WMO SPICE

SITE COMMISSIONING PROTOCOL

V3.1 (JUL, 23 2013)

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1. ORGANIZATION OF THE DOCUMENT

The Commissioning Protocol is organized into four parts:

1. **The site components,** data transfer and sharing pathways, and project organizational structure are outlined in Section 3;
2. **The site commissioning procedures**, including pre-commissioning activities and the Interaction with the Instrument Providers, Sections 4 to 6;
3. **SPICE Data Archive,** Section 7**.**
4. **Appendix A: the template for the Proof of Performance (POP) Report**, in which all site configuration details and commissioning activities are documented.

Appendix B outlines the SPICE Data Levels and Data Sets, and Appendix C includes a list of acronyms used throughout the document.

The first two sections are intended to provide background information on the commissioning process within the scope of the SPICE project, while the Appendix A contains the forms which are required to be filled out as part of the commissioning of the site. Once completed, these forms become the Commissioning Report.

The SPICE data archive section outlines the requirements regarding the SPICE data levels and datasets and the planned strategy for the archival of SPICE data to a central location(s).

2. PURPOSE AND SCOPE

This document is prepared by the WMO SPICE IOC. It outlines the procedures for post-installation testing and commissioning of the sites participating in the WMO SPICE experiment and documents the responsibilities for each aspect of the commissioning process.

Commissioning of a WMO SPICE site refers to the act of "turning it on" and marking the start of the collection of the "official" observations and measurements from the instruments included in the intercomparison (reference, instruments under test, ancillary measurements), and their archival on the designated Site Data Archive.
For this purpose, each site will designate a location for the Site Data Archive, which must protect the integrity of the intercomparison data.

End-to-end data quality and integrity for each instrument on each SPICE site will be verified before the commissioning can take place. It is essential that:

- Only agreed upon instruments are to be installed, in an accepted and standardized configuration;
- Each component be properly tested, and its performance verified, prior to commissioning;
- The transfer of instrument data to the Site Data Archive is validated and the archive secured.

Various individuals and organizations are referred to in this document as having responsibilities.

- SPICE IOC
- SPICE Project Team
- SPICE Data Analysis Team
- Site Manager
- Site (SPICE) Project Team
- ER refers to the Evaluation Representative, an individual named by the SPICE IOC
- IR, the Installation Representative, is identified by the Site Manager, responsible for the site configuration.
- Instrument Providers

3. CONFIGURATIONS AND ASSOCIATED COMMISSIONING REQUIREMENTS

3.1 SPICE SITE COMPONENTS

The SPICE Components include all or some of the following components:

- Field working reference systems (R3, and where applicable R2, and R1: site-specific)
- Reference measurements for snow on the ground (where applicable)
- Instruments under test provided by the host;
- Instruments under test supplied by the Instrument Providers;
- Ancillary measurements (both required and desired measurements listed):
  - Precipitation occurrence/intensity/size/type
  - Station pressure
  - Temperature/dew point
  - Relative humidity
  - Wind speed/direction (2-D and/or 3-D): different heights;
  - Manual observations
  - Vertical particle velocity
  - Net radiation
  - Snow Water Equivalent (SWE)
  - Icing occurrence
  - Visibility
  - Sky condition

- Derived or modeled ancillary parameters: wet bulb temperature, upper air temperature, snow particle density;
- Photography and video equipment for recording and archival of site conditions;

3.2 COMMUNICATION INTERFACES

The SPICE site teams are led by their respective Site Managers and are responsible to setup and manage an effective data communication system collecting, transmitting and archiving the site dataset, continuously, or at predefined intervals (e.g. daily) on the Site Data Archive.

As stated in the report of the SPICE IOC-2 meeting (Boulder), it is recommended that 6 s data be collected for gauges in reference systems and instruments under test, where possible; alternatively, 10 s or 60 s sample intervals can be used.
The frequency of the collection of ancillary measurements will be similar to that of the instruments under test, to the extent possible.

Data communication for SPICE includes the following components:

- Instrument to data logger (site specific);
- Instrument to a site data acquisition system located on site, site specific;
- Transmission of SPICE data from the site to a designated Site Data Archive;
- Transmission of SPICE data from the Site Data Archive to SPICE Archive(s) (See Section 7);
- Transmission of gauge-specific and requisite ancillary SPICE data to Instrument Providers for review.

The communication components and any future changes that may impact the availability of instruments will be documented. Any change to the configuration will be subject to a period of testing to ensure that the availability of instrument data is not affected. The IOC will review and accept the final configuration.

3.3 SPICE SITE PROJECT TEAM

The Site Manager will document the membership of the SPICE Site Project Team, including the names of the individuals who are engaged in the SPICE experiment on the respective site. This information will include reference to the roles relative to the SPICE experiment.
During the project, the participation in the SPICE Site Project Team could change. The Site Manager will to update the Site Documentation to reflect the changes (people, roles).

4. PRE-COMMISSIONING ACTIVITIES

The pre-commissioning activities are an integral part of the process of ensuring the quality of the experiment. The following sections detail the pre-commissioning activities ensuring that site infrastructure and procedures are properly managed and documented.

4.1 STATION INSTALLATION AND SCHEDULING

The IOC and the Site Managers will develop target dates for the installation and commissioning of each SPICE Site. An Installation Representative will be identified by the Site Manager to manage the installation. Site drawings, instrument siting and installation according to national standards, IOC agreed guidelines, or manufacturer recommendations, and exceptions will be documented as part of the POP Report.

4.2 TESTING OF INSTRUMENTS INCLUDED IN THE INTERCOMPARISON

The testing of instruments is conducted by the SPICE Site Project Team. Based on the results, the Site Manager will determine the readiness of instruments and the site for the formal phase of the experiment.

4.2.1 SITE DOCUMENTATION

Technical documentation for each SPICE component will include, but not limited to, the site layout, instruments details and configuration, data collection (including the data format), number of similar instruments, installation details, maintenance standards.
Specific information on the Site Documentation is provided in Appendix A.

4.2.2 MONITORING OF PERFORMANCE

The Site Manager will establish feasible procedures for monitoring the performance of instruments, identifying problems with the data, and initiating and tracking remedial actions. This may include:

- Review data, diagnostic data, quick view plots, QC reports, etc.
- Establishing Site Journals/Blogs documenting the performance and intervention on the instruments (directly – e.g. snow clearing - or indirectly – e.g. system reset -)

4.2.3 SITE MAINTENANCE

The SPICE Site Manager will ensure that site maintenance is available to limit the periods or data outage.

5. COMMISSIONING ACTIVITIES

The commissioning of a SPICE site is led by the Site Manager. The SPICE POP Report will document the status of the site operation at the start of the intercomparison.

The site commissioning process consists of the following steps:

- Determine the instrument readiness, including;
  - ⇒ Installation and configuration of the instruments participating in the experiment;
  - ⇒ Data integrity confirmation at the Site Data Archive;
- Review and approval of the POP Report by the IOC;
- Agreement on the official start of the experiment on the site.

5.1 DETERMINATION OF SITE READINESS

This sub-section details the activities to be conducted following the installation of instruments, and which are completed prior to the official start of the SPICE experiment on the site.

5.1.1 SITE READINESS EVALUATION

The Site Manager will initiate the evaluation of the SPICE Site and will provide to the IOC adequate notice of the SPICE site commissioning.

The IOC will name a representative (the ER) to conduct the evaluation of the Site Documentation prepared by the Site Manager. The ER will work with the Site Manager on the evaluation of the POP Report.

The site readiness evaluation should be sufficient to ensure proper operation of all instruments and interfaces. The assessments will include:

- Satisfactory performance of the field reference system(s).
- Satisfactory performance of each instrument under test.
- Satisfactory performance of instruments providing ancillary measurements.
- Satisfactory performance of site communication components and interfaces.
- Satisfactory performance of the data transmission to the Site Data Archive;
- Proper functioning of service backup capabilities for that particular site, if available.
- Maintenance capacity.

5.1.2 COMPLETION OF POP REPORT

The SPICE Site POP Report documents the readiness of the site and is approved by the IOC.

The POP Report includes:

- A form for recording station information and configuration, including the site layout;
- A form for documenting the configuration of SPICE field working reference configurations, including both manual and automatic measurements;
- Forms for recording the specifications of instruments under test and instruments used to provide ancillary measurements ;
- Details of tests conducted for instrument data validation;
- Details of tests conducted for end-to-end data validation;
- A checklist for all additional documentation to be recorded and submitted ;
- A table for recording commissioning milestones.

The Site Manager will provide the POP Report to the IOC, for final review.

5.1.3 INVOKING WORKAROUNDS

A workaround is a temporary solution to a system limitation that requires special attention and will be removed eventually. Any workarounds will be documented and included as part of the POP Report. Each work-around will be tracked as an open item until resolved.

5.2 Approval of Site Commissioning

The Site Manager will notify and update the IOC on the organization and completion of the tests outlined in Appendix A. Once all tests results are verified, the IOC and the Site Manager will agree on the start date of the formal experiment on the site.

In case some of the instruments under test are not ready for the start of the experiment as planned (currently Nov. 15, 2012), the experiment could commence in steps, provided that all field references and key ancillary parameters (wind speed and direction, temperature) have been commissioned.

Commissioning of additional instruments would follow as their configurations are finalized; this will allow for their inclusion in the experiment as early as feasible, with no compromise to the data quality. The Data Analysis Team will take into consideration the commissioning data for each instrument.

5.3 Implementation of Approved SPICE Site Commissioning

Upon commissioning, the site will commence the official collection of the SPICE project dataset and ancillary measurements/observations.

6. Interaction with the Instrument Providers

Instrument Providers are responsible for the delivery of their instruments to the SPICE Sites and for supporting the Site Managers in verifying their proper functioning before and during SPICE.

6.1 Pre-Commissioning Activities: Engagement of the Instrument Providers

During the installation, the Site Manager or a representative will engage the Instrument Provider regarding the preparation of their instruments, to ensure the operation within recommended standards.

The Site Manager would confirm with the Instrument Provider the functioning of the instrument prior to the commissioning of the site. This could be done by the sharing of instrument and/or ancillary data and pictures, coordinated site visits, or any other method agreed upon by the two parties.

The Site Manager should be able to indicate in the Commissioning Report the confirmation from the Instrument Provider that the instrument operates as expected.

6.2 Engagement of Instrument Providers during the Experiment

During the experiment, each Instrument Provider will be given access to the unprocessed output from its own instrument(s), and a minimum set of corresponding ancillary data consisting of air temperature, relative humidity, and wind speed. These data are provided only for ensuring the proper functioning of the instruments, and will neither be reported nor published prior to publication of the SPICE Final Report.

The Site Manager will coordinate the data transfer to the Instrument Provider(s), including such aspects as the frequency, methodology, etc. It is desired that this data transfer is in place prior to the start of the experiment. The Instrument Provider is expected to alert the Site Manager in the event that a malfunction of an instrument is noted, and provide support to the Site Project team (including site visits), if needed, to address the failure.

The Instrument Providers could visit the intercomparison sites, after prior arrangements are made with the Site Manager.

7. SPICE DATA ARCHIVAL

The SPICE Project Team will establish and maintain a SPICE Archive on at least one SPICE designated Server where the Site Intercomparison Datasets and the Input Documentation will be stored. This will facilitate the preparation of data for the individual and comparative data analysis and the preparation of the Final Report. A description of the data levels and datasets for SPICE, as currently defined, is provided in Appendix B.

The National Centre for Atmospheric Research (NCAR), USA, will host the SPICE Archive and provide quick view capabilities of (near) real time data. Options for a second SPICE Archive are being explored by Environment Canada, Canada.

Each Site Manager will work towards preparing the transfer of Level 1 and Level 2a datasets to the SPICE Archive(s). The IOC will provide to the Site Managers the requirements regarding the data transfer to enable the preparation of datasets (format change, setup of data uploads/availability, etc…)

The data transfer between the Site Data Archive and the SPICE Archive is expected to be established and validated within 3 months of the official start of the experiment, and implemented based on site specific conditions and limitations.

APPENDIX A: PROOF OF PERFORMANCE (POP) FORMS

SECTION A1: STATION INFORMATION

Station name	SPICE Site Sodankylä, Finland
Reference town	Sodankylä
Station latitude	67° 21' 59.87"
Station longitude	26° 37' 44.44"
Station elevation in metres	179 m

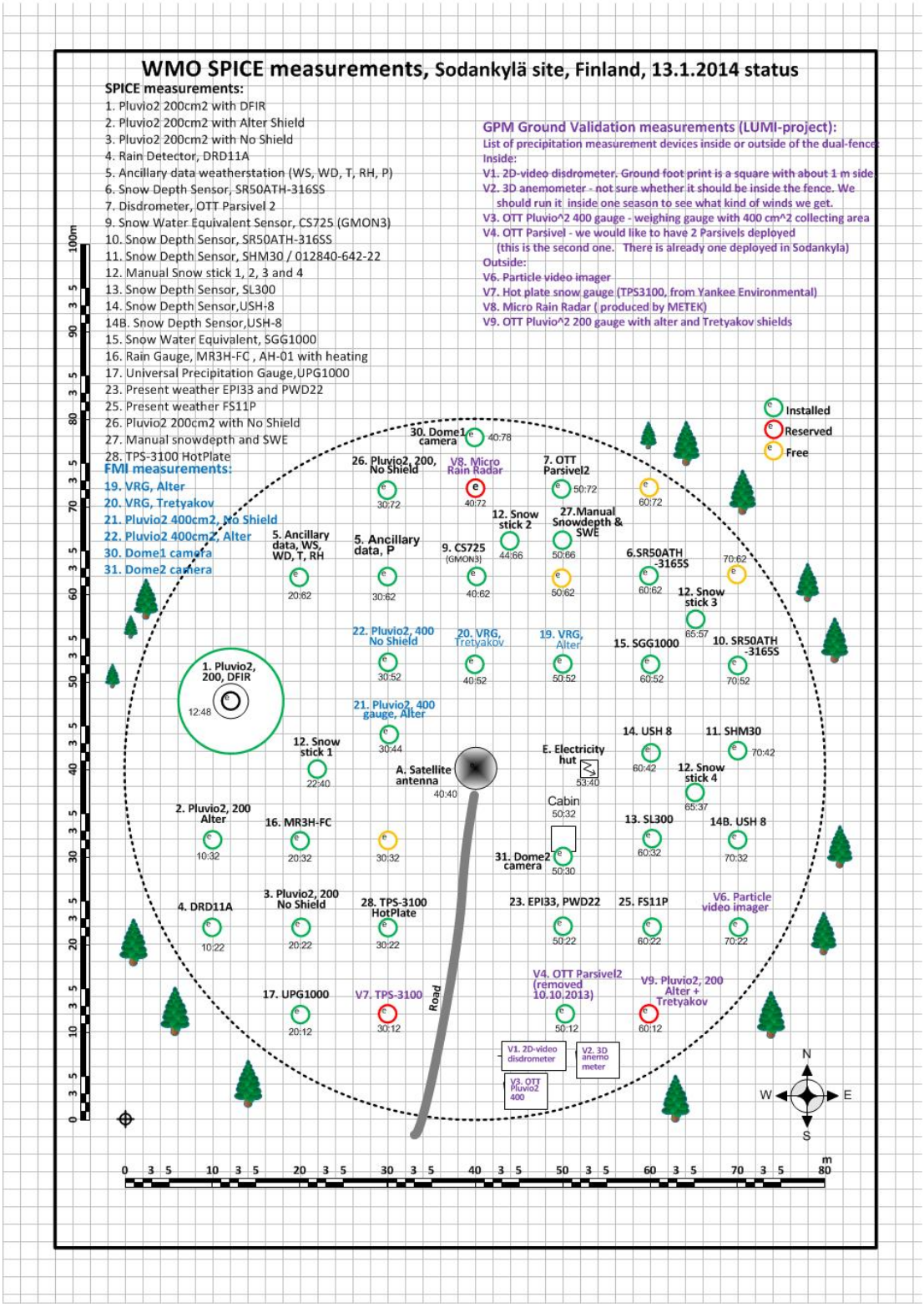


Figure 1: Sodankylä WMO/SPICE site layout and instrument information

Insert here a set of pictures documenting the overall site installation (views from N, E, S, W).

It is suggested to submit here also a horizon / sky view diagram taken with a camera., if available

towards South

towards West

towards North

towards South-West

towards East-West

SECTION A2: SPICE Field Working Reference System configuration

Field Reference Type R2 (Automatic)

Overall situation

Sodankylä SPICE field is built on a forest field which is 80 meter in diameter. The surrounding trees are all 10-12 meters high. This round forest field is the first level wind shield in this SPICE field. In general the winds also are weak in Sodankylä.

Configuration of the DFIR fence

Description of surrounding obstacles (including distance/direction from, height, and type)	DFIR fence is located 8 m from the edge of the forest. The Ancillary measurements are located 9 m of the DFIR. The nearest instruments (other Pluvios) are 11

	m of the DFIR
Diameter	12,0 m
Height of the outer fence (measured at the top)	4,0 m
Height of the inner fence (measured at the top)	3,5 m
Length of slats	1,5 m
Width of slats	50 mm
Slat material	wood

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)

Make and model	OTT Pluvio 200
Serial number	311956
Firmware version (if applicable)	V 1.30.1
Number of transducers (if applicable)	
Height of installation (measured from the top of the gauge)	4000 mm
Heater configuration and algorithm	The rim heating algorithm of Pluvios were changed 18.3.2013 from WMO-heating algorithm to Pluvio's own internal algorithm.
Output data message format	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the Pluvio2, place 1248. #1) Int_RT,Intensity RT,mm/min #2) A_RT_NRT,Accumulated RT/NRT,mm #3) A_NRT,Accumulated NRT, mm #4) A_Tot_NRT,Accumulated total NRT,mm

	#5) B_ #6) B_ #7) LC #8) HS #9) St #10) E #11) S #12) O #13) H 201309 91,02.
Data sampling rate	6 s
Data acquisition interval	6 s

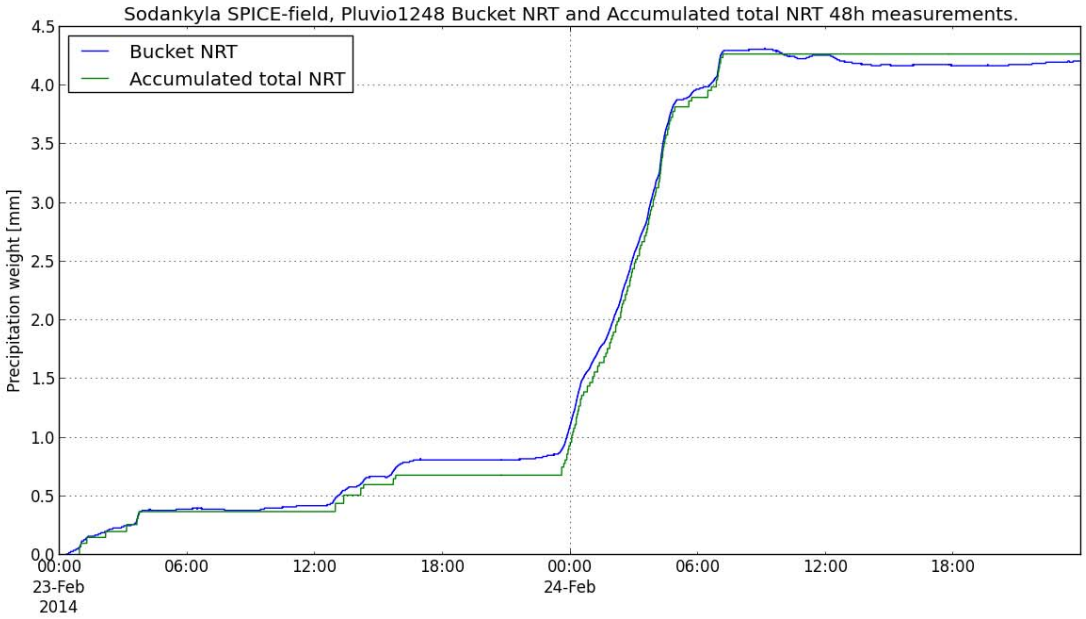
Precipitation detector

Make and model	
output data message format	
Data sampling frequency	
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* • *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*	

Figure 2. Field Reference Type R2 (Automatic)

PLUVIO1248 CALIBRATION, Date 2013-10-02, Calibration passed. S/N 311956					
Action	**Bucket_NRT [mm]**	**meas. diff [mm]**	**meas. diff [gr]**	**meas.-ref [gr]**	**meas.-ref[mm]**
Start (empty)	247.83				
Added ref. 1006.0 gr	298.14	50.31	1006.2	0.2	**0.01**
Added 6 ltr water	568.44				
Removed 1006.0 gr	518.11	50.33	1006.6	0.6	**0.03**
		The sensor's absolute accuracy based on the manual is +-0.1mm			

Table. Field Calibration of Reference Type R2 (Automatic)



48h Plot. Field Reference Type R2 (Automatic)

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)	Location on the field 10 meters of the edge of the forest and 10 m of nearest other instruments.
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.	

Weighing gauge (1 of 2)

Make and model	OTT Pluvio 200
Serial number	311957
Firmware version (if applicable)	V 1.30.1
Number of transducers (if applicable)	
Height of installation (measured from the top of the gauge)	1500 mm
Heater configuration and algorithm	The rim heating algorithm of Pluvios were changed 18.3.2013 from WMO-heating algorithm to Pluvio's own internal algorithm.

Output data message format	`#FIN_LIT`
	`#Sodankyla site SPICE field, FINLAND`
	`#Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0`
	`#Data is collected from the Pluvio2, place 1032.`
	`#1) Int_RT,Intensity RT,mm/min`
	`#2) A_RT_NRT,Accumulated RT/NRT,mm`
	`#3) A_NRT,Accumulated NRT, mm`

	#4) A_Tot_NRT,Accumulated total NRT,mm #5) B_RT,Bucket RT,mm #6) B_NRT,Bucket NRT,mm #7) LCTemp,Temperature of load cell,C #8) HStatus,Heating status,code #9) Status,Status,code #10) ETemp,Temperature of electronics unit,C #11) Supply,Supply voltage,V #12) OTemp,Temperature of orifice ring rim,C #13) HFla,Heating flag 1=ON 0=OFF,code 20130913,00:00:00,0000.00,0000.00,0000.00,0324.85,0617.98,0617.98,02.7,000,000,02.5,25.0,04.9,0
Data sampling rate	6 s
Data acquisition interval	6 s

Weighing gauge (2 of 2)

Make and model	OTT Pluvio 200
Serial number	311955
Firmware version (if applicable)	V 1.30.1
Number of transducers (if applicable)	
Height of installation (measured from the top of the gauge)	1500 mm
Heater configuration and algorithm	The rim heating algorithm of Pluvios were changed 18.3.2013 from WMO-heating algorithm to Pluvio's own internal algorithm.
Output data message format	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the Pluvio2, place 2022. #1) Int_RT,Intensity RT,mm/min #2) A_RT_NRT,Accumulated RT/NRT,mm #3) A_NRT,Accumulated NRT, mm #4) A_Tot_NRT,Accumulated total NRT,mm #5) B_RT,Bucket RT,mm #6) B_NRT,Bucket NRT,mm #7) LCTemp,Temperature of load cell,C #8) HStatus,Heating status,code #9) Status,Status,code #10) ETemp,Temperature of electronics unit,C #11) Supply,Supply voltage,V #12) OTemp,Temperature of orifice ring rim,C #13) HFla,Heating flag 1=ON 0=OFF,code 20130913,00:00:00,0000.00,0000.00,0000.00,0240.86,0563.74,0563.74,02.1,000,000,02.4,25.2,04.7,0
Data sampling rate	6 s
Data acquisition interval	6 s

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

Make and model	
Data output format	
Data sampling frequency	
Height of installation.	
Location of installation relative to WGs in reference system.	

Pictures. Field Reference Type R3 (Automatic).

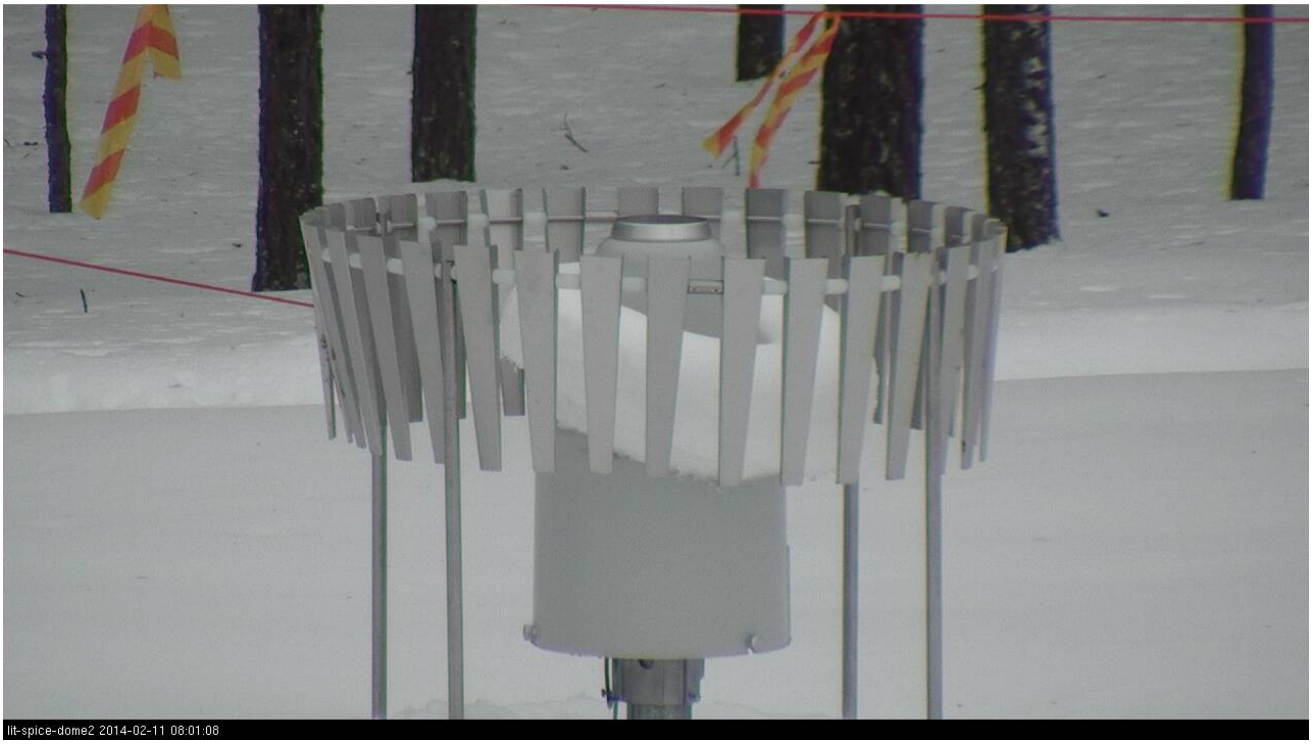


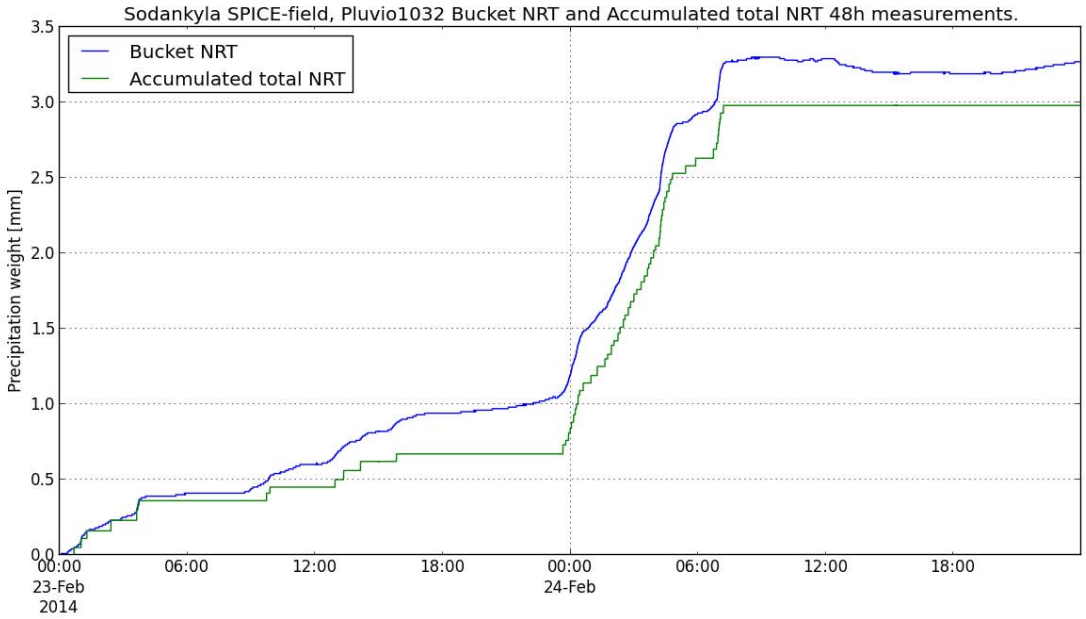
Figure 3: Weighing Gauge Ott Pluvio 200 with Alter shield

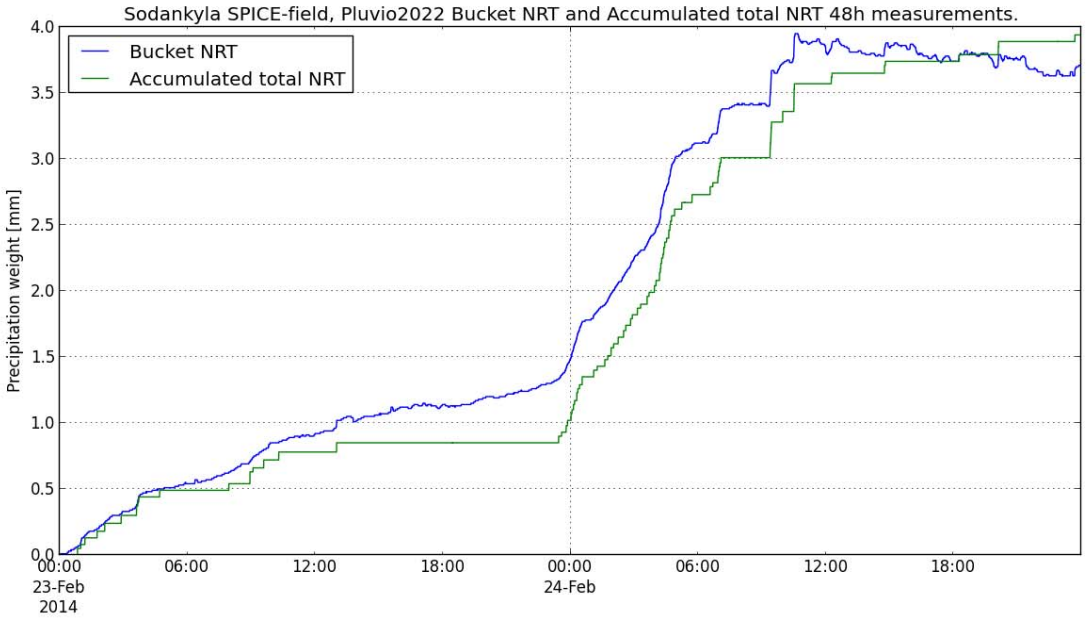
Figure 4: Weighing Gauge 2 Ott Pluvio 200 no shield

PLUVIO1032 CALIBRATION, Date 2013-10-02, Calibration passed. S/N 311957					
Action	**Bucket_NRT [mm]**	**meas. diff [mm]**	**meas. diff [gr]**	**meas-ref [gr]**	**meas-ref[mm]**
Start (empty)	250.7				
Added ref. 1006.0 gr	301.01	50.31	1006.2	0.2	**0.01**
Added 6 ltr water	617.18				
Removed 1006.0 gr	566.84	50.34	1006.8	0.8	**0.04**
		The sensor's absolute accuracy based on the manual is +-0.1mm			

PLUVIO2022 CALIBRATION, Date 2013-10-02, Calibration passed. S/N 311955					
Action	**Bucket_NRT [mm]**	**meas. diff [mm]**	**meas. diff [gr]**	**meas-ref [gr]**	**meas-ref[mm]**
Start (empty)	249.04				
Added ref. 1006.0 gr	299.42	50.38	1007.6	1.6	**0.08**
Added 6 ltr water	609.24				
Removed 1006.0 gr	558.89	50.35	1007	1	**0.05**
		The sensor's absolute accuracy based on the manual is +-0.1mm			

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





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

Field Reference for the Measurement of Snow on the Ground

Method used	**manually**
Equipment used	**4 pcs manual snow sticks (160 cm) centimetre scale**
Frequency of measurement	**once a day at 06.00 utc, video camera monitoring** **During Polar night period around at noon LT**

Figure 5. Field Reference for the Measurement of Snow on the Ground, one of the 4 manual snow sticks.

Table. Field Calibration for the Measurement of Snow on the Ground

48h Observation Table. Field Reference for the Measurement of Snow on the Ground

SECTION A3: INSTRUMENT METADATA REPORT

For each instrument under test and each instrument used to provide ancillary measurements, an Instrument Metadata Report should be completed in full and submitted as part of the POP Report.

Instrument Metadata Report

Ancillary data from Sodankylä SPICE site consists of a separate ancillary weather station that measures following parameters:

T, Rh, pp, DD and FMS

Instruments are:

Vaisala HMP155 (S/N F4640046) PT100 (T) for temperature (2m)

Vaisala HMP155 (S/N F4640046) Humicap (Rh) for relative humidity (2m)

Thies acoustic 2D wind sensor (S/N 1109122) for DD and FMS (3.5m)

Vaisala PTB220 (S/N E3330009) for pressure (1m)

Figure 6: Ancillary data measurements at Sodankylä SPICE field

Instrument Name: HMP155
instrument number _____1___ of _____1___

Manufacturer	Vaisala
Model	HMP155
Serial number	F4640046
Firmware version (if applicable)	

Field configuration

Location on site	20:62
Orientation	horizontal
Height (measured at top)	2,0 m
Shield (if applicable)	yes
Heating (if applicable)	

Data output

Data communication protocol	Ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #A data is collected from HMP155 temperature and humidity sensor, place 2062. #1) T, Air temperature 1min mean, C #2) RH, Air humidity, % #3) STATUS, Sensor Status, code 20140512,00:00:00,0.5,93,0000 20140512,00:01:00,0.5,93,0000
Data sampling rate	1 min
Data acquisition interval	1 min

Instrument Name: Thies acoustic 2D wind sensor
instrument number ____1__ of ____1__

Manufacturer	THIES
Model	THIES 2D
Serial number	1109122
Firmware version (if applicable)	

Field configuration

Location on site	20:62
Orientation	horizontal
Height (measured at top)	2,5 m

Shield (if applicable)	
Heating (if applicable)	yes

Data output

Data communication protocol	Ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #The data is collected from Thies 2D windspeed sensor, place 2062. #1) WS, Wind speed 1min mean, m/s #2) WSDev, Wind speed 1min deviation, m/s #3) WSGust, Wind speed Gust 1min maximum 3s average, m/s #4) WD, Wind direction 1min average, deg #5) WDDev, Wind direction 1min deviation, deg #6) T, Virtual temperature 1min average, C #7) STATUS, Sensor Status, code 20140512,00:00:00,01.0,00.7,01.2,295,049,01.2,C8 20140512,00:01:00,01.0,00.8,01.3,298,046,00.9,C8
Data sampling rate	1 min
Data acquisition interval	1 min

Instrument Name: PTB220 air pressure sensor
instrument number ____1__ of ____1__

Manufacturer	Vaisala
Model	PTB220
Serial number	E3330009
Firmware version (if applicable)	PTB220 / 3.05

Field configuration

Location on site	30:62
Orientation	horizontal
Height (measured at top)	1,0 m
Shield (if applicable)	
Heating (if applicable)	

Data output

Data communication protocol	Ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #The data is collected from PTB220 barometer sensor, place 3062. #1) P, Air pressure 1min mean, hPa #2) T, Sensor temperature, C #3) STATUS, Sensor status, code 20140512,00:00:00,980.15,1,0 20140512,00:01:00,980.17,1,0
Data sampling rate	1 min
Data acquisition interval	1 min

Instrument Name: DRD11A Rain Detector

instrument number _____1___ of _____1___

Manufacturer	Vaisala
Model	DRD11A
Serial number	
Firmware version (if applicable)	

Field configuration

Location on site	10:22
Orientation	horizontal
Height (measured at top)	1,0 m
Shield (if applicable)	
Heating (if applicable)	

Data output

Data communication protocol	Ascii

Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the DRD11A, place 1022. #1) rain, DRD11A rain on/off, code 20140512,00:02:00,0 20140512,00:03:00,0
Data sampling rate	1 min
Data acquisition interval	1 min

If other parameters are needed, those are collected from Sodankylä weather station about 200 meters away from the SPICE site.

Figure 7: Sodankylä automatic Weather Station (WMO: 02836)

Field calibration (if any).

48h Plot.

Instruments under test

Instrument Name: UPG1000
instrument number _____1__ of _____1__

Figure 8: UPG 1000

Manufacturer	EML
Model	UPG1000
Serial number	123955
Firmware version (if applicable)	

Field configuration

Location on site	20:12
Orientation	vertical
Height (measured at top)	2,0 m
Shield (if applicable)	yes
Heating (if applicable)	yes

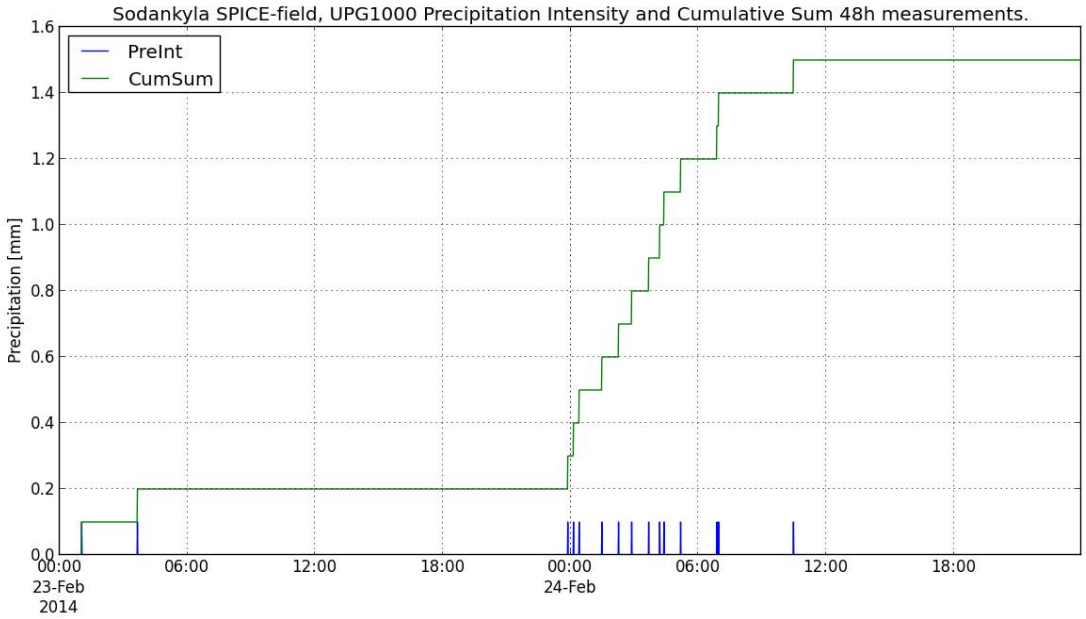
Data output

Data communication protocol	Ascii (Campbell CR800 logger)

Output data message format (include description of fields)	`#FIN_LIT`
	`#Sodankyla site SPICE field, FINLAND`
	`#Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0`
	`#The data is collected from UPG1000 sensor, place 2012.`
	`#1) RecNbr, Record Number, number`
	`#2) HeatSTATUS, Internal heater control status, code`
	`#3) IntTemp, Internal temperature, C`
	`#4) FunTemp, Funnel temperature, C`
	`#5) LogTemp, Logger temperature, C`
	`#6) PreInt, Precipitation Intensity 1min, mm/1min`
	`#7) FunSTATUS, Funnel heater control status, code`
	`#8) Volts, Power Voltage, Voltage`
	`20140224,00:00:00,229846,0,3.306,3.519,1.032,0.0,0,13.78`
	`20140224,00:01:00,229847,0,3.221,3.381,1.032,0.0,0,13.78`

Data sampling rate	1min
Data acquisition interval	1 min

Field calibration (if any).


Sodankyla SPICE-field, UPG1000 Precipitation Intensity and Cumulative Sum 48h measurements.
PreInt
CumSum
Precipitation [mm]
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
00:00
23-Feb
2014
06:00
12:00
18:00
00:00
24-Feb
06:00
12:00
18:00

48h Plot.

Instrument Name: SGG1000
Instrument number ____1__ of ____1__

Figure 9: SGG 1000

Manufacturer	Sommer
Model	SGG1000
Serial number	n/a
Firmware version (if applicable)	

Field configuration

Location on site	60:52
Orientation	horizontal on the ground
Height (measured at top)	ground level

Shield (if applicable)	n/a
Heating (if applicable)	

Data output

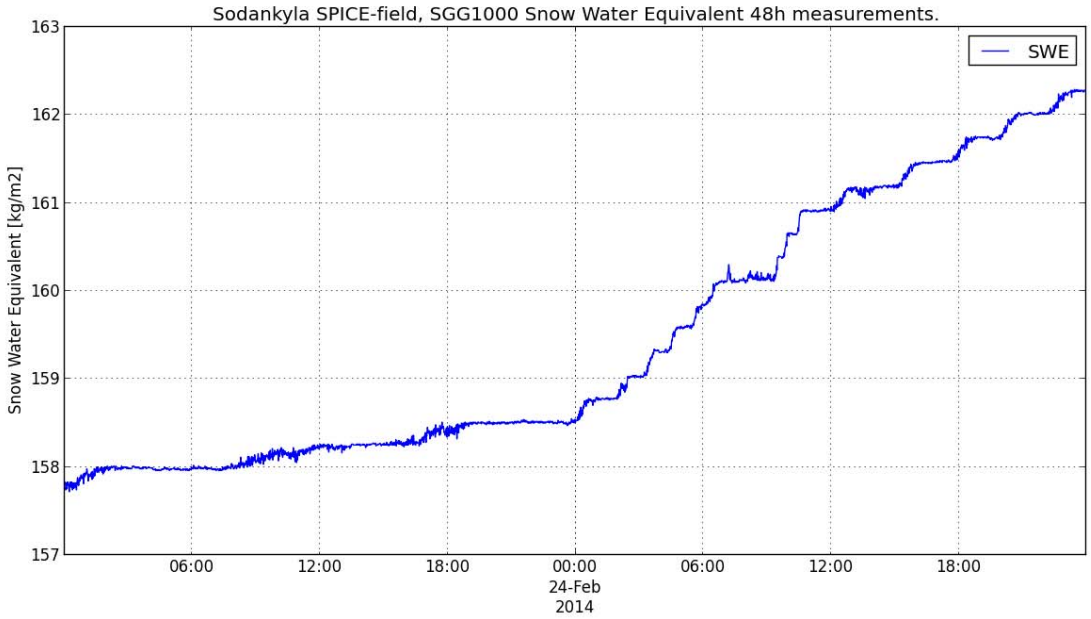
Data communication protocol	
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the SGG1000, place 6052. #1) SWE, Snow water equivalent, mm 20140224,00:01:00,158.52 20140224,00:02:00,158.53
Data sampling rate	1 min
Data acquisition interval	1 min

Field calibration (if any).

SSG1000-6052 Calibration 2013-09-27, Calibration passed.

Measured weight (empty),	1130 gr
Added 1006 gr weight,	2180 gr
Difference,	1050 gr
Diff. – ref.	44 gr

The sensor's accuracy is 0,3 % = 3000 gr/m2 based on the manual.



48h Plot.

Instrument Name: MR3H-FC
instrument number _____1___ of _____1___

Figure 10: MR3H-FC

Manufacturer	Meteoservis

Model	MR3H-FC
Serial number	1680
Firmware version (if applicable)	

Field configuration

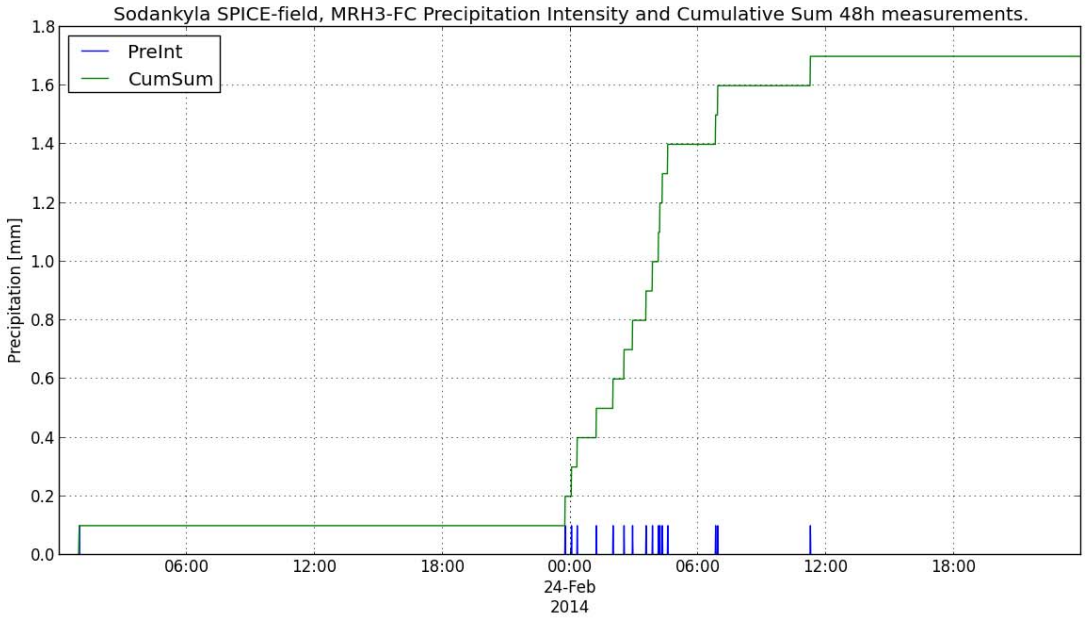
Location on site	20:32
Orientation	vertical
Height (measured at top)	1,35 m
Shield (if applicable)	N/A
Heating (if applicable)	yes

Data output

Data communication protocol	Tipping bucket pulse (TTL-level)

Output data message format (include description of fields)	`#FIN_LIT`
	`#Sodankyla site SPICE field, FINLAND`
	`#Latitude: 67.36663, Longitude: 26.62901,`
	`Altitude: 179.0`
	`#Data is collected from the MRH3H-FC, place 2032.`
	`#1) INT, Rain intensity, mm/min`
	`#2) TOT, Accumulated total, mm`
	`20140224,00:01:00,0.0,86.3`
	`20140224,00:02:00,0.0,86.3`

Data sampling rate	1 min
Data acquisition interval	1 min


Sodankyla SPICE-field, MRH3-FC Precipitation Intensity and Cumulative Sum 48h measurements.
PreInt
CumSum
Precipitation [mm]
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
06:00
12:00
18:00
00:00
24-Feb
2014
06:00
12:00
18:00

48h Plot.

Instrument Name: CS725/GMON
instrument number ____1__ of ____1__

Figure 11: CS725/GMON3

Manufacturer	Campbell Technology
Model	CS725/GMON3
Serial number	1040
Firmware version (if applicable)	

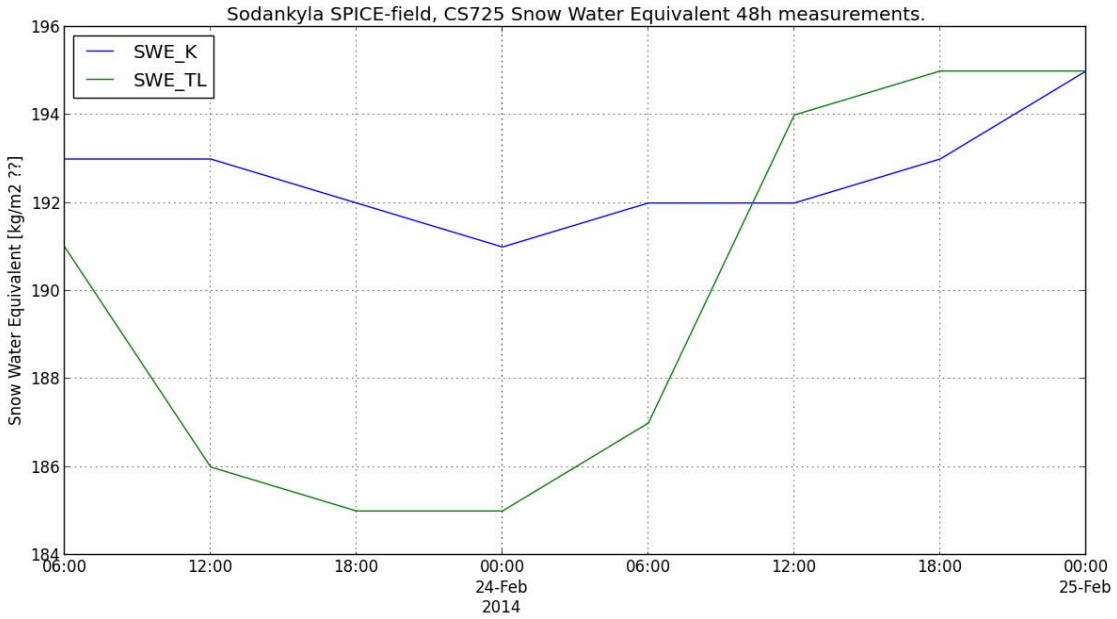
Field configuration

Location on site	40:62
Orientation	horizontal
Height (measured at top)	260 top, 190 bottom of instrument
Shield (if applicable)	N/A

Heating (if applicable)	

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #The data is collected from CS725 SWE sensor, place 4062. #1)SerialNum, Serial number,code #2)K_Uncorrected,, #3)K_Counts,, #4)TL_Counts,, #5)SWE_K,, #6)K_TL_Ratio,, #7)SWE_TL,, #8)SM_K,, #9)SM_TL,, #10)SM_K_TL,, #11)Precip_Index, Precipitation index, index #12)Crystal_TEMP_MIN, Crystal minimum temperature, C #13)Crystal_TEMP_MAX, Crystal maximum temperature, C #14)Hist_Blocks,Histogram blocks, count #15)K_Disp,, #16)Stats,, #17)PWR_Volt, Voltage, Voltage 20140223,23:59:00,1040,78950,39283,9620,191,212,185,20,20,4,0,3,4,24,-12,3.9,11.45 20140224,05:59:00,1040,79846,38856,9543,192,212,187,20,20,5,0,3,4,24,-11,4.0,11.45
Data sampling rate	6 hour
Data acquisition interval	6 hour



48h Plot.

Instrument Name: SR50ATH-316SS
instrument number ____1__ of ____2__

Figure 12: SR50ATH-316SS in horizontal position

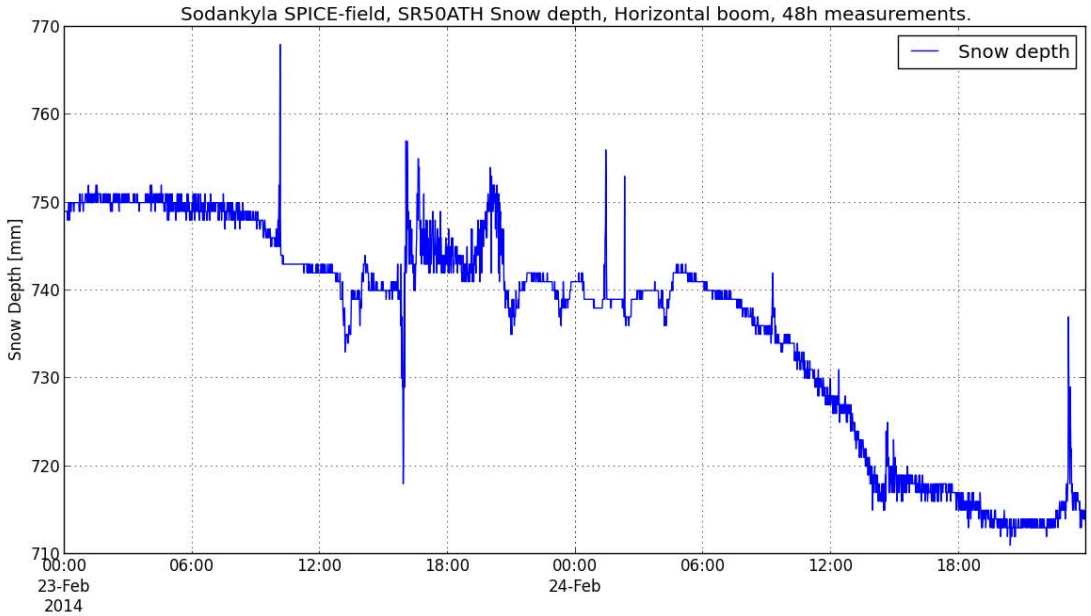
Manufacturer	Campbell Technology
Model	SR50ATH-316SS
Serial number	4710
Firmware version (if applicable)	

Field configuration

Location on site	70:52
Orientation	horizontal
Height (measured at top)	2,0 m
Shield (if applicable)	N/A
Heating (if applicable)	yes

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the SR50ATH, place 7052. #1) SNOW_LEVEL, Corrected Snow Level, mm #2) QUALITY, Snow Level Quality 162 to 600, code #2) TEMP, Temperature, C #4) STATUS, Status Report, code 20140224,00:00:00,741,190,0.62,11111 20140224,00:01:00,741,190,0.62,11111
Data sampling rate	1min
Data acquisition interval	1min



48h Plot.

Instrument Name: SR50ATH-316SS

instrument number _____2___ of _____2___

Figure 13: SR50ATH-316 45 deg. upwards tilted

Manufacturer	Campbell Technology
Model	SR50ATH-316SS
Serial number	4711

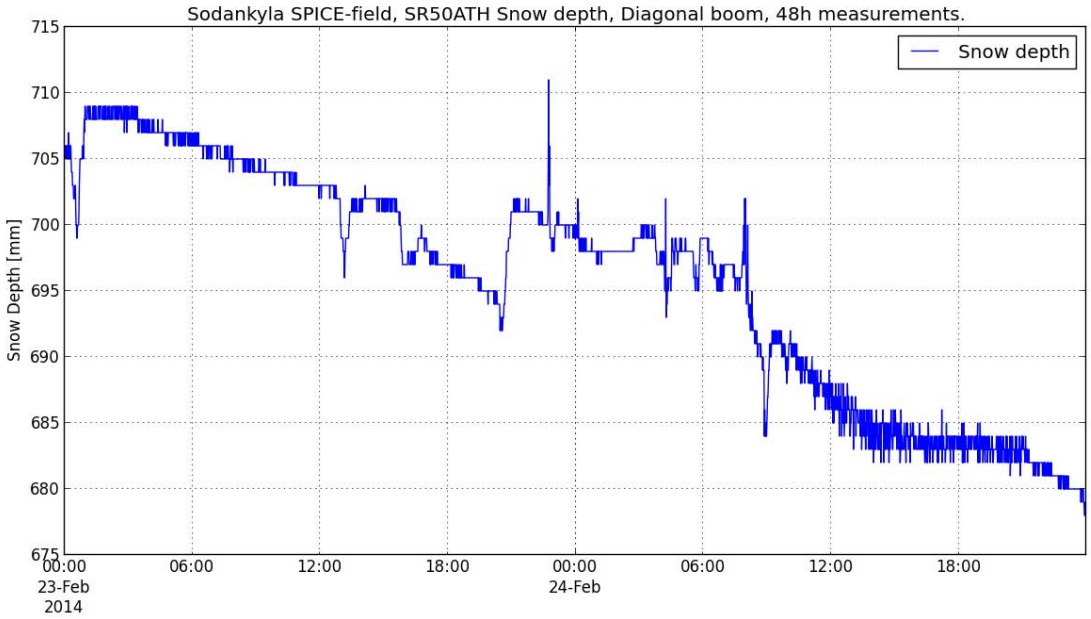
Firmware version (if applicable)	

Field configuration

Location on site	60:62
Orientation	45 deg. upwards tilted
Height (measured at top)	2,0 m
Shield (if applicable)	N/A
Heating (if applicable)	yes

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the SR50ATH, place 6062. #1) SNOW_LEVEL, Corrected Snow Level, mm #2) QUALITY, Snow Level Quality 162 to 600, code #2) TEMP, Temperature, C #4) STATUS, Status Report, code 20140224,00:00:00,700,193,0.69,11111 20140224,00:01:00,699,194,0.68,11111
Data sampling rate	1min
Data acquisition interval	1min



48h Plot.

Instrument Name: Parsivel 2 Distrometer
instrument number ____1__ of ____1__

Figure 14: Parsivel 2 Distrometer

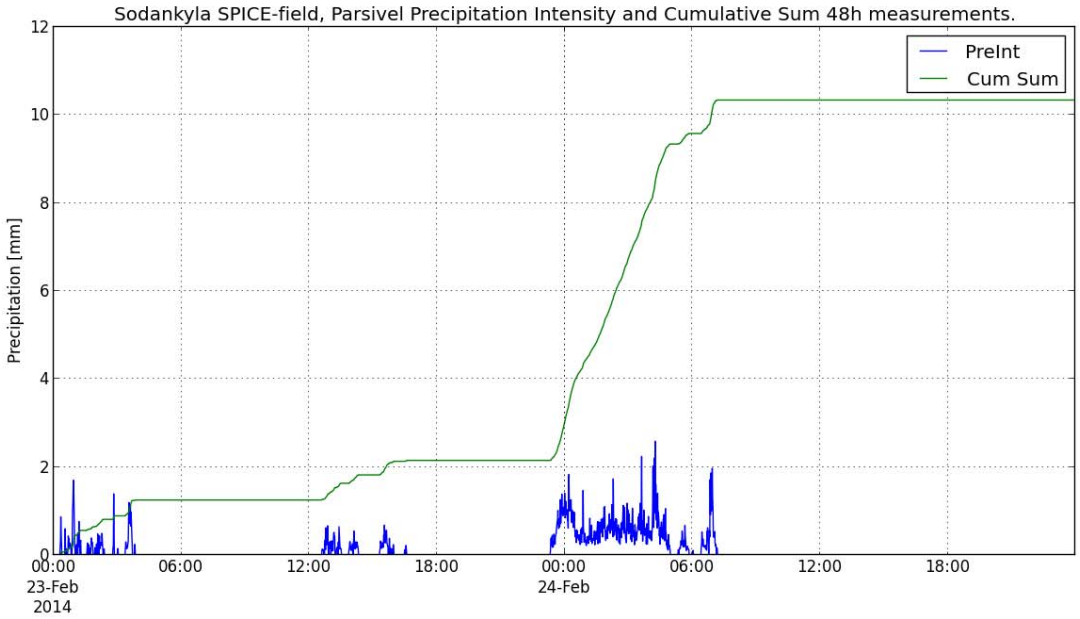
Manufacturer	OTT
Model	Parsivel 2 Distrometer
Serial number	304625
Firmware version (if applicable)	2.02.1

Field configuration

Location on site	50:72
Orientation	horizontal
Height (measured at top)	2,10 m
Shield (if applicable)	N/A
Heating (if applicable)	yes

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the Parsivel2, place 5072. #1) RI, Rain Intensity, mm/h #2) RA, Rain Amount since start of device, mm #3) WAWA, Weather code, code #4) RF, Radar reflectivity, dBz #5) VIS, MOR visibility in the precipitation, m #6) KINE, Kinetic energy, KJ #7) TS, Temperature in the sensor, C #8) LASER, Signal amplitude of the laser strip, value #9) COUNT, Number of detected particles, count #10) STATUS, Sensor status, code 20130913,00:00:00,0000.041;0232.73;61;15.292; 20000;0000.64;018;22964;99999;0;
Data sampling rate	1min
Data acquisition interval	1min


Sodankyla SPICE-field, Parsivel Precipitation Intensity and Cumulative Sum 48h measurements.
PreInt
Cum Sum
Precipitation [mm]
0
2
4
6
8
10
12
00:00
23-Feb
2014
06:00
12:00
18:00
00:00
24-Feb
06:00
12:00
18:00

48h Plot.

Instrument Name: TPS 3100 Hotplate, Total Precipitation Sensor

instrument number _____1___ of _____1___

Figure 15: TPS-3100 Hotplate

Manufacturer	Yankee Environmental Systems
Model	TPS3100 Hotplate
Serial number	120602
Firmware version (if applicable)	v3.1.2 11/1/2010

Field configuration

Location on site	30:22
Orientation	horizontal
Height (measured at top)	1,5 m

Shield (if applicable)	
Heating (if applicable)	

Data output

Data communication protocol	Ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #The data is collected from TPS-3100 HotPlate sensor, place 3022. #1) Time, Sensor's timestamp since 1/1/1970, s #2) I_PRE, Current precipitation rate, mm/hr #3) A_PRE, Total accumulated liquid precipitation, mm #4) PWR_S, Sensor power 1-minute running ave, W #5) PWR_REF, Reference power 1-minute running ave, W #6) T, Ambient temperature 1-minute running ave, C #7) T_ENC, Enclosure temperature 1-minute running ave, C #8) WS, Wind speed 1-minute running ave, m/s #9) COL_EF, Collection efficiency 1-minute running ave, code #10) PWR_OFFSET, Power offset 1-minute running ave, W #11) PWR_OFFSET_RAD_EFF, Power offset due to radiation effects, W #12) I_PRE_RAW_1, Raw precip. rate 1-minute running ave, mm/hr #13) I_PRE_RAW_5, Raw precip. rate 5-minute running ave, mm/hr #14) S_RAD, Solar radiation 1-minute running ave, W/m-2 #15) NET_IR_RAD, Net IR radiation ground to sky 1-minute running ave, W/m-2 #16) P, Barometric pressure referenced to sea level, mbar #17) T_HUM, Temperature of humidity sensor, C #18) RH, Relative humidity,% 20140512,00:00:00,1399853061,00.00,00303.61,015.5,016.7,001.4,011.0,00.2,1.000,000.1,000.0,-0.15,-0.10,0003,-021,1001.6,001.5,87.3 20140512,00:01:00,1399853121,00.00,00303.61,015.8,015.6,001.3,011.0,00.2,1.000,000.1,000.0,00.01,-0.14,0003,-021,1001.6,002.2,87.3
Data sampling rate	1 min
Data acquisition interval	1 min

Instrument Name: SL300 Snow Depth Sensor
instrument number ____1__ of ____1__

Figure 16: SL300 Snow Depth Sensor

Manufacturer	Felix Technology Inc.

Model	SL300 Snow Depth Sensor
Serial number	New one is coming
Firmware version (if applicable)	

Field configuration

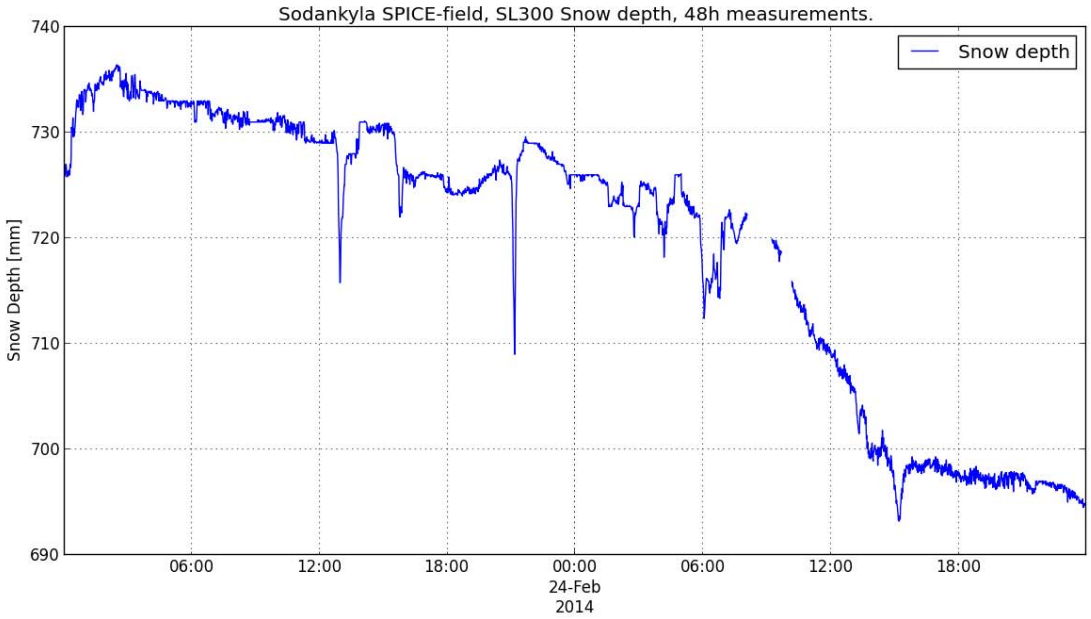
Location on site	60:32
Orientation	horizontal looking downwards
Height (measured at top)	2,0 m over an artificial grass matt
Shield (if applicable)	N/A
Heating (if applicable)	

Data output

Data communication protocol	ascii

Output data message format (include description of fields)	`#FIN_LIT`
	`#Sodankyla site SPICE field, FINLAND`
	`#Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0`
	`#Data is collected from the SL300, place 6032.`
	`#1) DIS, Measured distance 1 minute avg, mm`
	`#2) TEMP, Temperature 1 minute avg, C`
	`#3) TRAT, Travel time 1 minute avg, ms`
	`20130328,00:00:00,1248.7,-20.00,8.040`

Data sampling rate	1s
Data acquisition interval	1min



48h Plot.

Instrument Name: SMH30 Snow Depth Sensor
instrument number ____1__ of ____1__

Figure 17: SHM30 Snow Depth Sensor

Manufacturer	ESW GmbH (Jenoptic)
Model	SHM30 Snow Depth Sensor
Serial number	121421

Firmware version (if applicable)	

Field configuration

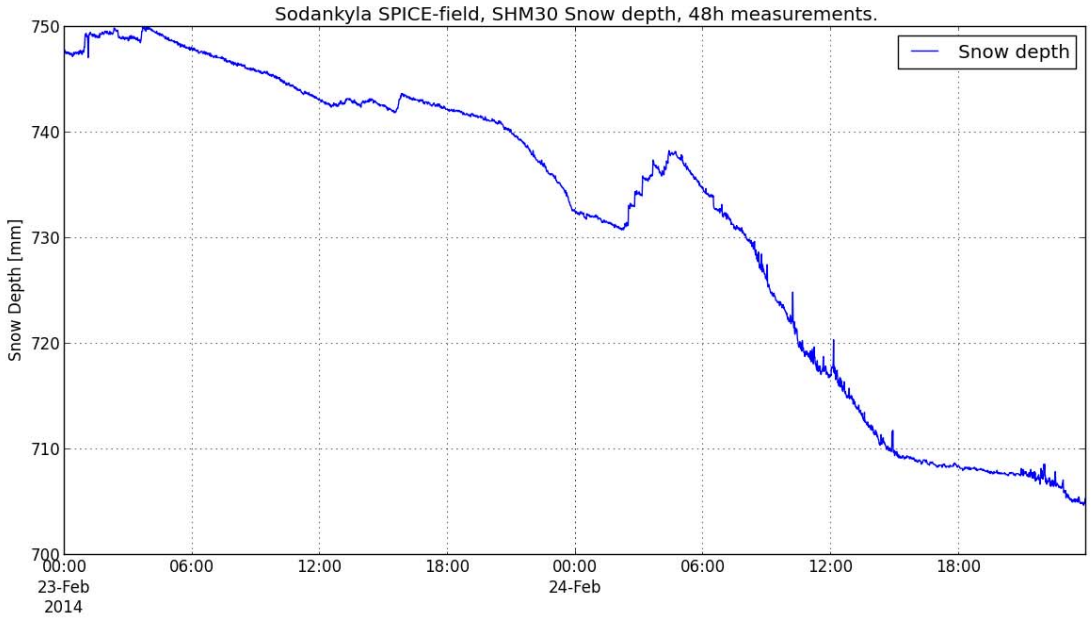
Location on site	70:42
Orientation	horizontal
Height (measured at top)	2,0 m over an artificial grass matt
Shield (if applicable)	N/A
Heating (if applicable)	yes

Data output

Data communication protocol	ascii

Output data message format (include description of fields)	`#FIN_LIT`
	`#Sodankyla site SPICE field, FINLAND`
	`#Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0`
	`#Data is collected from the SHM30, place 7042.`
	`#1) SNOW_LEVEL, Snow Level, m`
	`#2) SIGNAL_STRENGTH, Signal strength, value`
	`#3) TEMP, Temperature, C`
	`#4) ERROR, Error code, code`
	`20130913,00:00:00,00.1660,000.884,7,00`

Data sampling rate	1min
Data acquisition interval	1min



48h Plot.

Instrument Name: USH-8 Snow Depth Sensor
istrument number _____1___ of _____2___

Figure 18: USH-8 Snow Depth Sensor in horizontal position

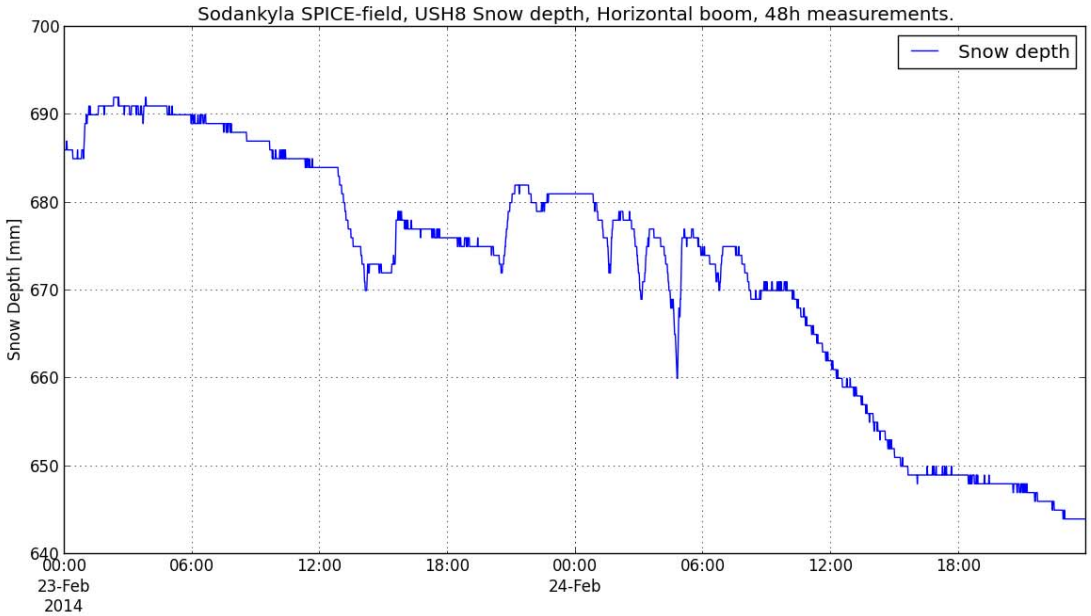
Manufacturer	Sommer
Model	USH-8 Snow Depth Sensor
Serial number	32120820
Firmware version (if applicable)	

Field configuration

Location on site	60:42
Orientation	horizontal
Height (measured at top)	2,05 m over an artificial grass matt
Shield (if applicable)	N/A
Heating (if applicable)	

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the USH-8, place 6042. #1) SNOW_LEVEL, Snow Level, mm #2) TEMP, Temperature, C #3) SNOW_U_LEVEL, Uncorrected Snow Level, mm #4) STATUS, Status Report, code 20130913,00:00:00,0000,+01.1,0000,000
Data sampling rate	1min
Data acquisition interval	1min



48h Plot.

Instrument Name: USH-8 Snow Depth Sensor
instrument number _____2___ of _____2___

Figure 19: USH-8 Snow Depth Sensor, 45 deg. upwards tilted

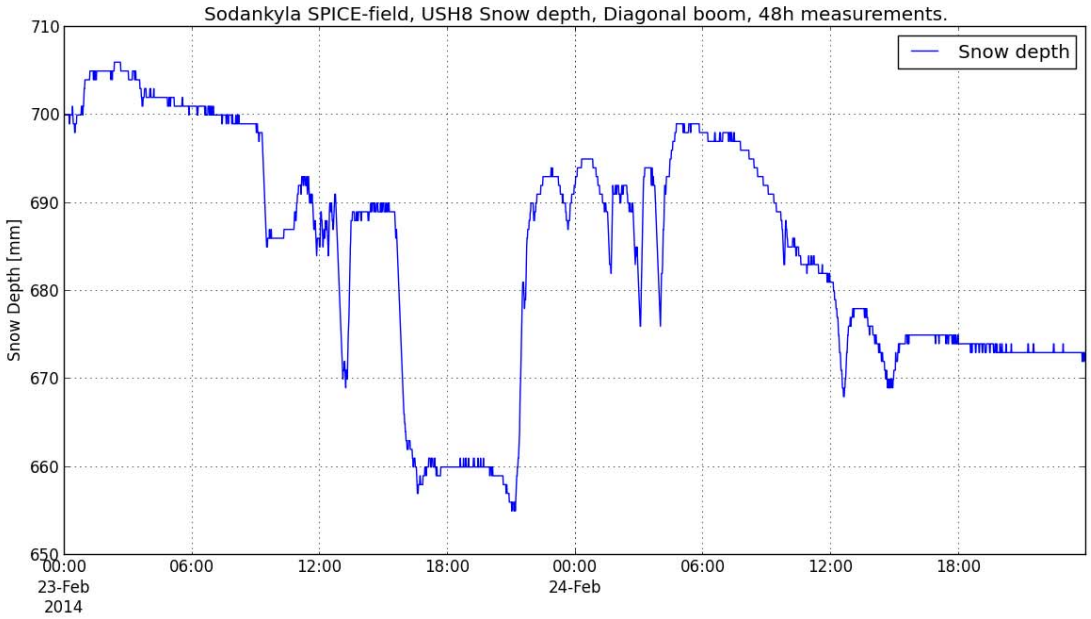
Manufacturer	Sommer
Model	USH-8 Snow Depth Sensor
Serial number	32120816
Firmware version (if applicable)	

Field configuration

Location on site	70:32
Orientation	45 deg. upwards tilted
Height (measured at top)	2,05 m over an artificial grass matt
Shield (if applicable)	N/A
Heating (if applicable)	

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the USH-8, place 7032. #1) SNOW_LEVEL, Snow Level, mm #2) TEMP, Temperature, C #3) SNOW_U_LEVEL, Uncorrected Snow Level, mm #4) STATUS, Status Report, code 20130913,00:00:00,0000,+01.1,0000,000
Data sampling rate	1min
Data acquisition interval	1min



48h Plot.

Instrument Name: FS11P (FS11 / PWD32 combination)
instrument number ____2__ of ____1__

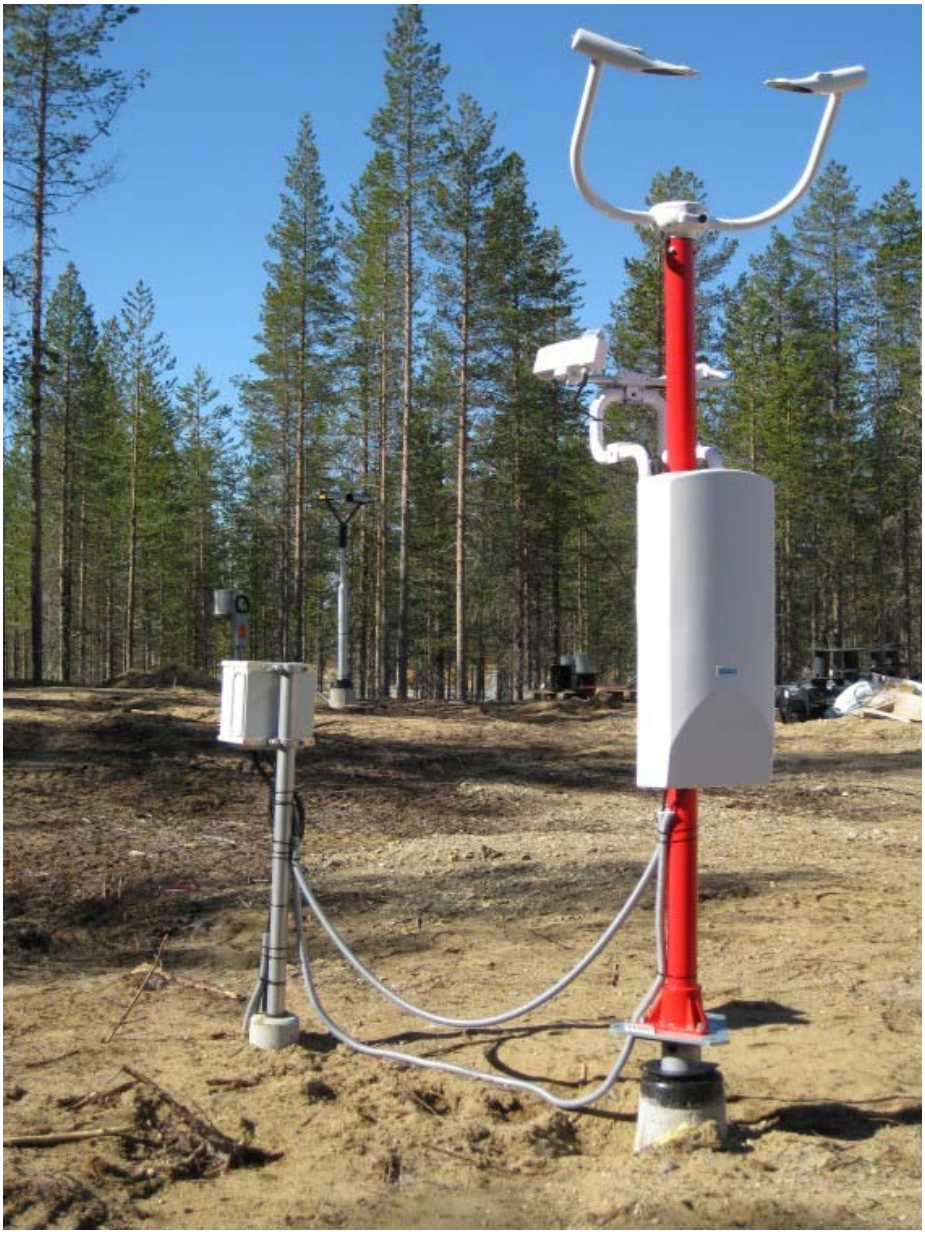


Figure 20: FS11P, FS11 / PWD 32 combination

Manufacturer	Vaisala
Model	FS11P, FS11 / PWD32 combination
Serial number	4020001
Firmware version (if applicable)	

Field configuration

Location on site	60:22
Orientation	horizontal looking downwards
Height (measured at top)	PWD32 2,15 m, FS11 2,90 m
Shield (if applicable)	N/A
Heating (if applicable)	

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the FS11P, site 6022. #1) NAME, Sensor name, name #2) ALARM, xy x=1= visibility alarm 1 (higher) x=2= visibility alarm 2(lower visibility y=1=hardware error y=2= hardware warning, code #3) VIS1, Visibility one minute average max 20000m, m #4) VIS10,Visibility ten minute average max 20000m, m #5) NWS, Instant present weather NWS codes, code #6) WAWA_INST, Instant present weather code 0 ... 99, code #7) WAWA_15, 15 minute present weather code 0...99, code #8) WAWA_1H, one hour present weather code 0...99, code #9) PREINT, Water intensity 1 min ave, mm/h #10) PRECUM, Cumulative water sum 0...99.99 mm, mm #11) SNOWCUM, Cumulative snow sum 0...999 mm, mm #12) T, TS pt100 temperature (C, 99 = error), C #13) LUM, Background luminance, cd/m2 #14) METAR, Metar, code #15) METARRECENT, Recent METAR, code #16) CRC, Check sum, code `20140311,12:36:53,FS3,00,68882,68141,C,0,0,0,0.00,29.70,633,5.9,////,,,39DF`
Data sampling rate	15s

Data acquisition interval	15s

Instrument Name: PWD 22
instrument number ____1__ of ____1__

Figure 21: PWD

Manufacturer	Vaisala
Model	PWD 22

Serial number	4020002
Firmware version (if applicable)	

Field configuration

Location on site	50:22
Orientation	horizontal looking downwards
Height (measured at top)	2,70 m
Shield (if applicable)	N/A
Heating (if applicable)	

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the PWD22, site 5022. #1) NAME, Sensor name, name #2) ID, ID number, code #3) ALARM, xy x=1= visibility alarm 1 (higher) x=2= visibility alarm 2(lower visibility y=1=hardware error y=2= hardware warning, code #4) VIS1, Visibility one minute average max 20000m, m #5) VIS10,Visibility ten minute average max 20000m, m #6) NWS, Instant present weather NWS codes, code #7) WAWA_INST, Instant present weather code 0 ... 99, code #8) WAWA_15, 15 minute present weather code 0...99, code #9) WAWA_1H, one hour present weather code 0...99, code #10) PREINT, Water intensity 1 min ave, mm/h #11) PRECUM, Cumulative water sum 0...99.99 mm, mm #12) SNOWCUM, Cumulative snow sum 0...999 mm, mm #13) T, TS pt100 temperature (C, 99 = error), C

	#14) LUM, Background luminance, cd/m2 #15) METAR, Metar, code #16) METARRECENT, Recent METAR, code 20140311,12:49:59,PW,01,00,23348,22867,C,0,0,0,0.00,82.96,121,3.3,/////,,,
Data sampling rate	15s
Data acquisition interval	15s

Instrument Name: PWD 33 EPI
instrument number ____1__ of ____1__

Figure 22: PWD 33 EPI

Manufacturer	Vaisala
Model	PWD 33 EPI

Serial number	4020002
Firmware version (if applicable)	

Field configuration

Location on site	50:22
Orientation	horizontal looking downwards
Height (measured at top)	2,70 m
Shield (if applicable)	N/A
Heating (if applicable)	

Data output

Data communication protocol	ascii
Output data message format (include description of fields)	#FIN_LIT #Sodankyla site SPICE field, FINLAND #Latitude: 67.36663, Longitude: 26.62901, Altitude: 179.0 #Data is collected from the PWD33 EPI, site 5022. #1) NAME, Sensor name, name #2) ID, ID number, code #3) ALARM, xy x=1= visibility alarm 1 (higher) x=2= visibility alarm 2(lower visibility y=1=hardware error y=2= hardware warning, code #4) VIS1, Visibility one minute average max 20000m, m #5) VIS10,Visibility ten minute average max 20000m, m #6) NWS, Instant present weather NWS codes, code #7) WAWA_INST, Instant present weather code 0 ... 99, code #8) WAWA_15, 15 minute present weather code 0...99, code #9) WAWA_1H, one hour present weather code 0...99, code #10) PREINT, Water intensity 1 min ave, mm/h #11) PRECUM, Cumulative water sum 0...99.99 mm, mm #12) SNOWCUM, Cumulative snow sum 0...999 mm, mm #13) STATUS_HW, Hardware status bits in hex and warning bits in hex, code

	#14) PREINT_OPT, Precipitation intensity calculated from optical signal, mm/h #15) T, TS pt100 temperature (C, 99 = error), C #16) DRD_INT, DRD rain plate intensity, mm/h #17) DRD_SIGAVG, DRD signal average (0 ... 1.2), value #18) DRD_SIGVAR, DRD signal variance (0 ... 1), value #19) OPT_INC, Number of optical signal increases, bigger than the drop detection limit, value #20) OPT_CHG, Biggest change in optical signal, value #21) BIG_DROP, (Big) drop time average (0...9), value #22) DRD1_T, The DRD1 temperature, C #23) DRD2_T, The DRD2 temperature, C #24) IMPACT_CUM, cumulative hard hit amount from PWS111 Impact Sensor, value #25) DRD1_SAMPLE, DRD1 sample, value #26) DRD2_SAMPLE, DRD2 sample, value #27) K_HITS_INTERVAL, K-hits/ message polling interval, value #28) L_HITS, L-hits, value #29) M_HITS, M-hits, value #30) MAX_AMPLITUDE, Maximum amplitude, value #31) DROPPLET_COUNT1, Numbers of dropplets of certain time of flight fastest, count #32) DROPPLET_COUNT2, Numbers of dropplets of certain time of flight, count #33) DROPPLET_COUNT3, Numbers of dropplets of certain time of flight, count #34) DROPPLET_COUNT4, Numbers of dropplets of certain time of flight slowest=snow, count `20140311,12:51:56,PW,02,02,20000,20000,C,0,0,0,0.00,42.31,999,0000,0.00,4.01,0.000,0.017,0.000,0,3,0.00,6,4,0,831,780,0,0,0,0,0,0,0,0`
Data sampling rate	15s
Data acquisition interval	15s

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
Pluvio1248	☒ Yes ☐ No Date: 2012-11-15	☒ Yes ☐ No Date:	
Pluvio1032	☒ Yes ☐ No Date: 2012-11-20	☒ Yes ☐ No Date:	
Pluvio2022	☒ Yes ☐ No Date: 2012-11-21	☒ Yes ☐ No Date:	
CS725-4062	☒ Yes ☐ No Date: 2013-10-16	☒ Yes ☐ No Date:	

DRD11A-1022	☒ Yes ☐ No Date: 2013-10-17	☒ Yes ☐ No Date:	
HMP155-2062	☒ Yes ☐ No Date: 2013-09-13	☒ Yes ☐ No Date:	
MRH3FC-2032	☒ Yes ☐ No Date: 2013-10-17	☒ Yes ☐ No Date:	
PARSIVEL-5072	☒ Yes ☐ No Date: 2013-09-13	☒ Yes ☐ No Date:	
PTB220-3062	☒ Yes ☐ No Date: 2013-10-08	☒ Yes ☐ No Date:	
SGG1000-6052	☒ Yes ☐ No Date: 2013-10-17	☒ Yes ☐ No Date:	
SHM30-7042	☒ Yes ☐ No Date: 2013-03-15	☒ Yes ☐ No Date:	
SL300-6032	☒ Yes ☐ No Date: 2012-11-15	☒ Yes ☐ No Date:	Sensor and sensor's format has been changed 2013-10-10

SR50ATH-6062	☒ Yes ☐ No Date: 2013-10-04	☒ Yes ☐ No Date:	
SR50ATH-7052	☒ Yes ☐ No Date: 2012-12-21	☒ Yes ☐ No Date:	
THIES-2062	☒ Yes ☐ No Date: 2013-09-09	☒ Yes ☐ No Date:	
UPG1000-2012	☒ Yes ☐ No Date: 2013-09-20	☒ Yes ☐ No Date:	
USH8-6042	☒ Yes ☐ No Date: 2012-12-19	☒ Yes ☐ No Date:	
USH8-7032	☒ Yes ☐ No Date: 2013-10-10	☒ Yes ☐ No Date:	
TPS3100-3022	☒ Yes ☐ No Date: 2014-01-13	☒ Yes ☐ No Date:	
	☒ Yes ☐ No	☐ Yes ☒ No	

PWD22-5022	Date: 2012-12-14	Date: 2014-06-01	
FS11P-6022	☒ Yes ☐ No Date: 2012-12-14	☐ Yes ☒ No Date: 2014-06-01	
PWD33-5022	☒ Yes ☐ No Date: 2012-12-14	☐ Yes ☒ No Date: 2014-06-01	

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 Most of them, Yes
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 Installation pictures No, otherwise Yes
End-to-end data validation (Section A4; see Instrument data validation table).	☐ Full (all gauges) ☐ Partial (some gauges) ☒ No No, not yet
SPICE archive end-to-end data validation: discrepancy reports (Section A4)	☐ Yes ☒ No No, not yet
Details of any workarounds (Sections A2, A3, A4)	☒ Included ☐ Not Applicable In LogBook

APPENDIX B: SPICE DATA LEVELS AND DATASETS

Details of the different levels of data and associated datasets for SPICE are included below. **The present document addresses only data up to and including Level 2a.** Data of higher levels, and the associated datasets, are tentatively defined here for completeness.

Data Levels:

Level 1 data: are those collected as the output of each individual instrument, which have been converted into geophysical measurements (e.g. weight, mass, intensity), generally with high temporal resolution, and before any significant data quality control has been applied. A **Level 1** dataset contains data from only one instrument at one site.

Level 2a data: are time-synchronized data resulting from the sampling, averaging or some other signal/data processing having been applied to **Level 1** data from an individual instrument in order to separate signal from noise. These data have not been quality controlled, and should be used only for monitoring an instrument's status. A **Level 2a** dataset contains data from only one instrument at one site.

Level 2b data: are time-synchronized **Level 2a** data after a basic data quality control procedure has been applied. Basic data quality flags for validity and quality have been added. Missing records have been created and filled with a missing data quality indicator. A **Level 2b** dataset contains data from only one instrument at one site.

Level 3 data: derived by combining and further processing all **Level 2b** datasets from a site. At this level, advanced and multiple instrument data quality techniques have been applied. A **Level 3** dataset contains data from all instruments at an individual site.

Level 4 data: derived after performing an intercomparison of the **Level 3** data from one or more sites, taking into account snow climatology, wind regimes, temperatures, etc., and where applicable, differences in these from one site to another.

Datasets:

SPICE Site Dataset: A dataset comprising all **Level 1, 2a, 2b and 3** datasets from that Intercomparison Site.

SPICE Intercomparison Dataset: this is the Level 4 dataset that combines the **Level 3** data from all SPICE intercomparison sites. The **Project Team** will develop the **SPICE Intercomparison Dataset** using the Level 3 datasets from each **Intercomparison Site.** It contains summary Level 3 data and intercomparison data for all instruments and all sites.

The SPICE Dataset: The total SPICE dataset including all **SPICE Site Datasets**, **Site Documentation** and **Instrument Documentation** for all participating sites and instruments, the **SPICE Intercomparison Dataset,** and all SPICE analysis and assessment documentation.

APPENDIX C: ACRONYMS AND ABBREVIATIONS

DFIR	Double-Fence Intercomparison Reference
e2e	End-to-end
ER	Evaluating Representative
IOC	International Organizing Committee
IR	Installation Representative
NCAR	National Center for Atmospheric Research (USA)
POP	Proof of Performance
QC	Quality control
R0	Working field reference configuration 0: manual or automatic precipitation gauge in bush
R1	Working field reference configuration 1: manual precipitation gauge in DFIR
R2	Working field reference configuration 2: automatic weighing gauge in DFIR
R3	Working field reference configuration 3: two automatic weighing gauges; one shielded (single-Alter), one unshielded
SPICE	Solid Precipitation Intercomparison Experiment
SWE	Snow water equivalent
WG	Weighing gauge
WMO	World Meteorological Organization