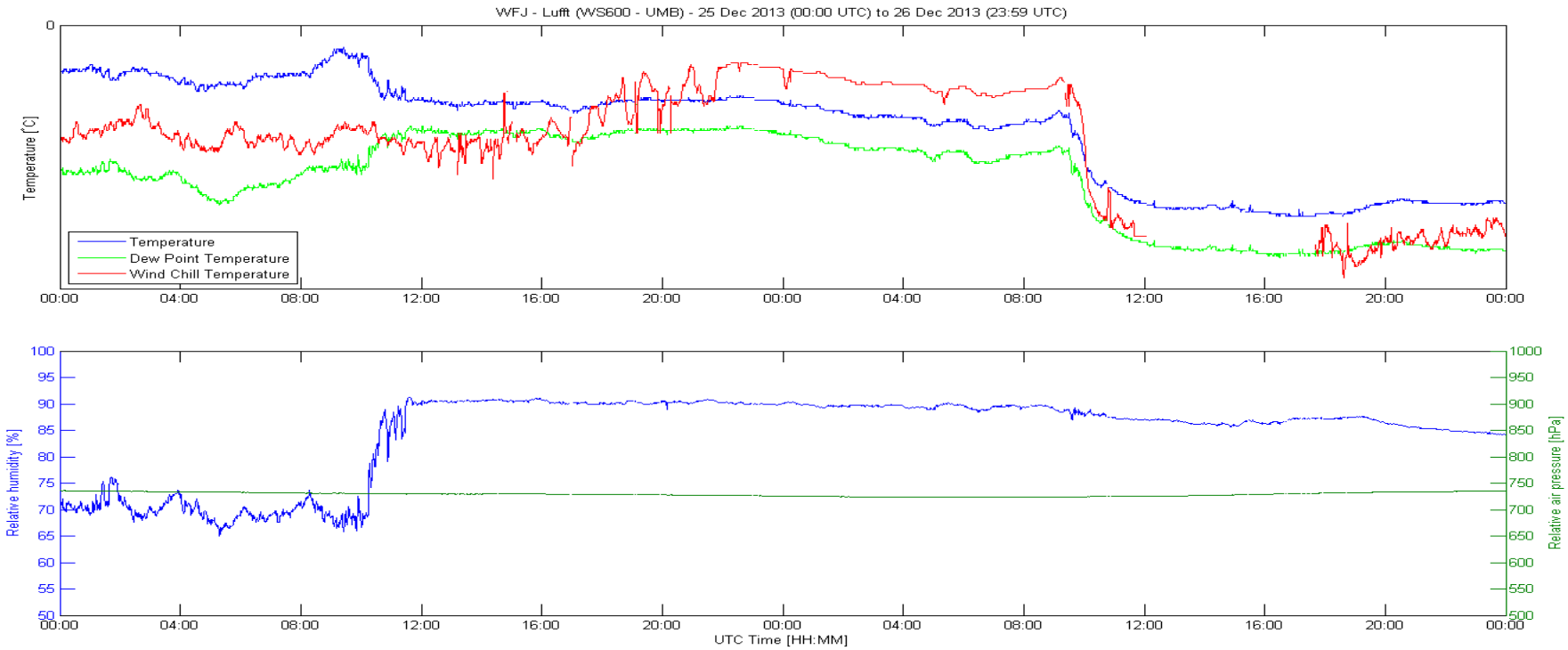
Data sampling rate	1 min (10 sec for wind speed and direction)
Data acquisition interval	1 min

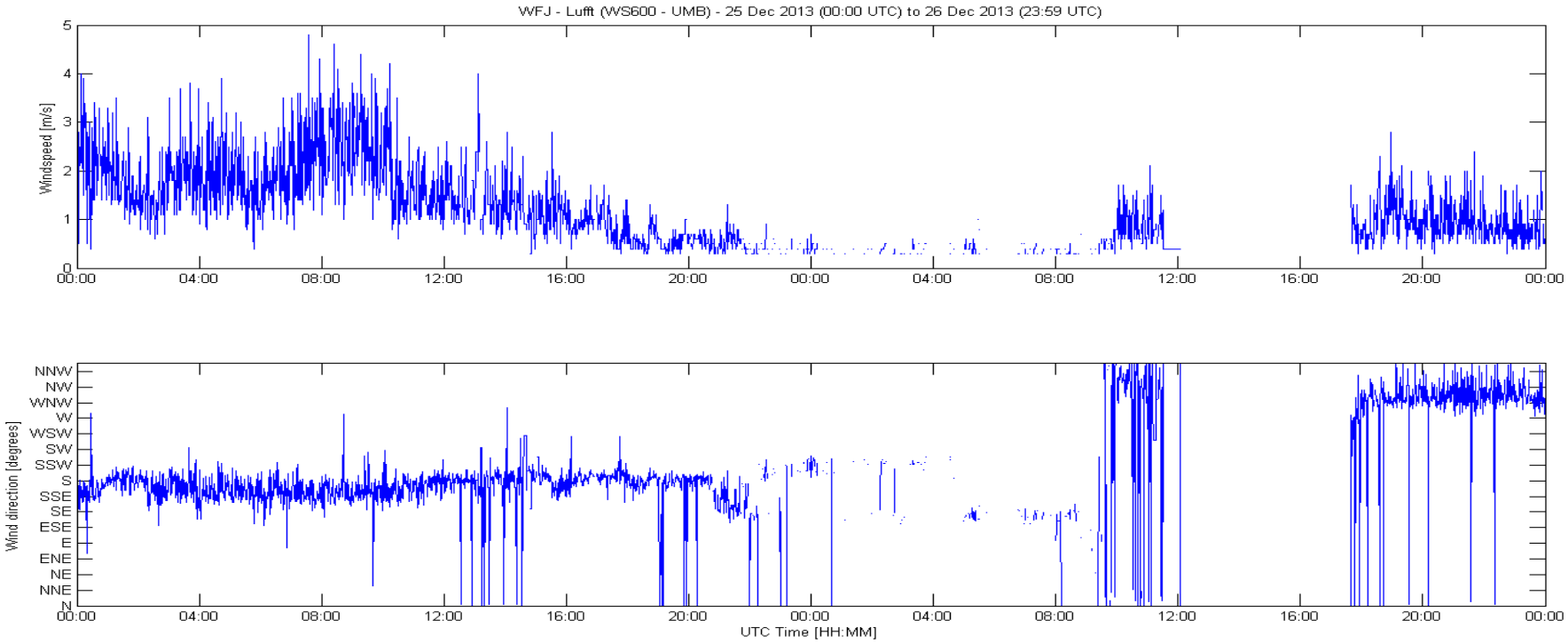
Field calibration (if any): None.

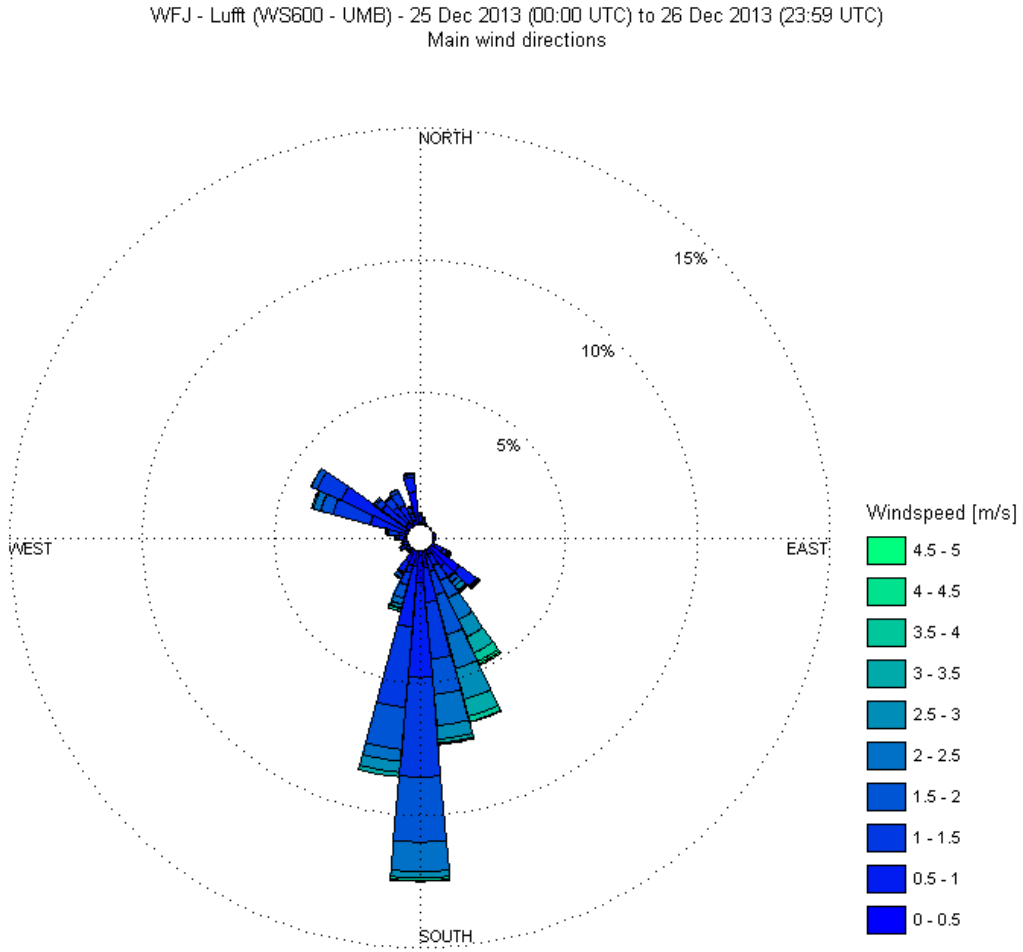
Picture of installation – WS600 – UMB weather station (Position n°10)

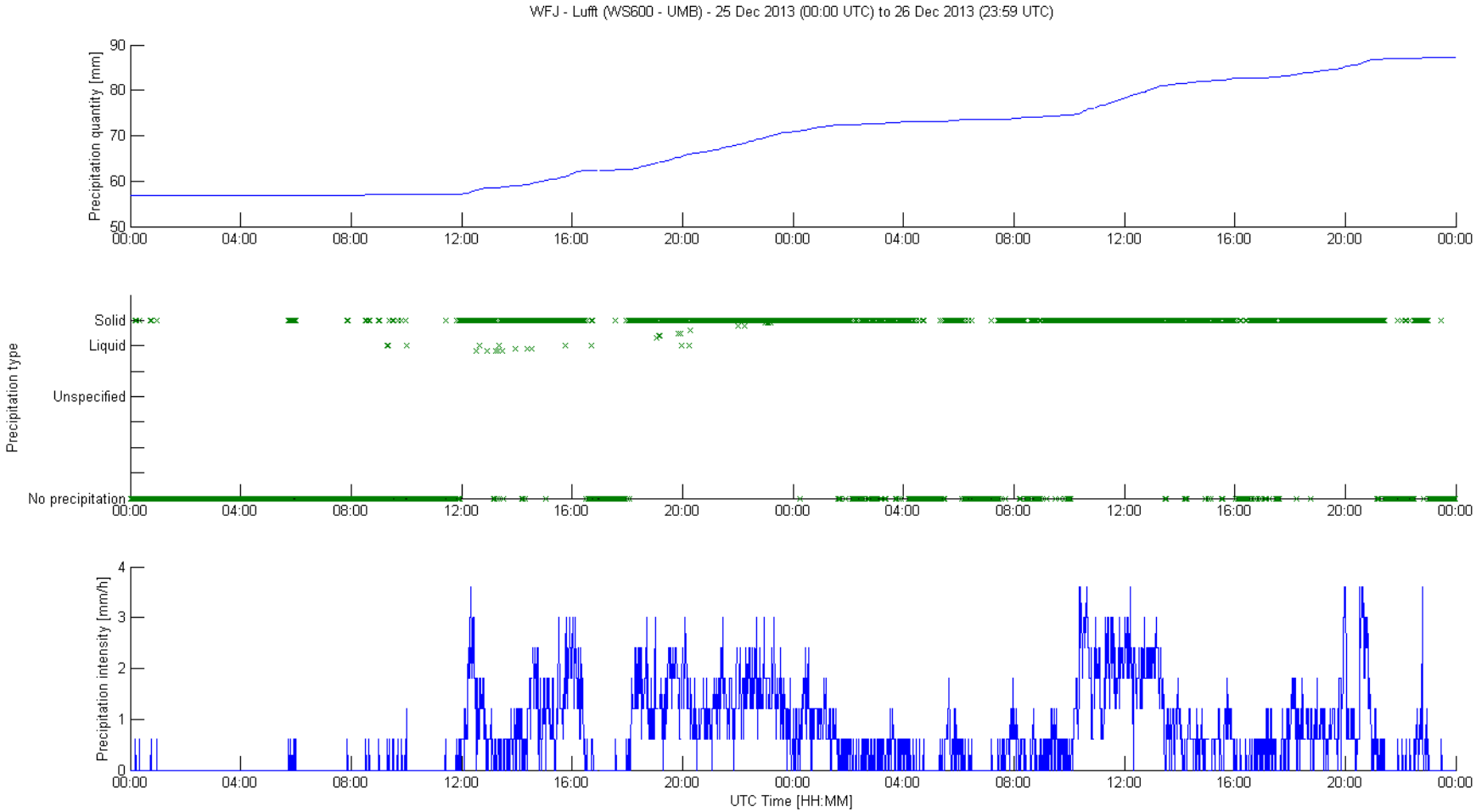
Picture taken from North

48h Plot.


WFJ - Lufft (WS600 - UMB) - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Temperature [°C]
Temperature
Dew Point Temperature
Wind Chill Temperature
Relative humidity [%]
Relative air pressure [hPa]
UTC Time [HH:MM]


WFJ - Lufft (WS600 - UMB) - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Windspeed [m/s]
0
1
2
3
4
5
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Wind direction [degrees]
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
UTC Time [HH:MM]


WFJ - Lufft (WS600 - UMB) - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Main wind directions
NORTH
15%
10%
5%
WEST
EAST
SOUTH
Windspeed [m/s]
4.5 - 5
4 - 4.5
3.5 - 4
3 - 3.5
2.5 - 3
2 - 2.5
1.5 - 2
1 - 1.5
0.5 - 1
0 - 0.5


WFJ - Lufft (WS600 - UMB) - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Precipitation quantity [mm]
90
80
70
60
50
Precipitation type
Solid
Liquid
Unspecified
No precipitation
Precipitation intensity [mm/h]
4
3
2
1
0
00:00
04:00
08:00
12:00
16:00
20:00
UTC Time [HH:MM]

Instrument Metadata Report

Instrument Name: **THIES precipitation monitor**
Instrument Status : Under test
Type of measurement : Automatic
Parameter measured : Precipitation rate and type
Instrument number 7 of 24

Manufacturer	Thies
Model	LPM 5.4110.01.200 V2.50 STD
Serial number	0840
Firmware version (if applicable)	V2.50

Field configuration

Location on site	Position n°11 (Please refer to site layout)
Orientation	Laser perpendicular to main wind direction
Height (measured at top)	5 m
Shield (if applicable)	Wind Protection Element 5.4200.00.000
Heating (if applicable)	**Heating description** The optical components are equipped with an integrated heating. The sensor has heated glass panes on both heads to prevent interferences through freeze up, steaming up or similar. In addition to the two glass pane heaters the sensor has 3 heating circuits to prevent against malfunction due to icing and packing of snow : 1. Housing (top side) 2. Heads (under the stainless steel components) 3. Carriers (straight section of the carriers at the receiver head) **Heater Location** The sensor contains two heaters in the glass panes (one at each) and three heating circuits respectively in the top side of the housing, under the stainless steel components of the heads, and in the straight section of the carriers at the receiver head.

	Temperature Measurement A Pt 100-sensor is used at the bottom of the housing for the measurement of the ambient temperature (measurement current < 0.8 mA). The interior temperature differs from the ambient about +5°C, if the heating is off (ambient temperature > 3°C). **Heating Control** The heating power for glass panes is controlled in subject to the ambient conditions. The three heating circuits are controlled separately against the ambient temperature (ambient temperature sensor). The heaters are switched on from a measured temperature under 3°C. **Heating Power** The heating currents and the supply voltage of the heating are measured for self diagnostic. For heating circuits, the heating power varies from 10% to 100%. Supply voltage AC (heating + electronics) : 230 V~AC +10% - 25% Glass pane: 2.5W each (with temperature regulation) Laser-/Receiver-Head : 9W each Carriers : 27W each Housing : 20W

Data output

Data communication protocol	Digital Output
Output data message format (include description of fields)	[1M SYNOP Tab.4677] [1M SYNOP Tab.4680] [1M METAR Tab.4678] [1M Intensity (mm/h) total precipitation] [1M Intensity (mm/h) liquid precipitation] [1M Intensity (mm/h) solid precipitation] [Precipitation amount (mm)] [1M Visibility in precipitation] [1M Measuring quality] [Status Laser] [Static signal] [Status Laser temperature (digital)] [Status Laser current (digital)] [Status Sensor supply] [Status Current pane heating laser head] [Status Current pane heating receiver

	head] [Status Temperature sensor] [Status Heating supply] [Status Current heating housing] [Status Current heating heads] [Status Current heating carriers] [Status Control output laser power] [Interior temperature (°C)] [Temperature of laser driver] [Mean value laser current 1/100(mA)] [Control voltage (mV)] [Voltage sensor supply (1/10V)] [Current pane heating laser head (mA)] [Current pane heating receiver head (mA)] [Ambient temperature (°C)] [Voltage Heating supply (1/10V)] [Current heating housing (mA)] [Current heating heads (mA)] [Current heating carriers (mA)] [Number of all measured particles]
Data sampling rate	Laser beam : 109 kHz. Resulting precipitation events collected each minute
Data acquisition interval	1 min

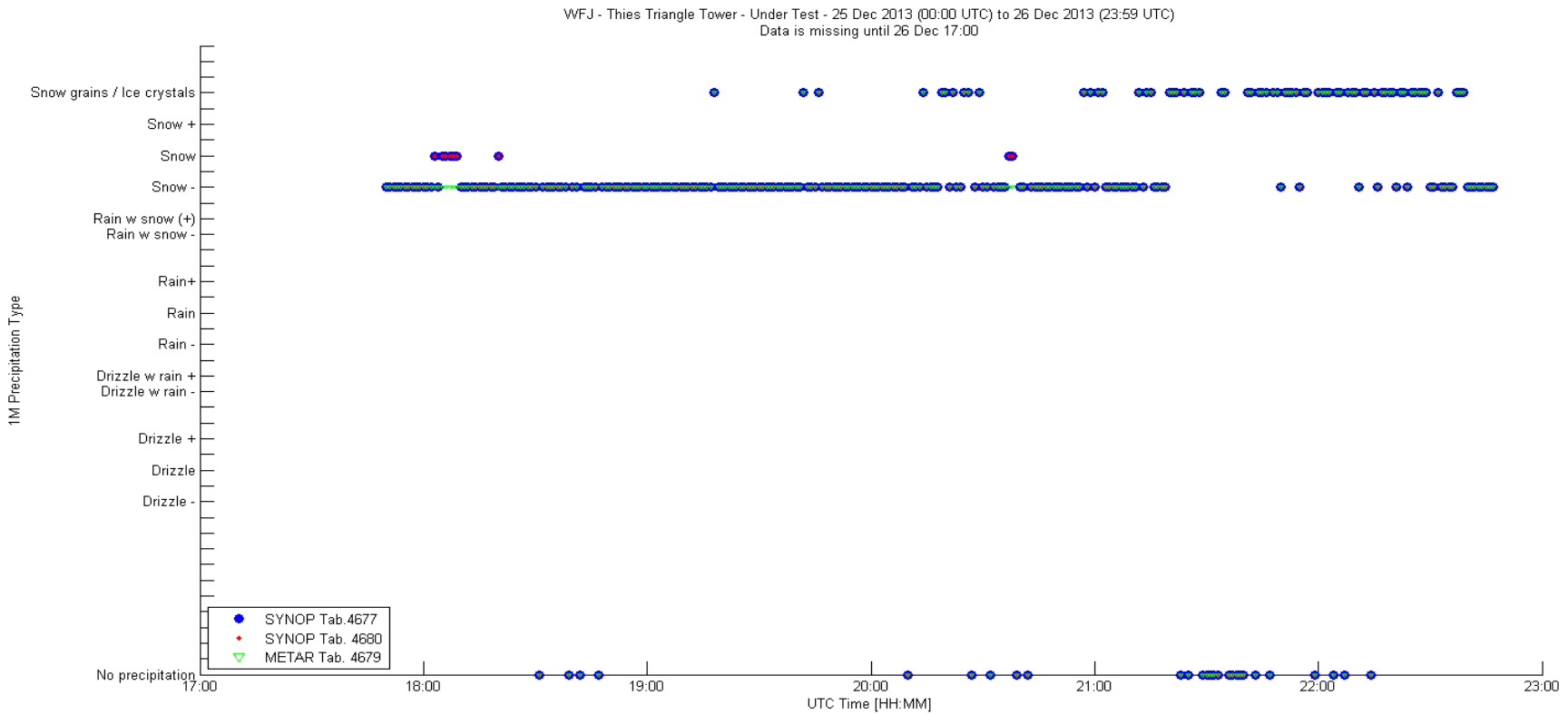
Field calibration (if any) : None.

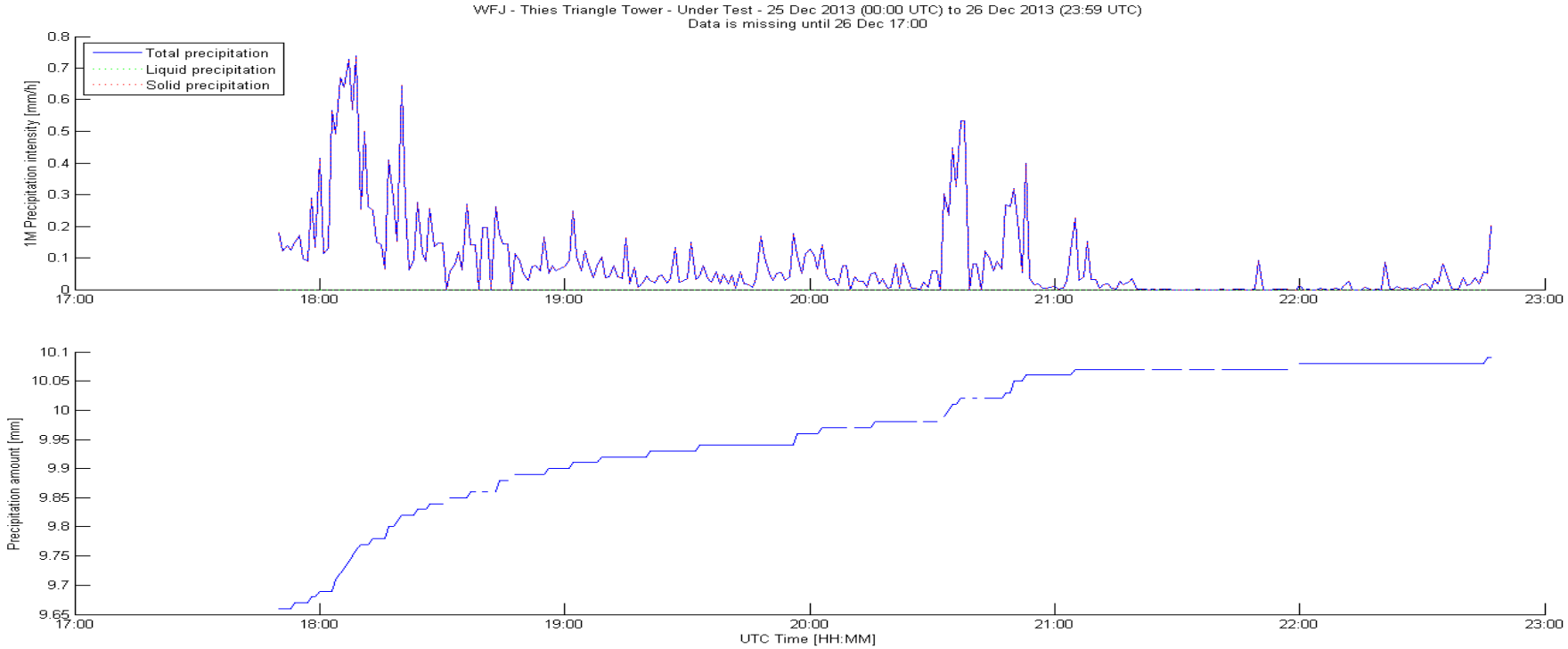
Pictures of installation – THIES precipitation monitor (Position n°11)

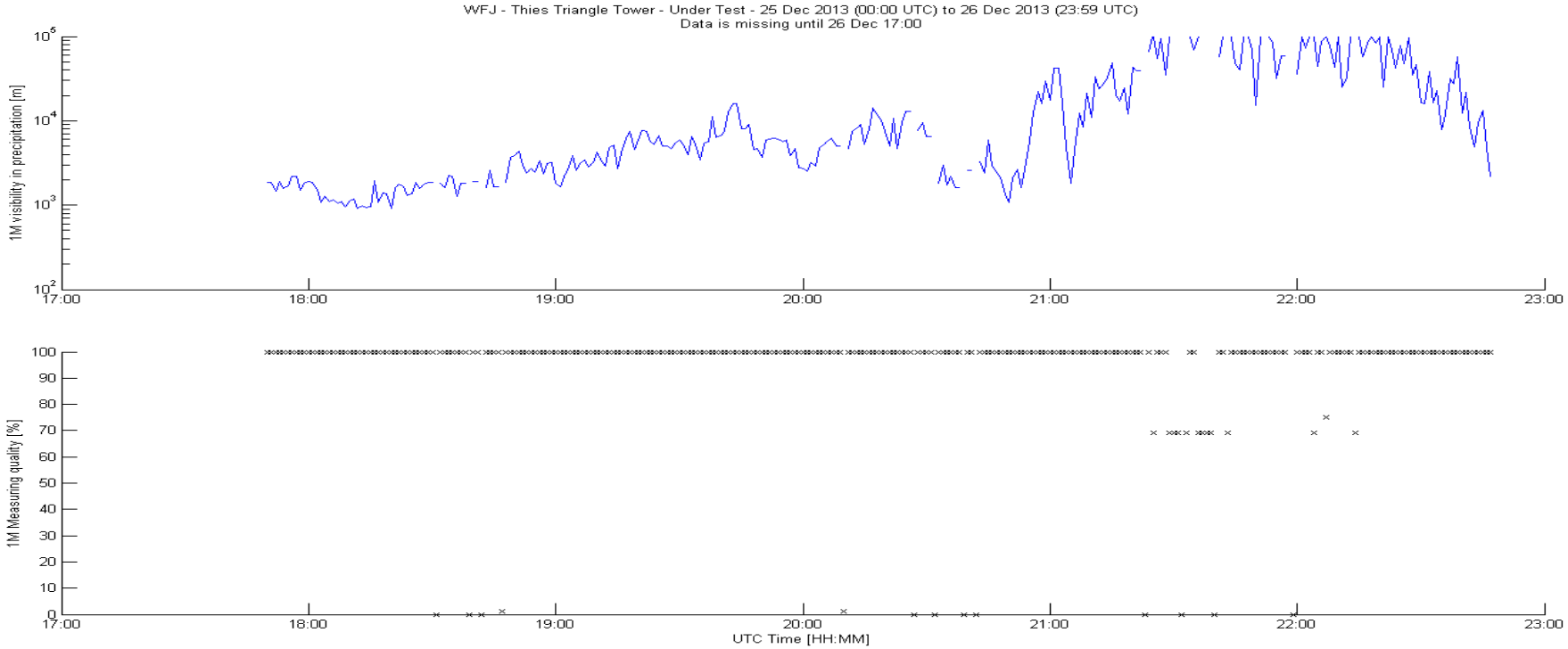
Picture taken from North-West

Picture taken from West

48h Plot.


WFJ - Thies Triangle Tower - Under Test - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Data is missing until 26 Dec 17:00
1M Precipitation Type
Snow grains / Ice crystals
Snow +
Snow
Snow -
Rain w snow (+)
Rain w snow -
Rain+
Rain
Rain -
Drizzle w rain +
Drizzle w rain -
Drizzle +
Drizzle
Drizzle -
No precipitation
SYNOP Tab.4677
SYNOP Tab. 4680
METAR Tab. 4679
17:00
18:00
19:00
20:00
21:00
22:00
23:00
UTC Time [HH:MM]


WFJ - Thies Triangle Tower - Under Test - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Data is missing until 26 Dec 17:00
Total precipitation
Liquid precipitation
Solid precipitation
1M Precipitation intensity [mm/h]
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Precipitation amount [mm]
10.1
10.05
10
9.95
9.9
9.85
9.8
9.75
9.7
9.65
UTC Time [HH:MM]

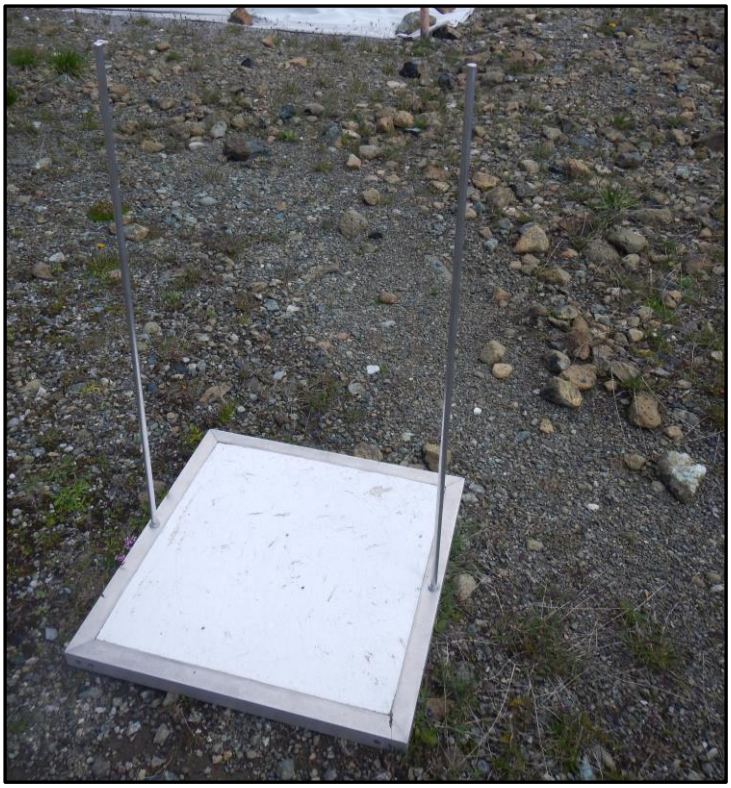

WFJ - Thies Triangle Tower - Under Test - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:59 UTC)
Data is missing until 26 Dec 17:00
1M visibility in precipitation [m]
1M Measuring quality [%]
UTC Time [HH:MM]
17:00
18:00
19:00
20:00
21:00
22:00
23:00

Instrument Metadata Report

Instrument Name: **Snow Board**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Manual
Parameter measured : New snow height, new snow SWE
Instrument number 8 of 24

Location on site	Position n°12 (Please refer to site layout)
Method used	Measured parameters : new snow height and new snow SWE
Equipment used	Scale, Double meter stick, Pin cylinder (big)
Frequency of measurement	1 per day at 8:00 LT

Picture of installation – Snow Board (Position n°12)



Picture taken from West

Field calibration : N/A

48h plot : N/A, manual daily measurement.

Instrument Metadata Report

Instrument Name: **Lysimeter**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Automatic
Parameter measured : Precipitation accumulation underground
Instrument number 9 of 24

Manufacturer	N/A
Model	N/A
Serial number	N/A
Firmware version (if applicable)	N/A

Field configuration

Location on site	Position n°13 (Please refer to site layout)
Orientation	None
Height (measured at top)	On ground surface
Shield (if applicable)	N/A
Heating (if applicable)	The pipe bringing the water to the counting device is heated.

Data output

Data communication protocol	Pulse count
Output data message format (include description of fields)	[Timestamp] [Lysi] Timestamp (UTC+1) Impulse pro 10min (0.8 Liter/10min/5m^2)
Data sampling rate	N/A
Data acquisition interval	10 min

Field calibration : Not done recently

Pictures of installation – Lysimeter (Position n°13)

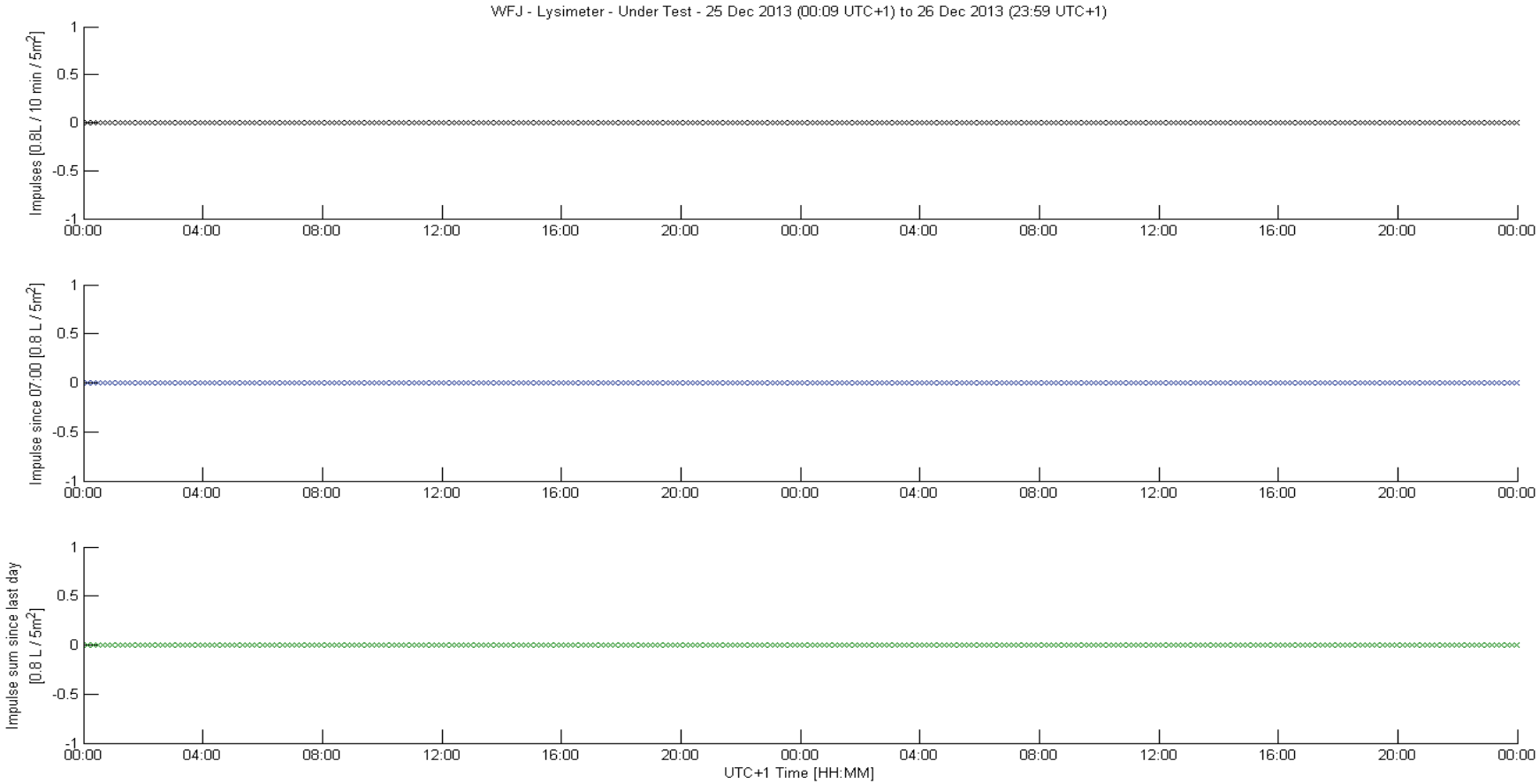
Picture taken from West

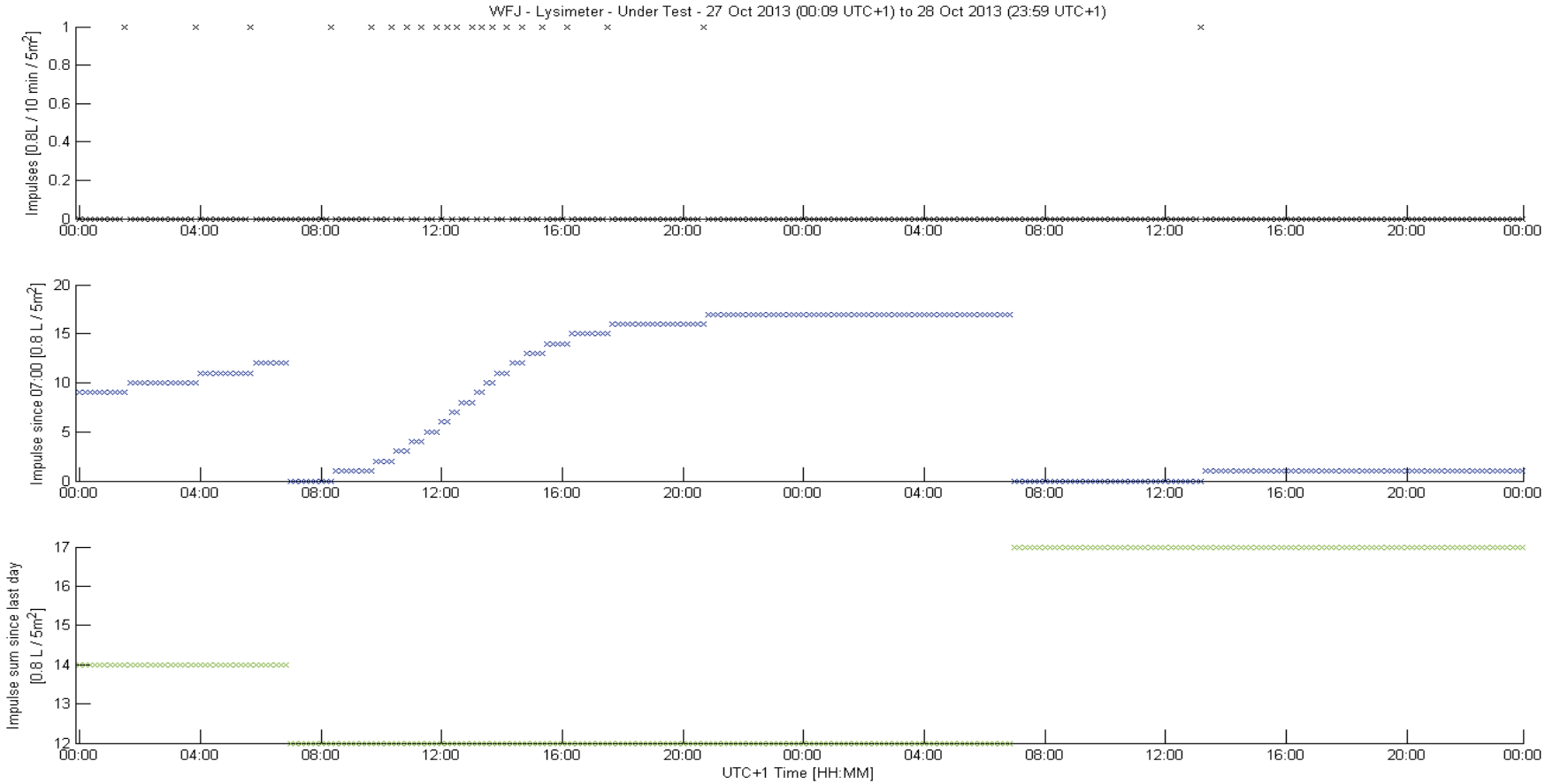
External part of the instrument

Picture taken in small Hut

Underground part of the instrument with counting tipping. Inside small Hut.

48h Plot.


WFJ - Lysimeter - Under Test - 25 Dec 2013 (00:09 UTC+1) to 26 Dec 2013 (23:59 UTC+1)
Impulses [0.8L / 10 min / 5m²]
Impulse since 07:00 [0.8 L / 5m²]
Impulse sum since last day [0.8 L / 5m²]
1
0.5
0
-0.5
-1
00:00
04:00
08:00
12:00
16:00
20:00
UTC+1 Time [HH:MM]


WFJ - Lysimeter - Under Test - 27 Oct 2013 (00:09 UTC+1) to 28 Oct 2013 (23:59 UTC+1)
Impulses [0.8L / 10 min / 5m²]
Impulse since 07:00 [0.8 L / 5m²]
Impulse sum since last day [0.8 L / 5m²]
UTC+1 Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Snow Pillow**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Automatic
Parameter measured : Snow Water Equivalent (Hydrostatic pressure measurement)
Instrument number 10 of 24

Manufacturer	Sommer Mess-Systemtechnik
Model	SP 3 (dimension : 3 x 3 x 0.1 m)
Serial number	Unknown
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°14 (Please refer to site layout)
Orientation	None
Height (measured at top)	On ground surface
Shield (if applicable)	N/A
Heating (if applicable)	N/A

Data output

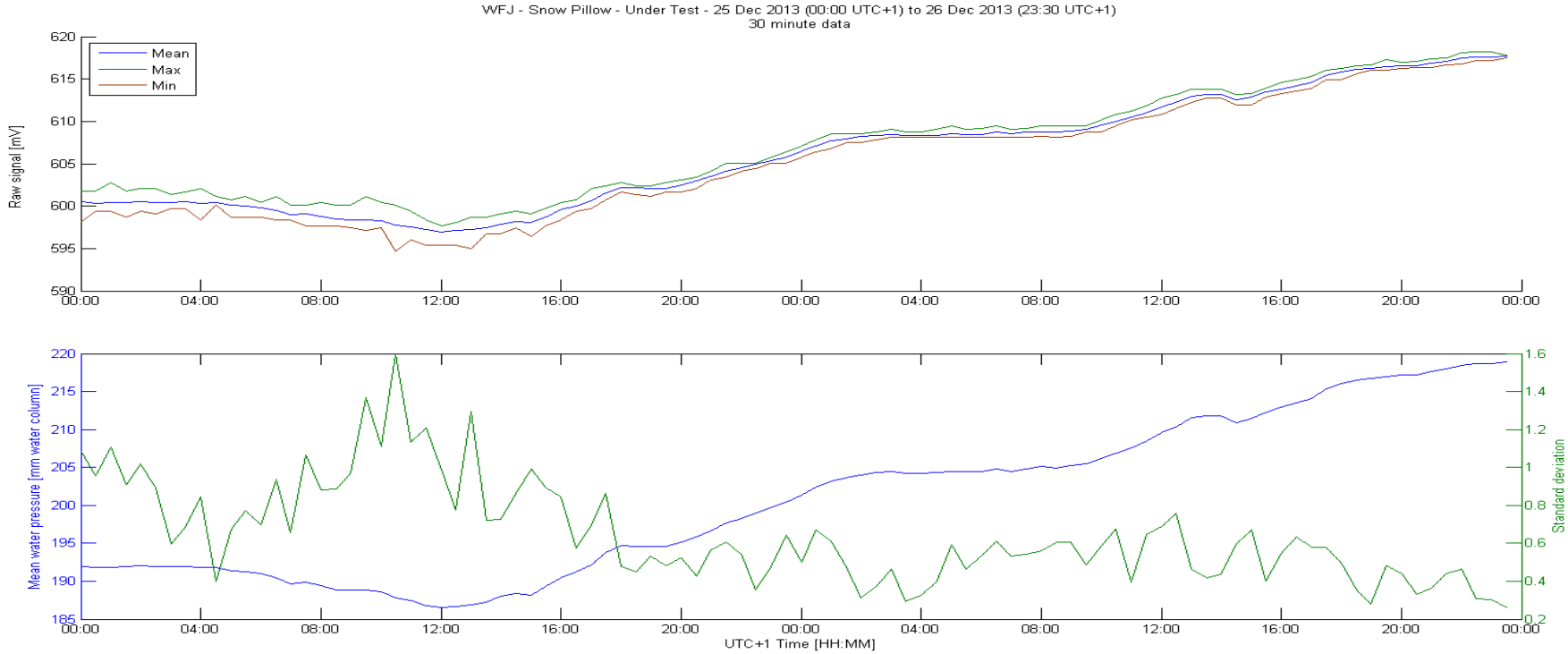
Data communication protocol	Analog output : Signal: 0/4 to 20 mA max. load 500 Ω
Output data message format (include description of fields)	[Timestamp] [Pi_mV_mean] [Pi_mV_max] [Pi_mV_min] [Pi_mm_WS_mean] [Stand_Dev of Pi_mm_WS] Timestamp (UTC+1) Snowpillow Mean Raw Signal (mV) Snowpillow Max Raw Signal (mV) Snowpillow Min Raw Signal (mV) Snowpillow Mean Water Pressure (mm WaterColumn) Snowpillow Standard Deviation Water Pressure
Data sampling rate	1 measurement every minute
Data acquisition interval	Average over 30 minutes

Field calibration : Offset correction to 0 each autumn before the first snow fall.

Pictures of installation – Snow Pillow (Position n°14)

Picture taken from West

48h Plot.

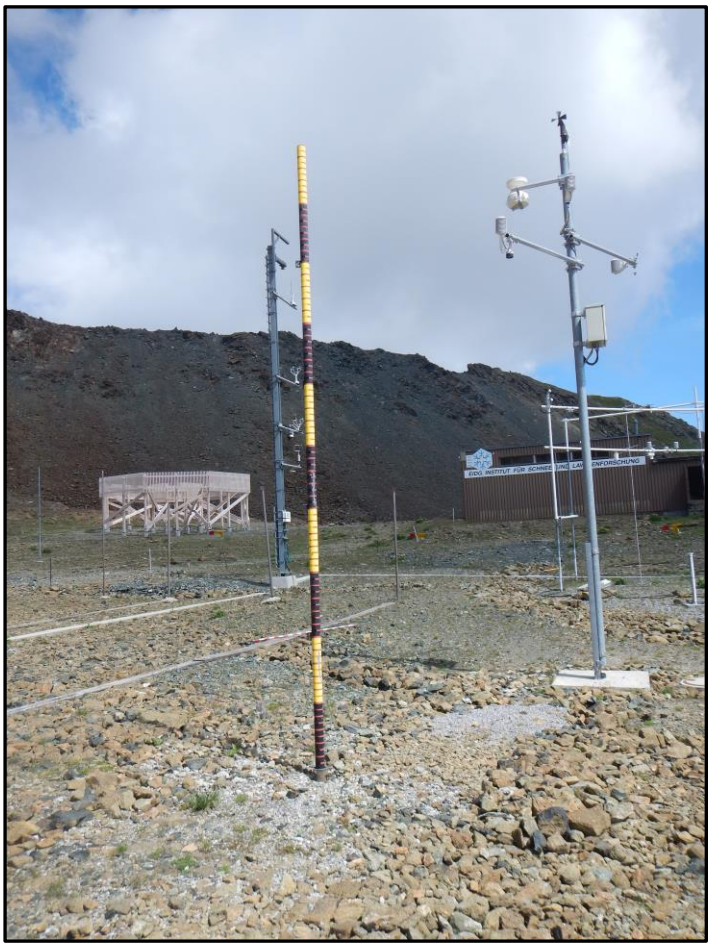

WFJ - Snow Pillow - Under Test - 25 Dec 2013 (00:00 UTC+1) to 26 Dec 2013 (23:30 UTC+1)
30 minute data
Mean
Max
Min
Raw signal [mV]
620
615
610
605
600
595
590
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Mean water pressure [mm water column]
220
215
210
205
200
195
190
185
Standard deviation
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
UTC+1 Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Graduate Stake**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Manual
Parameter measured : Snow depth
Instrument number 11 of 24

Location on site	Position n°15 (Please refer to site layout)
Method used	Manually read every morning by the observer
Equipment used	Graduate stake
Frequency of measurement	Every day, at 8:00 LT (UTC+1)

Pictures of installation – Graduate Stake (Position n°15)



Picture taken from West

Field calibration : N/A
48h plot : N/A, manual daily measurement.

Instrument Metadata Report

Instrument Name: **SSG Snow Scale**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Automatic
Parameter measured : Snow Water Equivalent
Instrument number 12 of 24

Manufacturer	Sommer Mess-Systemtechnik
Model	SSG Snowscale
Serial number	Unknown
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°16 (Please refer to site layout)
Orientation	None
Height (measured at top)	On ground surface
Shield (if applicable)	None
Heating (if applicable)	None

Data output

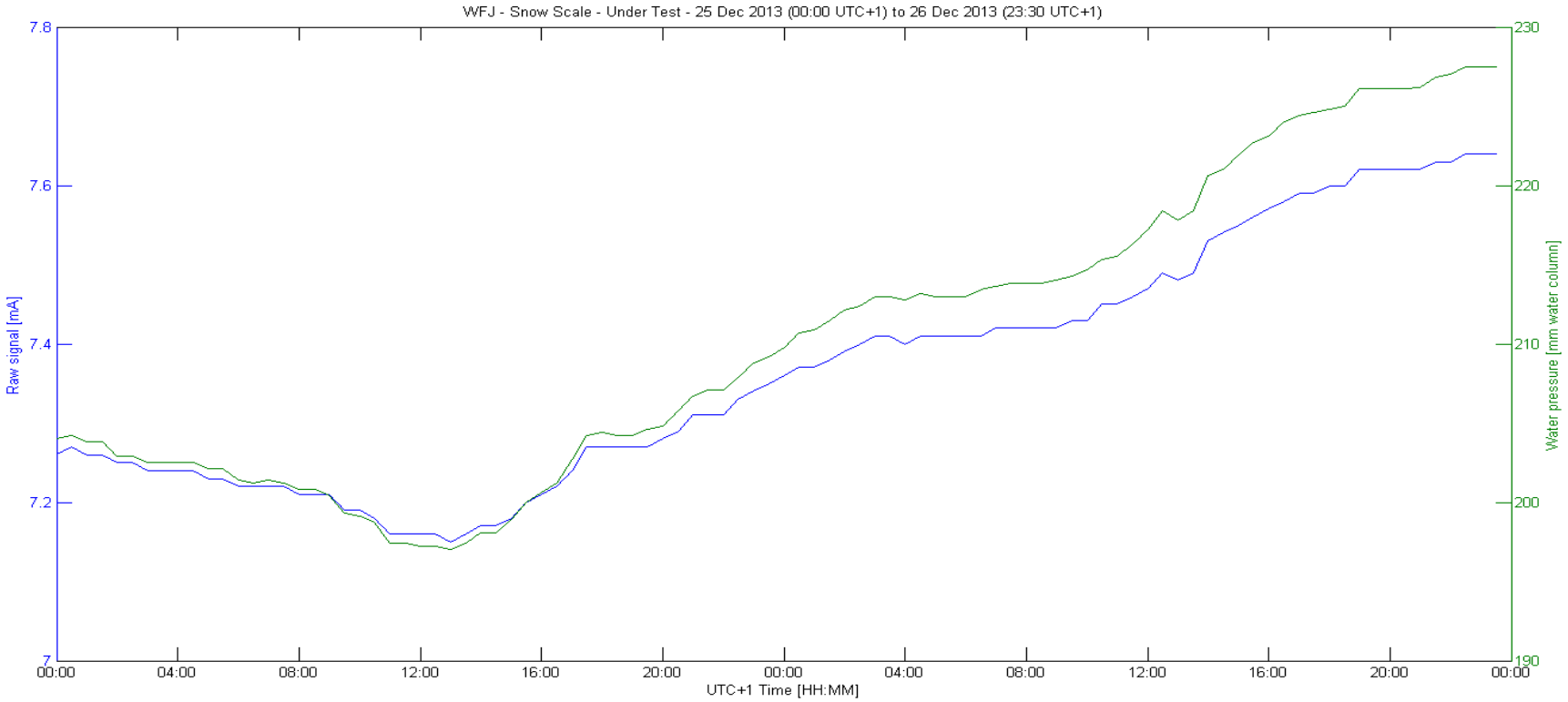
Data communication protocol	4-20 mA = 0-1000 mm SWE
Output data message format (include description of fields)	[Timestamp] [Waage_mA] [Waage_mmWS] Timestamp (UTC+1) Snowplate Raw Signal (mA) Snowplate Water Pressure (mm WaterColumn)
Data sampling rate	1 measurement every 30 minutes
Data acquisition interval	30 minutes

Field calibration : Not done, but will be done in future similar to instrument snow pillow (n°10).

Picture of installation – Snow Scale for snow on the ground (Position n°16)

Picture taken from West

48h Plot.


WFJ - Snow Scale - Under Test - 25 Dec 2013 (00:00 UTC+1) to 26 Dec 2013 (23:30 UTC+1)
Raw signal [mA]
Water pressure [mm water column]
UTC+1 Time [HH:MM]
7.8
7.6
7.4
7.2
7
230
220
210
200
190
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00

Instrument Metadata Report

Instrument Name: **Sonic Ranging Sensor SR50**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Automatic
Parameter measured : Snow depth
Instrument number 13 of 24

Manufacturer	Campbell Scientific
Model	SR50AT
Serial number	3056
Firmware version (if applicable)	Unknown

Field configuration

Location on site	Position n°17 (Please refer to site layout)
Orientation	Facing down
Height (measured at top)	4.6 m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

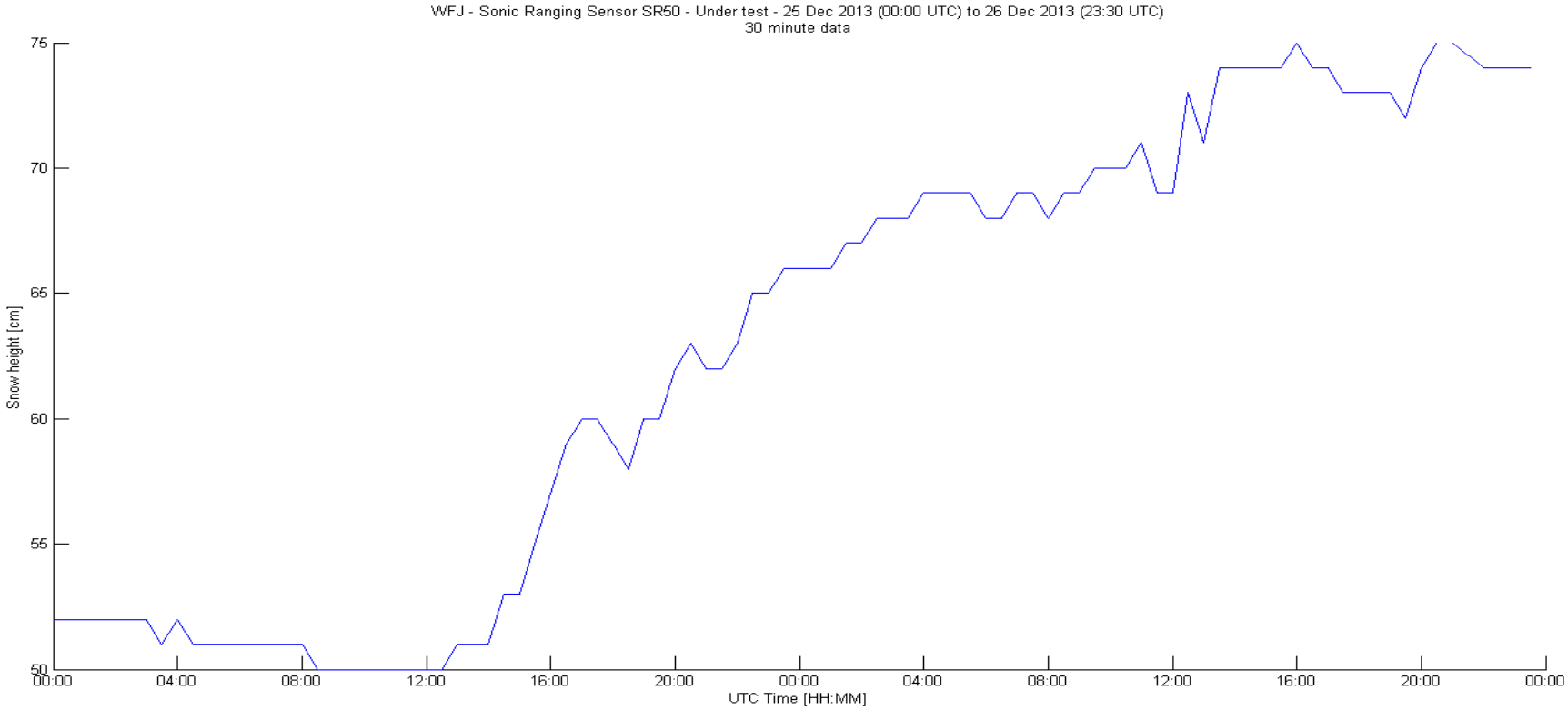
Data communication protocol	SDI7
Output data message format (include description of fields)	[Snow height (cm)]
Data sampling rate	10 measurements every 30 minutes
Data acquisition interval	30 minutes (Median filter over the 10 values)

Field calibration : Yearly, set to 0 before first snowfall.

Pictures of installation – Sonic Ranging Sensor SR50 (Position n°17)

Pictures taken from West

48h Plot.


WFJ - Sonic Ranging Sensor SR50 - Under test - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:30 UTC)
30 minute data
Snow height [cm]
75
70
65
60
55
50
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Jenoptik**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Automatic
Parameter measured : Snow depth
Instrument number 14 of 24

Manufacturer	Jenoptik
Model	SHM30 (012840-630-22)
Serial number	91103
Firmware version (if applicable)	Unknown

Field configuration

Location on site	Position n°18 (Please refer to site layout)
Orientation	Pointing downwards, mounting angle is 12.5° (around 0.5° accuracy)
Height (measured at top)	5 m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

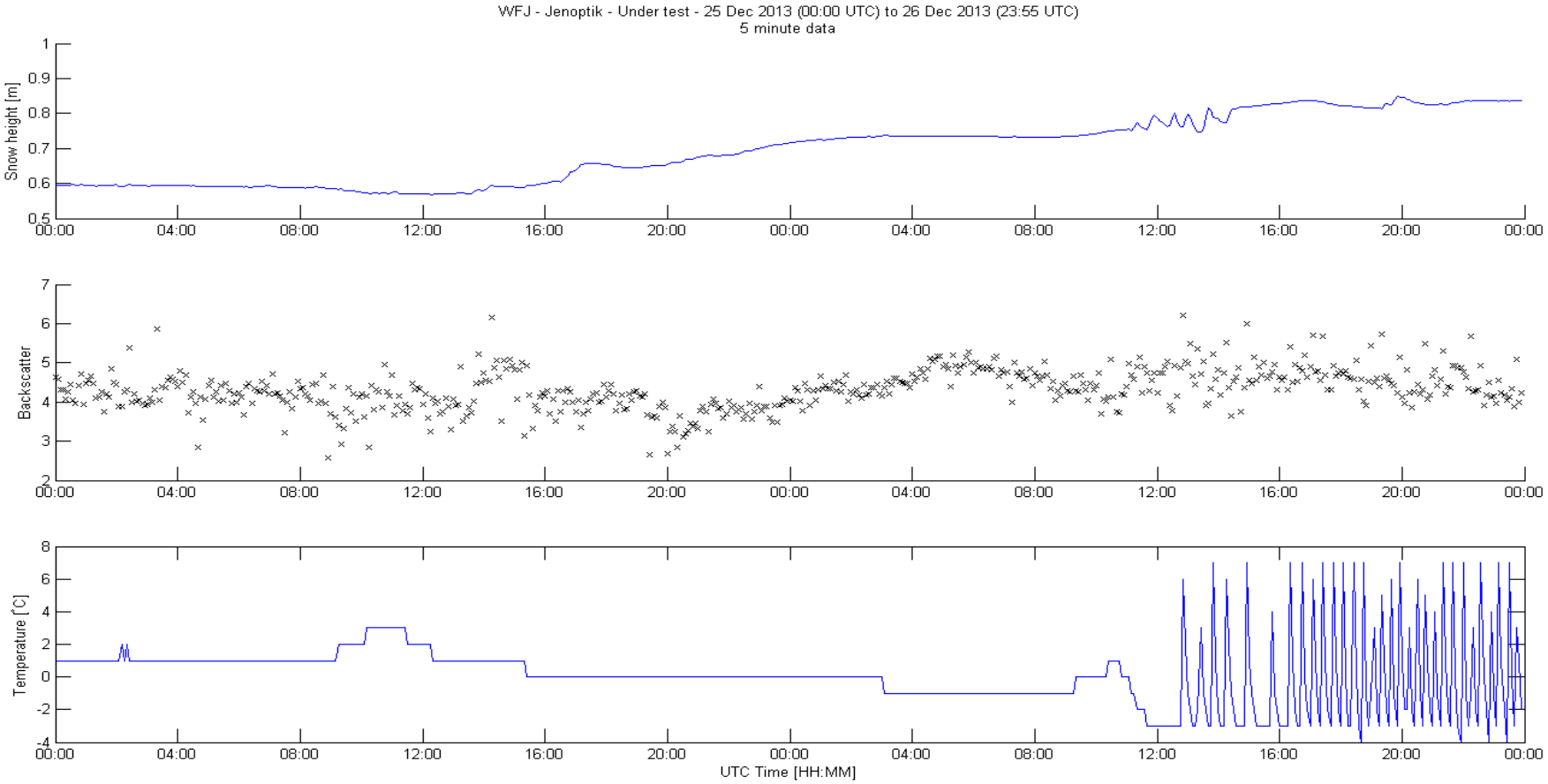
Data communication protocol	RS232
Output data message format (include description of fields)	[Time in CET/CEST] [Snowheight (m)] [backscatter] [Device Temperature] [Error Code]
Data sampling rate	5 minutes
Data acquisition interval	5 minutes

Field calibration : Calibration was only done during installation (set mounting height).

Pictures of installation – Jenoptik (Position n°18)

Pictures taken from West

48h Plot.


WFJ - Jenoptik - Under test - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:55 UTC)
5 minute data
Snow height [m]
Backscatter
Temperature [C]
UTC Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Parsivel OTT disdrometer**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Precipitation rate and type
Instrument number 15 of 24

Manufacturer	OTT Hydrometrie
Model	Parsivel 1
Serial number	20 40 82
Firmware version (if applicable)	Unknown

Field configuration

Location on site	Position n°19 (Please refer to site layout)
Orientation	Laser perpendicular to wind main direction
Height (measured at top)	6 m
Shield (if applicable)	None
Heating (if applicable)	**Heating description** An automatic heating system prevents ice buildup on the sensor heads. In order to prevent condensation of the sensor apertures, the heater must be activated and I_{min} set to 0.15 A. **Temperature Measurement** The temperature sensor in the sensor head measures the temperature each second. **Heating Control** The heating system adjusts according to the temperature sensor. The purpose is to hold the sensor heads at a constant temperature of at least 10°C. If the outside temperature drops below 10°C, the heating current is increased until either 10°C is again reached in the sensor heads or until the maximum current consumption is reached. **Heating Power** Optimum heating output can be guaranteed with a supply voltage of 20 V DC. Maximum heating current : 2 A

	Minimum heating current : 0.15 A Heating power supply : 12/24 VDC Heating current consumption : 50/100W

Data output

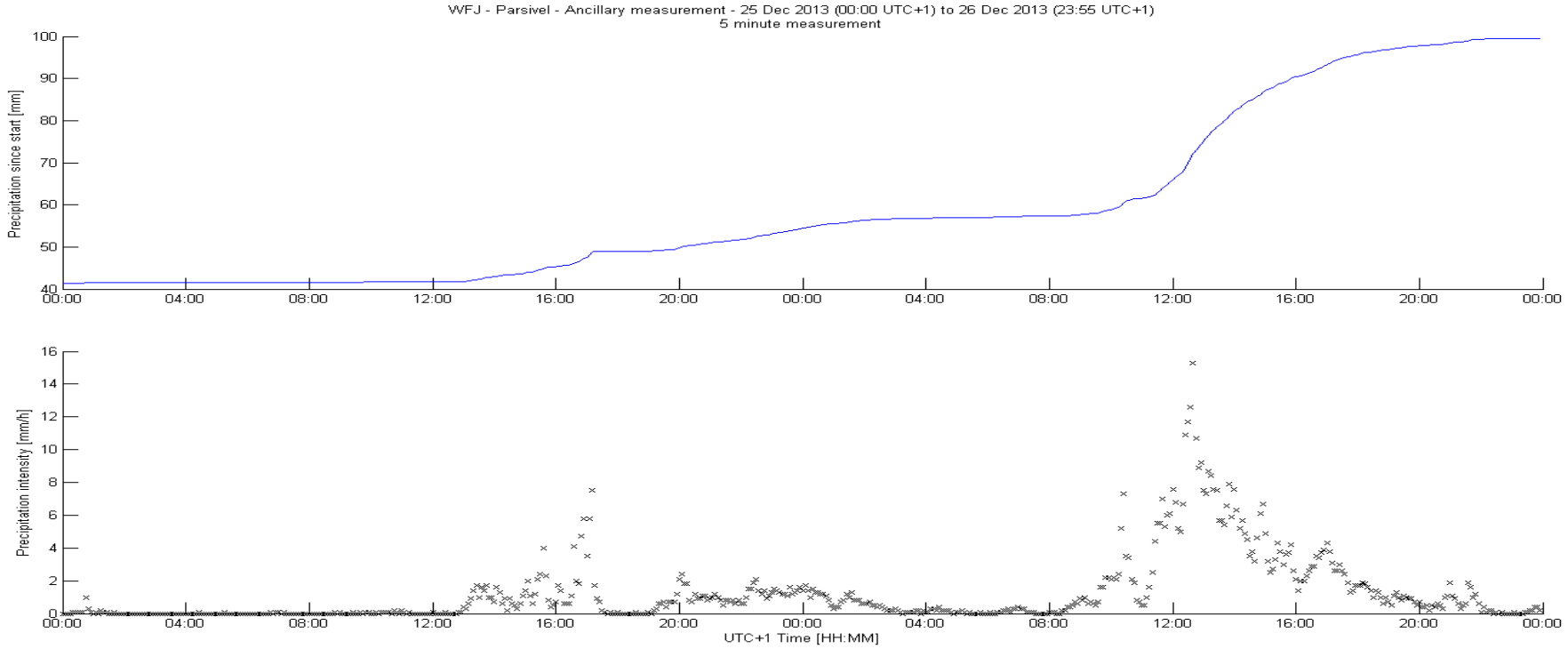
Data communication protocol	SDI
Output data message format (include description of fields)	[Timestamp (UTC+1)] [precipitation_intensity (mm/h)] [precipitation_since_start (mm)] [weather_code] [radar_reflectivity] [mor_visibility] [laser_signal_amplitude] [detected_particles]
Data sampling rate	5 minutes
Data acquisition interval	5 minutes (read out from sensor)

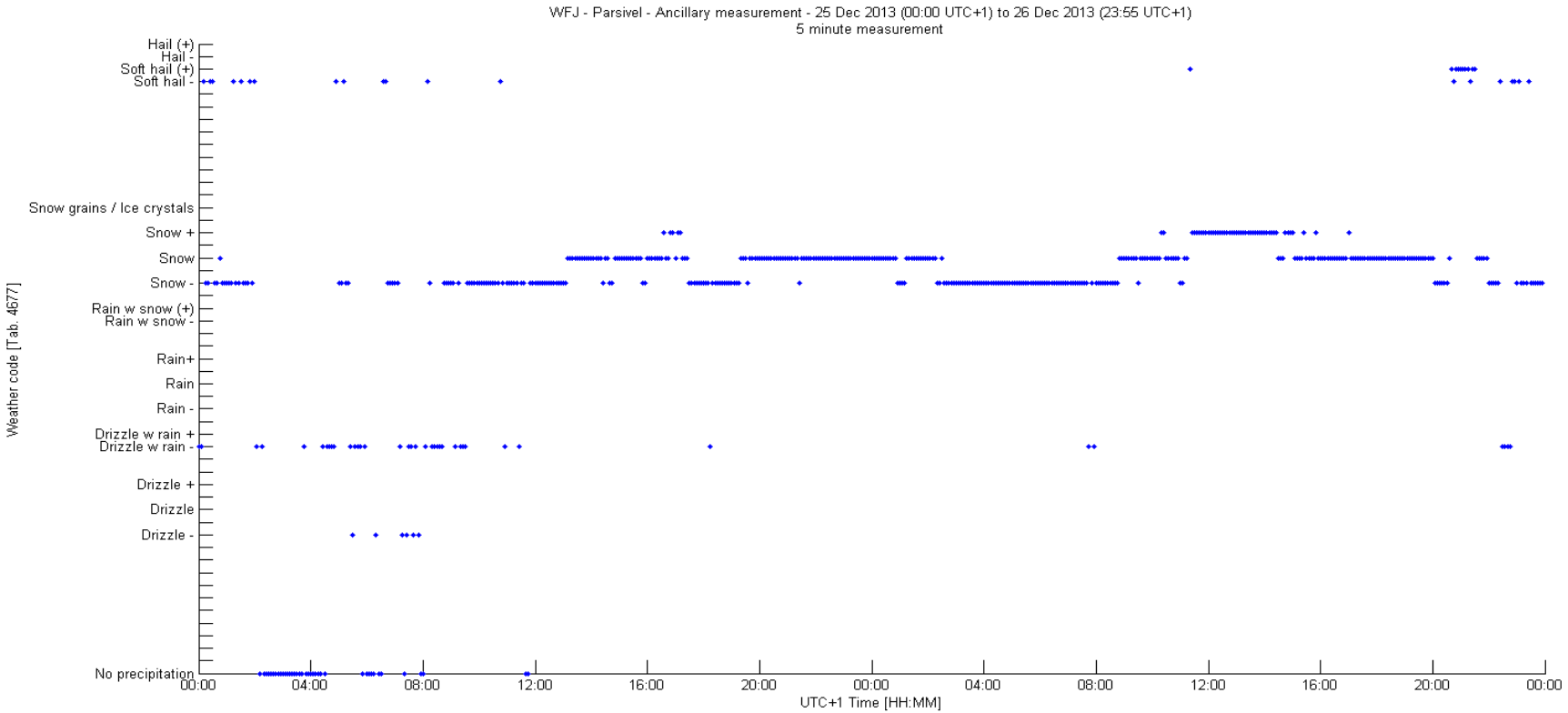
Field calibration : No calibration, no quality checks.

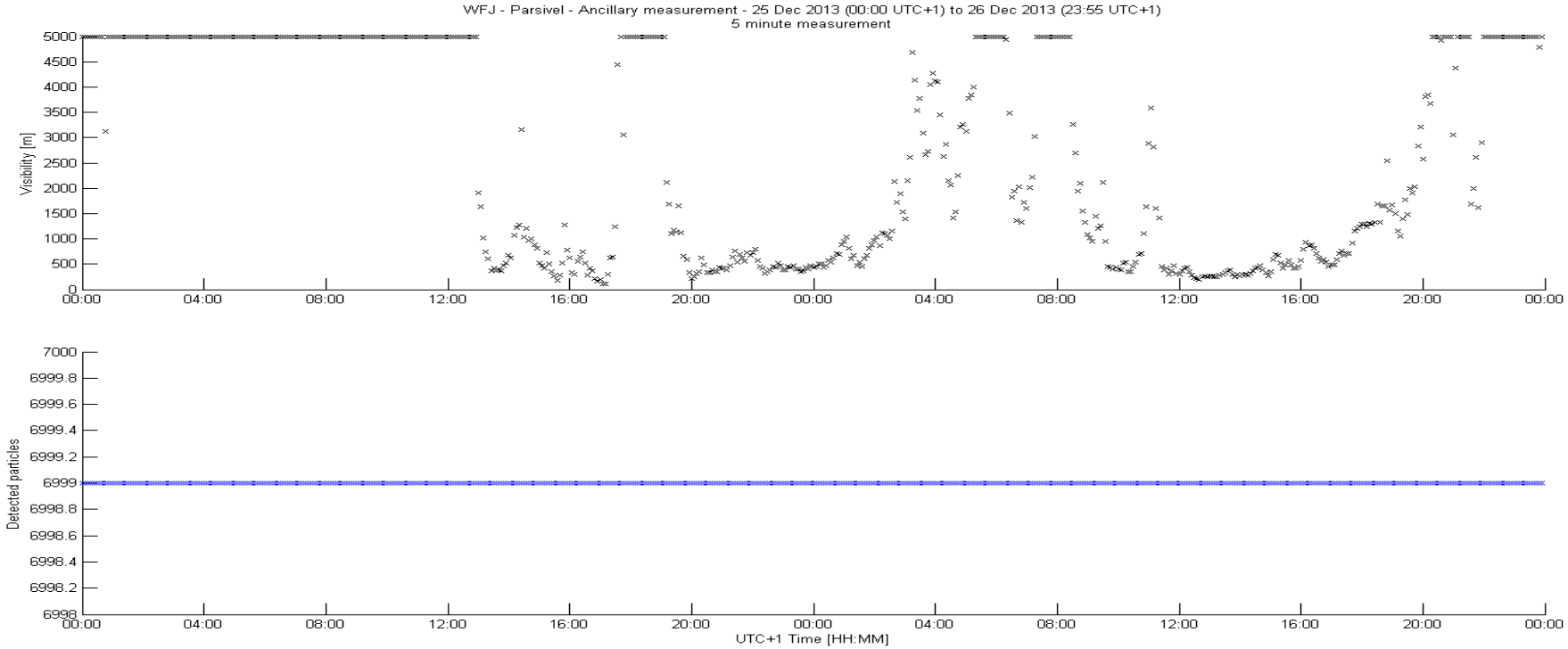
Pictures of installation – Parsivel OTT disdrometer (Position n°19)

Pictures taken from West

48h Plot.


WFJ - Parsivel - Ancillary measurement - 25 Dec 2013 (00:00 UTC+1) to 26 Dec 2013 (23:55 UTC+1)
5 minute measurement
Precipitation since start [mm]
100
90
80
70
60
50
40
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Precipitation intensity [mm/h]
16
14
12
10
8
6
4
2
0
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC+1 Time [HH:MM]


WFJ - Parsivel - Ancillary measurement - 25 Dec 2013 (00:00 UTC+1) to 26 Dec 2013 (23:55 UTC+1)
5 minute measurement
Weather code [Tab. 4677]
Hail (+)
Hail -
Soft hail (+)
Soft hail -
Snow grains / Ice crystals
Snow +
Snow
Snow -
Rain w snow (+)
Rain w snow -
Rain+
Rain
Rain -
Drizzle w rain +
Drizzle w rain -
Drizzle +
Drizzle
Drizzle -
No precipitation
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC+1 Time [HH:MM]


WFJ - Parsivel - Ancillary measurement - 25 Dec 2013 (00:00 UTC+1) to 26 Dec 2013 (23:55 UTC+1)
5 minute measurement
Visibility [m]
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Detected particles
7000
6999.8
6999.6
6999.4
6999.2
6999
6998.8
6998.6
6998.4
6998.2
6998
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC+1 Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Thygan**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Temperature, Dew Point, Humidity
Instrument number 16 of 24

Manufacturer	Meteolabor AG
Model	VTP 6 Thygan
Serial number	200
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°20 (Please refer to site layout)
Orientation	Facing south
Height (measured at top)	5 m
Shield (if applicable)	None
Heating (if applicable)	**Heating description** VTP 6 Thygan has two heating systems. One for the housing and another for the ventilator. **Temperature Measurement** The housing temperature is measured every 10 sec as does the ventilator housing. **Heating Control** The housing heater is working if the housing temperature is below 4°C.The heating is put on or off every 10 sec. It is on whenever : $T_G \leq 0.9\ T_p + 4$ (°C) where : - T_G is the housing temperature measured every 10 sec - T_p is the dew point measured every 10 min The heating is put on continually when the ventilator is defective and the housing temperature is under 4°C. This allows to fix the problem of the frozen ventilator. The ventilator has also his own heating. His engagement depend on humidity. It is commended every 10 sec with

	the functioning time t_e defined by the following equation: $t_e = 20\ (4 - T_G + T_p)$ [sec] In general, the definition of t_e is 10 sec. **Heating Power** Power of housing heating : H = Int((t_g+6)/7) (Where t_g is the number of 10 sec cycles, counted up in a 10 min cycle during which heating is on). Heater power : 140W Power consumption : 48 V AC, max. 3A (housing heater)

Data output

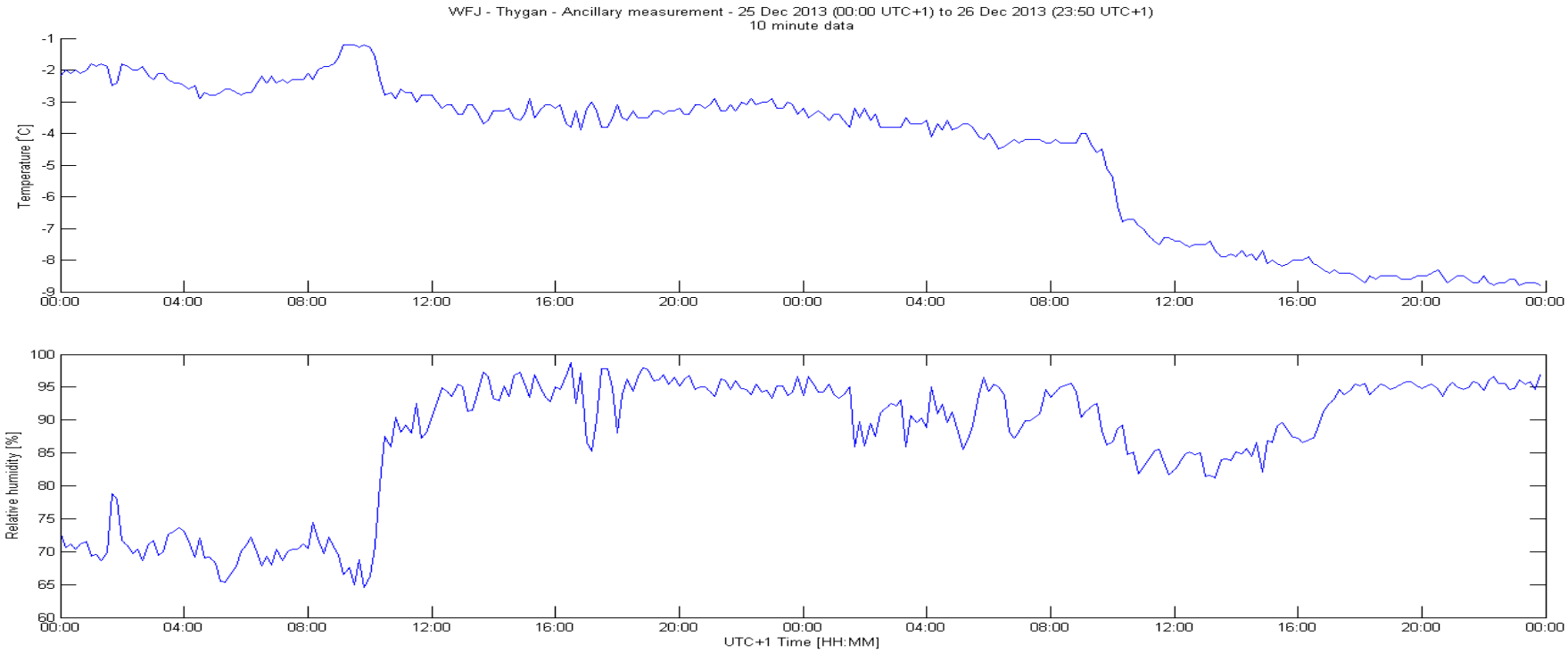
Data communication protocol	Analog output
Output data message format (include description of fields)	[Timestamp] [AirTemp] [RelHum] Timestamp (UTC+1) Air temperature Relative humidity
Data sampling rate	60 seconds
Data acquisition interval	10 minutes

Field calibration : None

Pictures of installation – Thygan (Position n°20)

Pictures taken from West

48h Plot.


WFJ - Thygan - Ancillary measurement - 25 Dec 2013 (00:00 UTC+1) to 26 Dec 2013 (23:50 UTC+1)
10 minute data
Temperature [°C]
-1
-2
-3
-4
-5
-6
-7
-8
-9
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Relative humidity [%]
100
95
90
85
80
75
70
65
60
UTC+1 Time [HH:MM]

Instrument Metadata Report

Instrument Name: **CM21 pyranometer (1 of 2)**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Shortwave Radiation
Instrument number 17 of 24

Manufacturer	Kipp & Zonen
Model	CM21
Serial number	950235
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°21 (Please refer to site layout)
Orientation	Pointing upwards
Height (measured at top)	5 m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

Data communication protocol	Analog output (micro Volt)
Output data message format (include description of fields)	[Timestamp][SWin] Timestamp (UTC+1) Short Wave IN
Data sampling rate	60 seconds
Data acquisition interval	2 minutes

Field calibration : Calibration done during the installation and has not change since then.
Calibration factor : C = 12.75

Instrument Metadata Report

Instrument Name: **CM21 pyranometer (2 of 2)**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Shortwave Radiation
Instrument number 18 of 24

Manufacturer	Kipp & Zonen
Model	CM21
Serial number	950237
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°22 (Please refer to site layout)
Orientation	Pointing downwards
Height (measured at top)	5 m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

Data communication protocol	Analog output (micro Volt)
Output data message format (include description of fields)	[Timestamp][SWout] Timestamp (UTC+1) Short Wave OUT
Data sampling rate	60 seconds
Data acquisition interval	2 minutes

Field calibration : Calibration done during the installation and has not change since then.
Calibration factor : C = 11.92

Instrument Metadata Report

Instrument Name: **PIR Pyrgeometer (1 of 2)**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Longwave Radiation
Instrument number 19 of 24

Manufacturer	Eppley Laboratory
Model	PIR (Precision Infrared Radiometer)
Serial number	30335
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°23 (Please refer to site layout)
Orientation	Pointing upwards
Height (measured at top)	5 m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

Data communication protocol	Analog output (micro Volt)
Output data message format (include description of fields)	[Timestamp][LWin] Timestamp (UTC+1) Long Wave IN
Data sampling rate	60 seconds
Data acquisition interval	2 minutes

Field calibration : Calibration done during the installation and has not change since then.
Calibration factor : C=3.75, k1=0.0282, k2=0.9999, k3=3.25, g_b=-0.1, g_a=-3.6, f=12.8

Instrument Metadata Report

Instrument Name: **PIR Pyrgeometer (2 of 2)**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Longwave Radiation
Instrument number 20 of 24

Manufacturer	Eppley Laboratory
Model	PIR (Precision Infrared Radiometer)
Serial number	30332
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°24 (Please refer to site layout)
Orientation	Pointing downwards
Height (measured at top)	5 m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

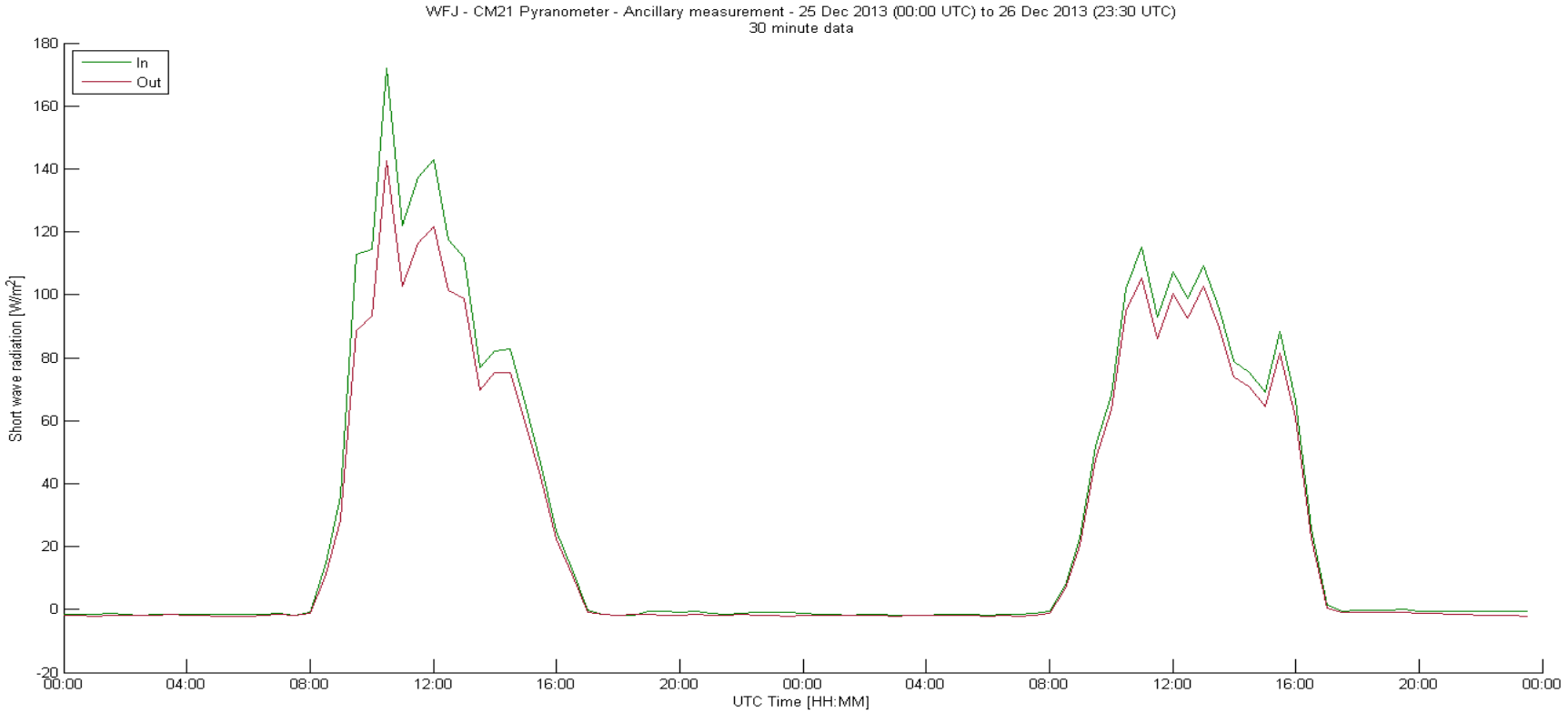
Data communication protocol	Analog output (micro Volt)
Output data message format (include description of fields)	[Timestamp][LWout] Timestamp (UTC+1) Long Wave OUT
Data sampling rate	60 seconds
Data acquisition interval	2 minutes

Field calibration : Calibration done during the installation and has not change since then.
Calibration factor : C=3.84, k1=0.0547, k2=0.9997, k3=3.45, g_b=-0.1, g_a=-7.2, f=0

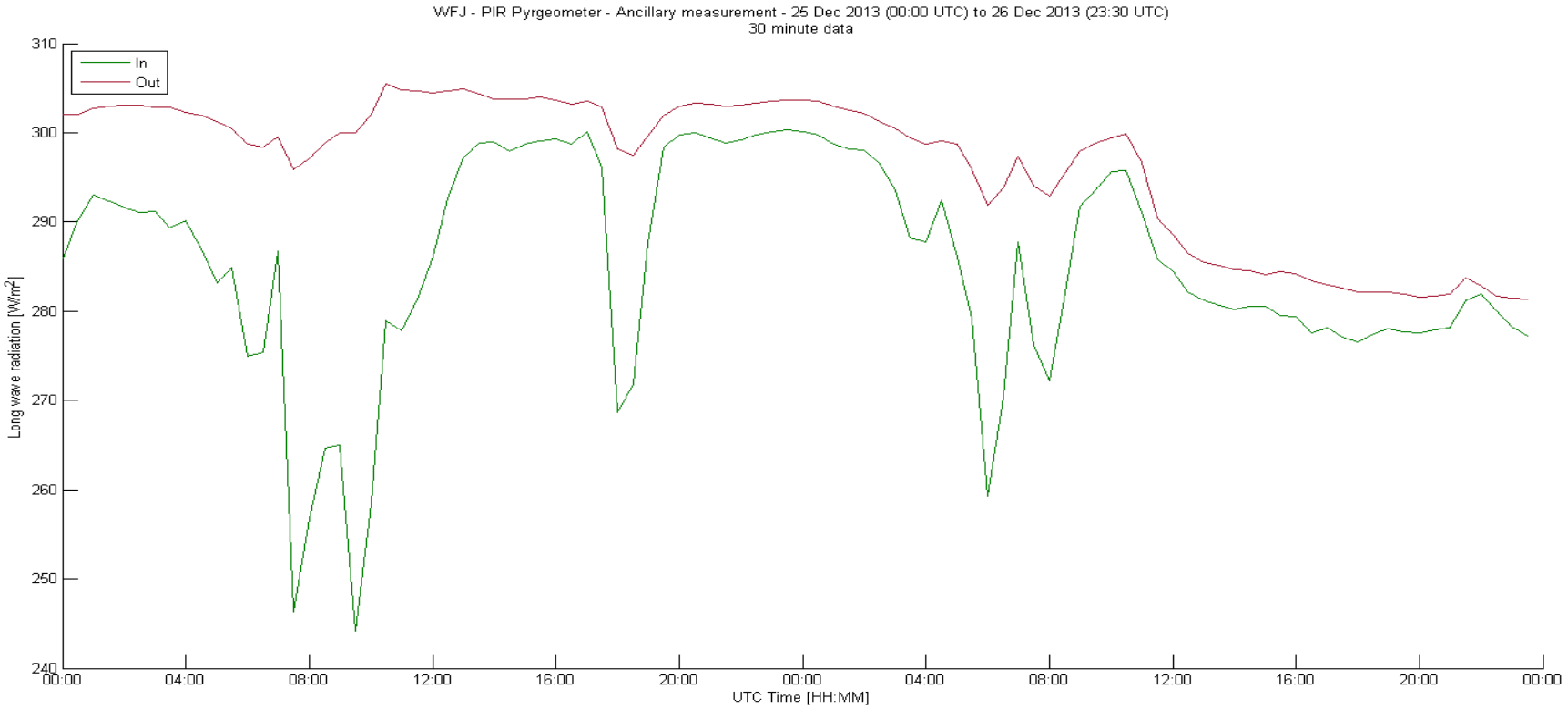
Pictures of installation – CM21 + CG4 (2 times) Radiation Measurements (Positions n°21 to 24)

Pictures taken from West

48h Plot.


WFJ - CM21 Pyranometer - Ancillary measurement - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:30 UTC)
30 minute data
In
Out
Short wave radiation [W/m2]
180
160
140
120
100
80
60
40
20
0
-20
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC Time [HH:MM]

48h Plot.


WFJ - PIR Pyrgeometer - Ancillary measurement - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:30 UTC)
30 minute data
In
Out
Long wave radiation [W/m²]
310
300
290
280
270
260
250
240
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Young Wind Monitor (2 of 3)**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Wind speed and direction
Instrument number 21 of 24

Manufacturer	R. M. Young
Model	1503
Serial number	122170
Firmware version (if applicable)	None

Field configuration

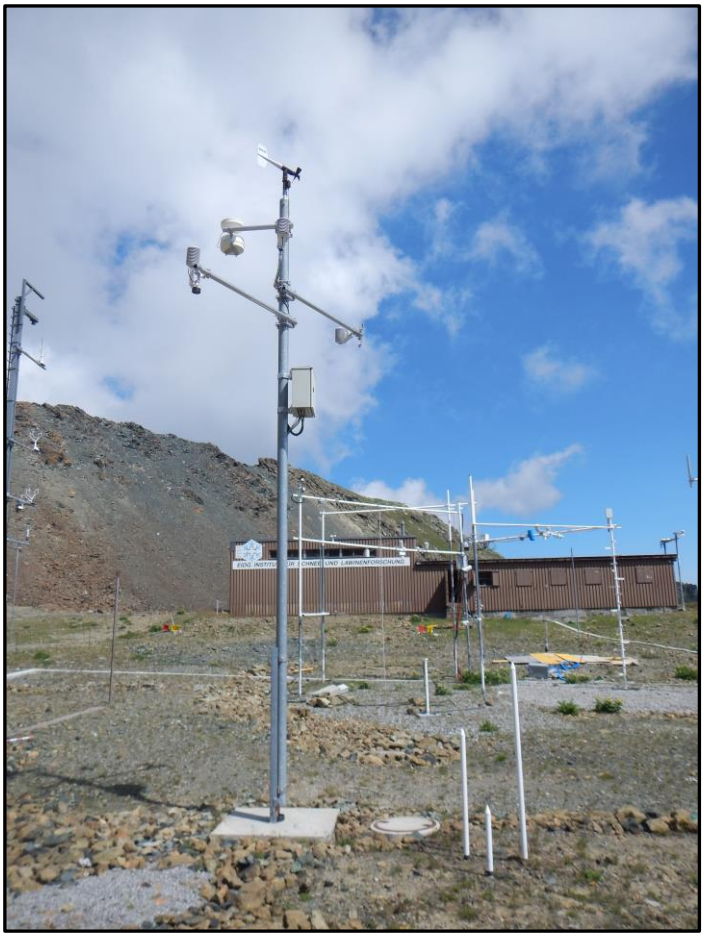
Location on site	Position n°25 (Please refer to site layout)
Orientation	None
Height (measured at top)	5.5 m
Shield (if applicable)	None
Heating (if applicable)	None

Data output

Data communication protocol	Analog output
Output data message format (include description of fields)	[wsp] [wind_dir] Wind speed (m/s) Wind direction (grad)
Data sampling rate	5 seconds
Data acquisition interval	30 minutes **Method**: Wind speed: Average Wind direction : Resultant vector direction from vector addition

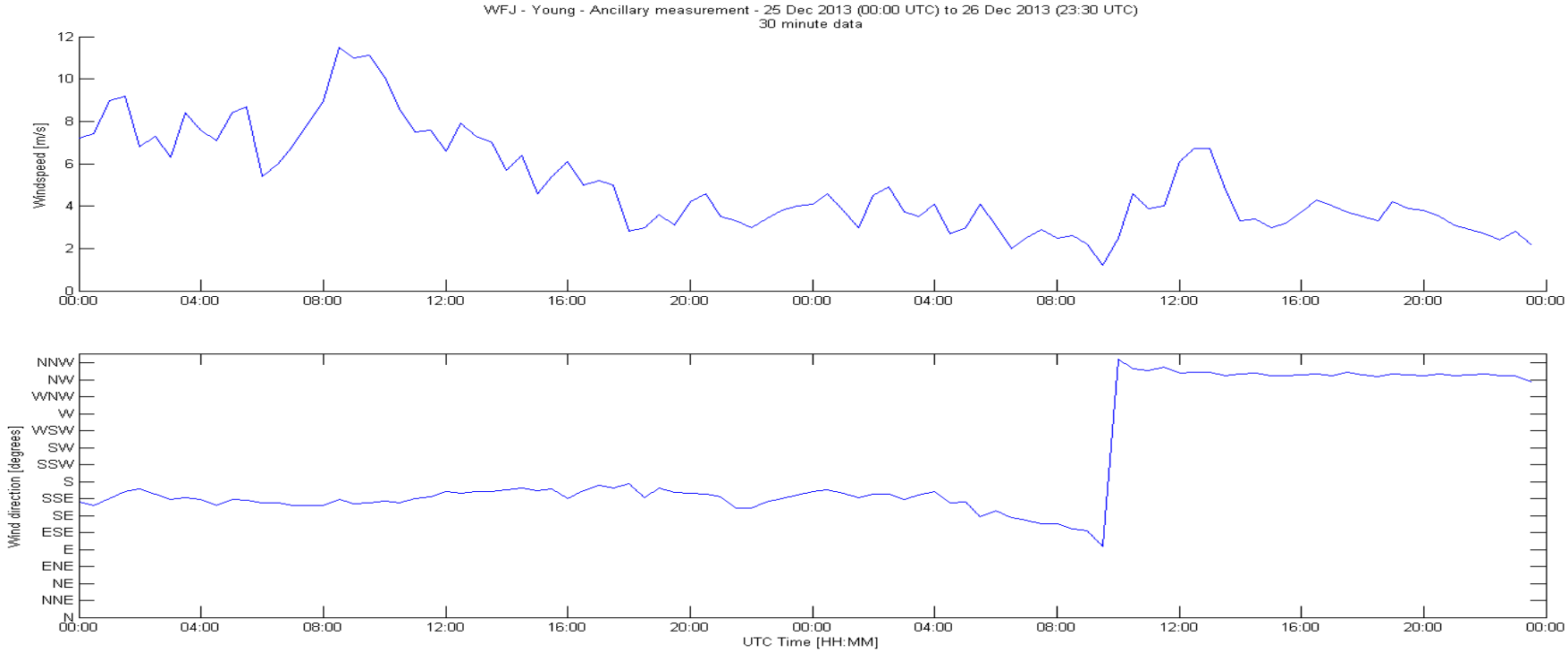
Field calibration : None

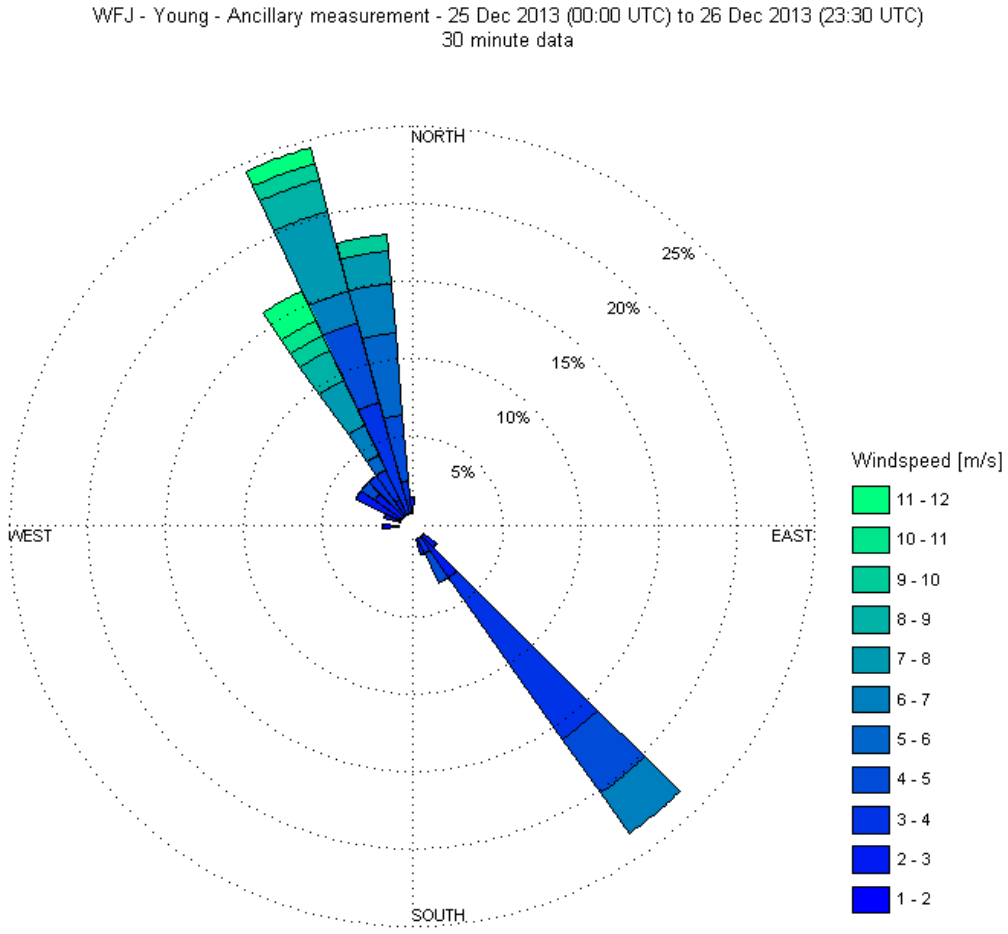
Pictures of installation – Young Wind Monitor (2 of 3) (Position n°25)



Pictures taken from West

48h Plot.


WFJ - Young - Ancillary measurement - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:30 UTC)
30 minute data
Windspeed [m/s]
0
2
4
6
8
10
12
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Wind direction [degrees]
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
UTC Time [HH:MM]


WFJ - Young - Ancillary measurement - 25 Dec 2013 (00:00 UTC) to 26 Dec 2013 (23:30 UTC)
30 minute data
NORTH
EAST
SOUTH
WEST
25%
20%
15%
10%
5%
Windspeed [m/s]
11 - 12
10 - 11
9 - 10
8 - 9
7 - 8
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2

Instrument Metadata Report

Instrument Name: **Manual measurement of Snow on the Ground**
Instrument Status : Under test (for Snow on the Ground)
Type of measurement : Manual
Parameter measured : Snow profile, snow height and SWE
Instrument number 22 of 24

Location on site	Position n°26 (Please refer to site layout)
Method used	Measurement of snow profile (including SWE and snow height)
Equipment used	Scale, double meter stick, pin cylinder (small), magnifier, etc.
Frequency of measurement	2 per month

Pictures of installation – Manual measurements (Position n°26)

Pictures taken in small hut

Instrument Metadata Report

Instrument Name: **Pressure transmitter**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Pressure
Instrument number 23 of 24

Manufacturer	Vaisala
Model	PTB101B
Serial number	S3730013
Firmware version (if applicable)	N/A

Field configuration

Location on site	Position n°27 (Please refer to site layout)
Orientation	None
Height (measured at top)	N/A
Shield (if applicable)	None
Heating (if applicable)	N/A

Data output

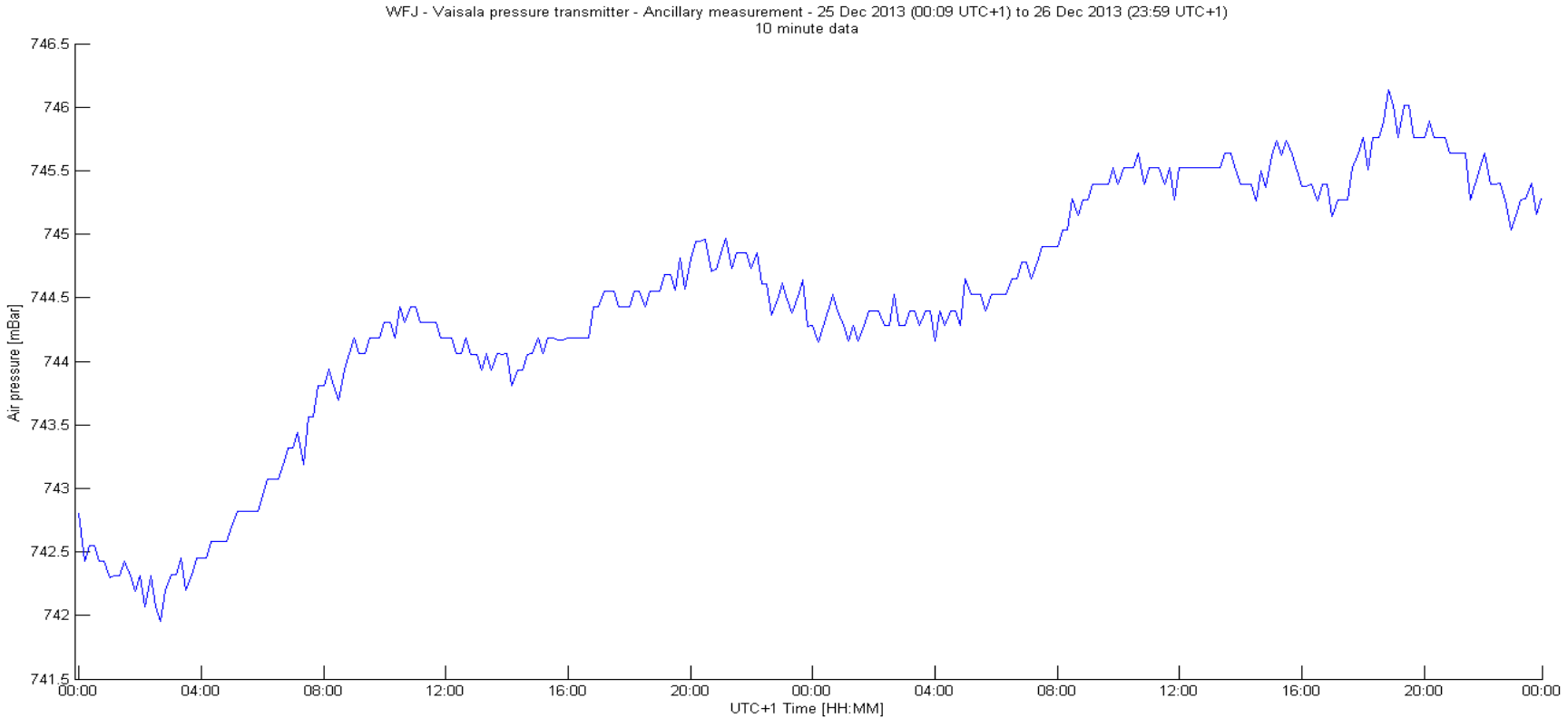
Data communication protocol	Analog 0 – 2.5V = 600 – 1060 hPa
Output data message format (include description of fields)	[Timestamp] [air_pressure] Timestamp (UTC+1) Air pressure (mbar)
Data sampling rate	10 seconds
Data acquisition interval	10 minutes

Picture of installation – pressure transmitter (Position n°27)

Picture taken in small hut

Field calibration **(if any) :** N/A

48h Plot.


WFJ - Vaisala pressure transmitter - Ancillary measurement - 25 Dec 2013 (00:09 UTC+1) to 26 Dec 2013 (23:59 UTC+1)
10 minute data
Air pressure [mBar]
746.5
746
745.5
745
744.5
744
743.5
743
742.5
742
741.5
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC+1 Time [HH:MM]

Instrument Metadata Report

Instrument Name: **Young Wind Monitor (3 of 3)**
Instrument Status : Ancillary measurement
Type of measurement : Automatic
Parameter measured : Wind speed and direction
Instrument number 24 of 24

Manufacturer	R. M. Young
Model	05103
Serial number	112073
Firmware version (if applicable)	None

Field configuration

Location on site	Position n°28 (Please refer to site layout)
Orientation	Junction Box facing South
Height (measured at top)	3.5 m
Shield (if applicable)	N/A
Heating (if applicable)	None

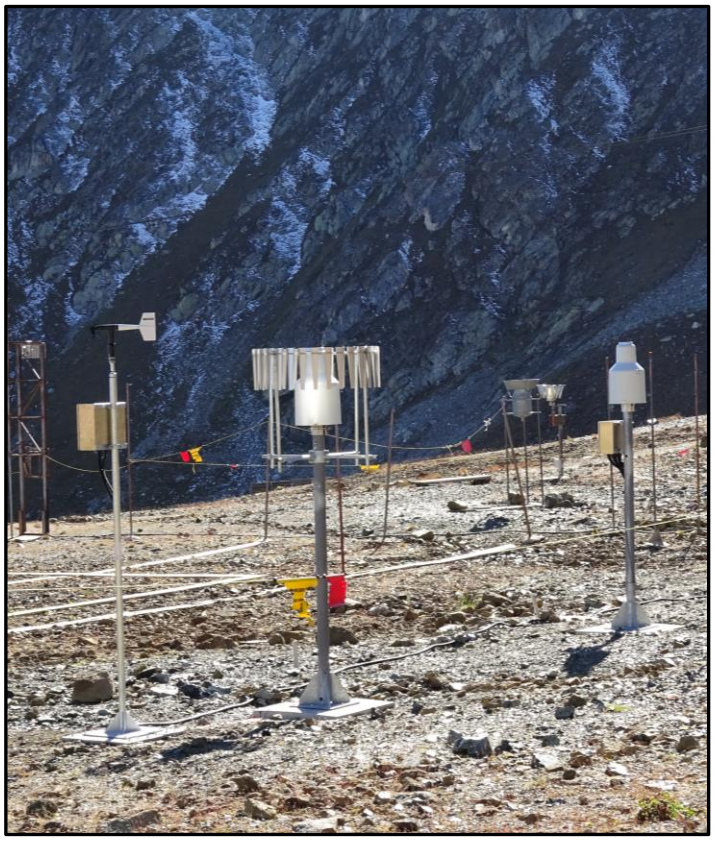
Data output

Data communication protocol	Analog Output
Output data message format (include description of fields)	[Wind speed] [Wind direction]
Data sampling rate	1 sec
Data acquisition interval	1 min

Field calibration (if any) : None
Installed on September 22, 2014.

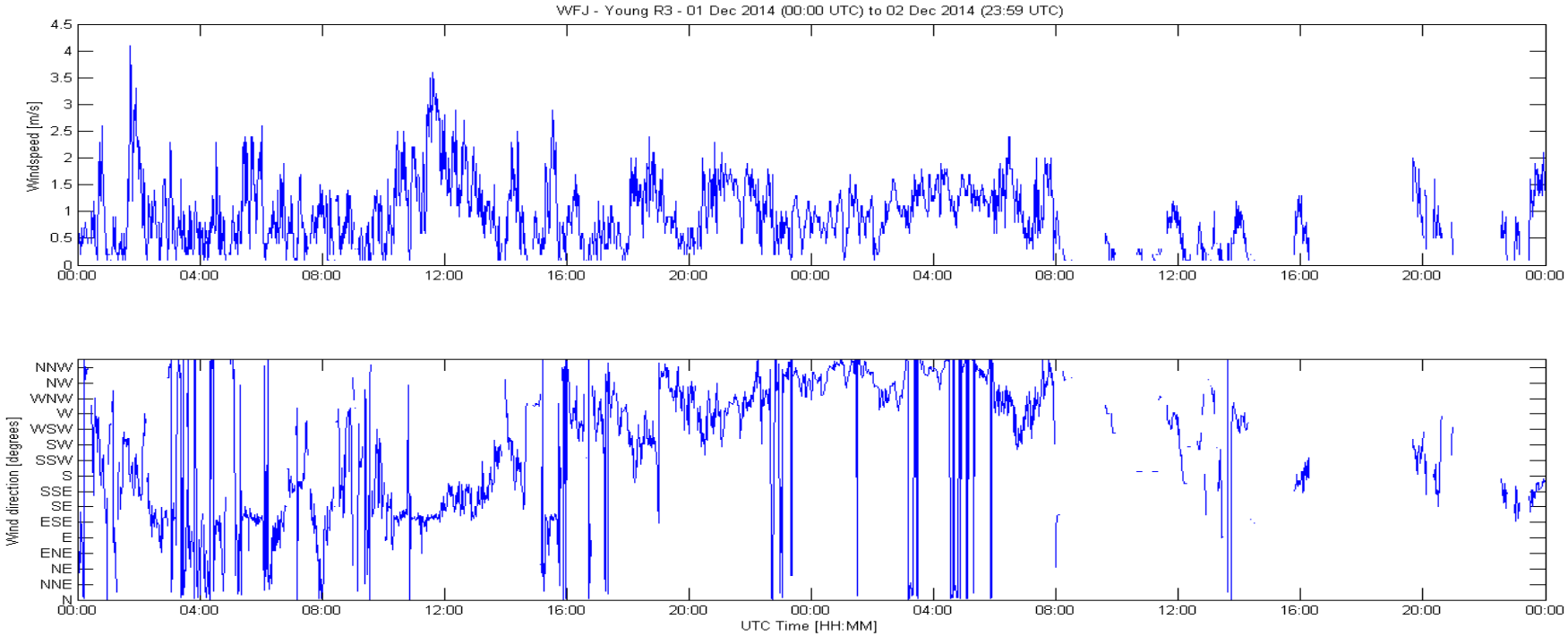
Picture of installation – Young Wind Monitor (3 of 3) (Position n°28) – wind measurement for R3

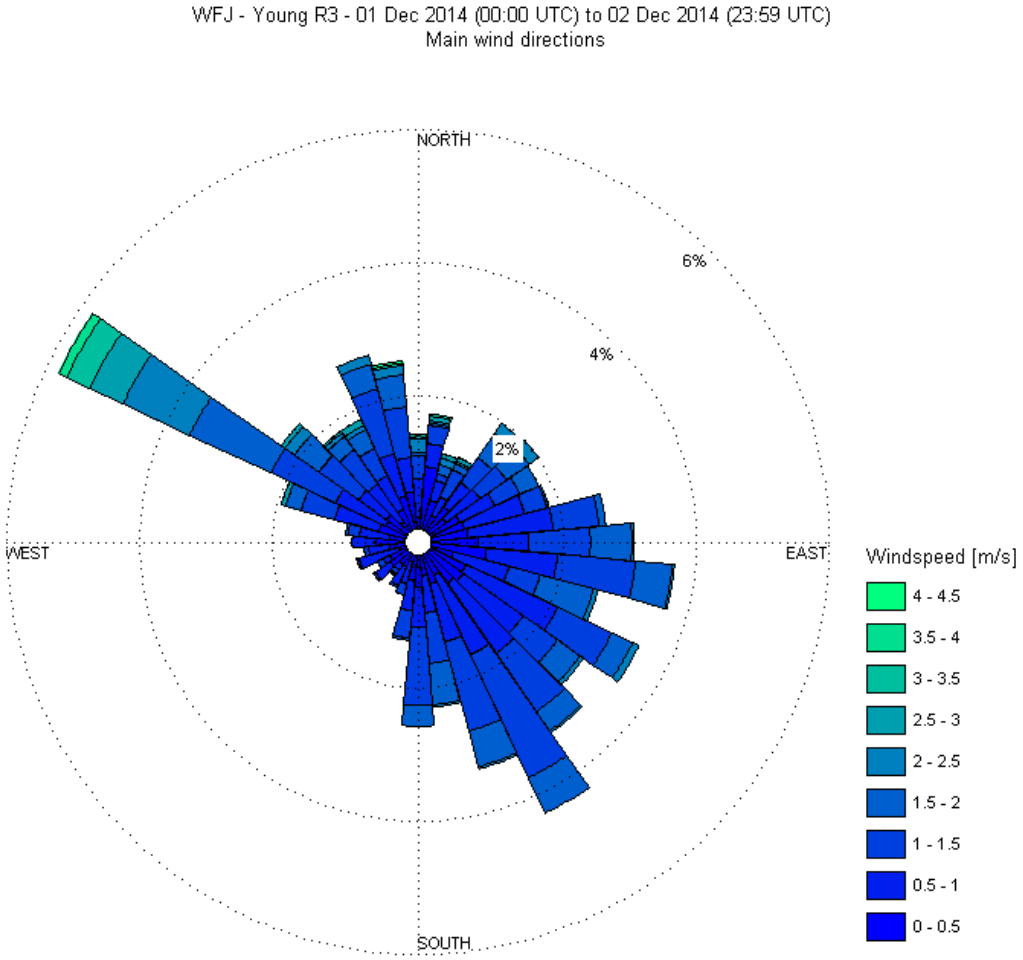
Picture taken from South



Picture taken from North-East
Wind sensor near R3 reference

48h Plot.


WFJ - Young R3 - 01 Dec 2014 (00:00 UTC) to 02 Dec 2014 (23:59 UTC)
Windspeed [m/s]
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
Wind direction [degrees]
NNW
NW
WNW
W
WSW
SW
SSW
S
SSE
SE
ESE
E
ENE
NE
NNE
N
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
UTC Time [HH:MM]


WFJ - Young R3 - 01 Dec 2014 (00:00 UTC) to 02 Dec 2014 (23:59 UTC)
Main wind directions
NORTH
EAST
SOUTH
WEST
2%
4%
6%
Windspeed [m/s]
4 - 4.5
3.5 - 4
3 - 3.5
2.5 - 3
2 - 2.5
1.5 - 2
1 - 1.5
0.5 - 1
0 - 0.5

SECTION A4: Confirmation of Experiment Configuration

TEST 1: INSTRUMENT CALIBRATION AND CHECKS

The Site Manager will organize the check and calibration of each instrument included in the experiment (as part of the reference, or as an instrument under test). The check sheets and calibration results will be included in the designated areas of Sections A2 and A3.

- The calibration and check of the WG used as part of the reference will be conducted based on the guidelines adopted by the SPICE IOC.
- The calibration and check of the instruments under test will be conducted as specified by the manufacturer prior to the installation on the SPICE site, as well as following the installation in the field.

TEST 2: INSTRUMENT VALIDATION

After the field installation of each instrument (both those that are part of the reference and those that are instruments under test), at the minimum, a **continuous 48 hour data set** of the entire test setup will be stored and examined as an indication of instrument performance**.** The data sets for each instrument included in the intercomparison will be reviewed for data integrity and representativeness, against the predefined data format.

The evaluation of the instrument performance at this stage will be conducted using the 48 hour time series plots provided in Sections A2 and A3. The readiness state of each instrument will be reported in the Instrument Data Validation table below.

Any discrepancies will be investigated, addressed, and documented. Following the resolution of the discrepancies, the 48-hour end to end (e2e) test will be repeated. Notes, plots, logs, will be appended to the POP table of the reference/instrument under test, and the readiness state and date will be updated in the Instrument Data Validation table.

TEST 3: SITE-TO-ARCHIVE TRANSFER VALIDATION

Once the transfer of site data files to the SPICE Data Archive at NCAR has been initiated, compare the site data with those received at the SPICE Data Archive for a 24 hour period to ensure that no errors occurred during archival or transmission.
If any errors occur, log them and following the resolution of the discrepancies, repeat the 24-hour validation test.

When the Test 3 is passed mark the check box YES in the Instrument Data Validation table below (this means that they have been also validated), with the starting date of the data transfer.

If Test 3 is not passed at the time of the Commissioning Report tick the checkbox NO and provide the expected date.

(Plots, datasets, errors logs, referred to Test 3 are **NOT** included in this document but archived by the site manager if further tests or analysis are required),

IMPORTANT: *Test 2 and Test 3 may be conducted simultaneously, depending on the site configuration.*

Instrument Data Validation

Instrument	Readiness (if Yes, indicate the date)	Data transfer to NCAR archive (**Test 3**) (If the answer is No report the expected date) **	Comments
N°1 : OTT Pluvio² (DFIR)	☒ Yes ☐ No Date: February 7, 2013	☐ Yes ☒ No Date: February 2015	No shield until October 2, 2013
N°2 : OTT Pluvio² (Single Alter shield)	☒ Yes ☐ No Date: February 7, 2013	☐ Yes ☒ No Date: February 2015	No shield until October 2, 2013
N°3 : OTT Pluvio² (Unshielded)	☒ Yes ☐ No Date: February 7, 2013	☐ Yes ☒ No Date: February 2015	Entire gauge has been changed on June 17, 2014 for heating version. Before, no heating system.
N°4 : Geonor T-200B3MD	☒ Yes ☐ No Date: February 7, 2013	☐ Yes ☒ No Date: February 2015	Change of a transducer on October 28, 2013.

** Data are transferred automatically to NCAR since March 2014 but we haven't had a chance to apply the Test 3 because we still need to send older data and check again if all is ok. We hope to do so by February 2015.

N°5 : Belfort AEPG 600	☒ Yes ☐ No Date: February 7, 2013	☐ Yes ☒ No Date: February 2015	Bad calibration between September 23, 2013 and February 3, 2014.
N°6 : Meteoservis MR3H-FC (ZAMG version)	☒ Yes ☐ No Date: December 13, 2013	☐ Yes ☒ No Date: February 2015	
N°7 : Thies LPM (in DFIR)	☒ Yes ☐ No Date: December 13, 2013	☐ Yes ☒ No Date: February 2015	523 parameters loaded from February 5, 2014 (particles diameters/velocities distributions)
N°8 : FROS-D GPS	☒ Yes ☐ No Date: October 28, 2013	☐ Yes ☒ No Date: ??	Instrument installed, but no data collected since start. The antenna didn't work and was changed on December 16, 2014. Data are collected by the provider.
N°9 : Young Wind Monitor (in DFIR)	☒ Yes ☐ No Date: December 13, 2013	☐ Yes ☒ No Date: February 2015	
N°10 : Lufft WS600 (in DFIR)	☒ Yes ☐ No Date: December 13, 2013	☐ Yes ☒ No Date: February 2015	Sporadic shifts in data due to data transfer by logger. When occurs, data were removed.
N°11 : Thies LPM (shielded)	☒ Yes ☐ No Date: December 13, 2013	☐ Yes ☒ No Date: February 2015	
N°12 : Snow Board	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°13 : Lysimeter	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°14 : Snow Pillow	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	

N°15 : Graduate Stake	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°16 : SSG Snow Scale	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°17 : SR 50 AT	☒ Yes ☐ No Date: October 18, 2013	☐ Yes ☒ No Date: February 2015	
N°18 : Jenoptik SHM30	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°19 : OTT Pasivel 1	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°20 : Thygan	☒ Yes ☐ No Date: October 1, 2013	☐ Yes ☒ No Date: February 2015	
N°21&22 : CM21 pyranometer (x2)	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°23&24 : PIR Pyrgeometer (x2)	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°25 : Young Wind Monitor (ENET mast)	☒ Yes ☐ No Date: October 18, 2013	☐ Yes ☒ No Date: February 2015	
N°26 : Manual measurement of SOG	☒ Yes ☐ No Date: November 29, 2013	☐ Yes ☒ No Date: February 2015	
N°27 : Pressure transmitter	☒ Yes ☐ No Date: October 1, 2012	☐ Yes ☒ No Date: February 2015	
N°28 : Young Wind Monitor (near R3 reference)	☒ Yes ☐ No Date: October 3, 2014	☐ Yes ☒ No Date: February 2015	

SECTION A5: Site Documentation Checklist

A **Site Documentation Checklist** is provided below to track the inclusion of requisite documentation, data plots, and photos in sections A1 to A4.

Site Documentation Checklist

Site information and layout (Section A1)	☒ Included
Complete set of pictures documenting the overall site installation - views from N, E, S, W (Section A1)	☒ Included
Details of manual measurement procedure (Section A2)	☒ Included ☐ Not Applicable
Instrument Metadata Reports for all instruments under test and all instruments used to provide ancillary measurements (Section A3)	☒ Included
Calibration results and check sheets for all instruments (Sections A2, A3)	☒ Included
Instrument data validation:, 48h time series plots (Sections A2, A3)	☒ Included
Instrument data validation table (Section A4)	☒ Included
48h Instrument data validation: discrepancy reports (Section A4)	☐ Included ☒ Not Applicable
Pictures of installations of all reference instruments, instruments under test, and instruments used to provide ancillary measurements (Sections A2, A3)	☒ Included
End-to-end data validation (Section A4; see Instrument data validation table).	☒ Full (all gauges) ☐ Partial (some gauges) ☐ No
SPICE archive end-to-end data validation: discrepancy reports (Section A4)	☐ Yes ☒ No
Details of any workarounds (Sections A2, A3, A4)	☐ Included ☒ Not Applicable