Svalbard Environment Monitoring System at UNIS

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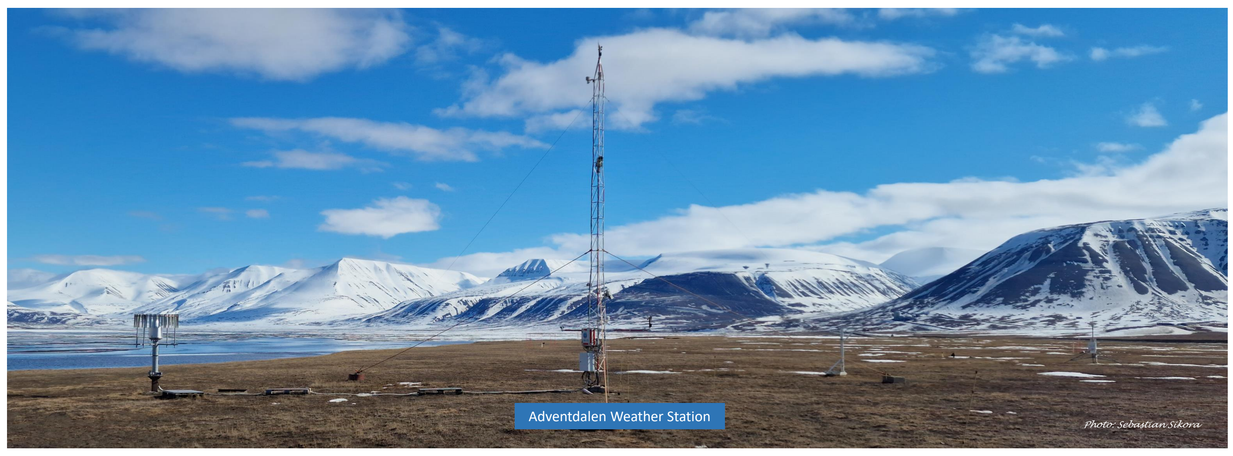
The intensification of human impact on the environment has reached unprecedented levels, and nowhere is this more evident than in the Arctic. The repercussions of these processes are readily observed, emphasizing the urgent need for collecting environmental data through automated monitoring stations. Access to this information is crucial in order to comprehensively comprehend the ongoing changes. This is particularly significant due to the challenging conditions faced by human presence in the polar regions, where harsh environmental factors constantly necessitate adaptation to new circumstances.

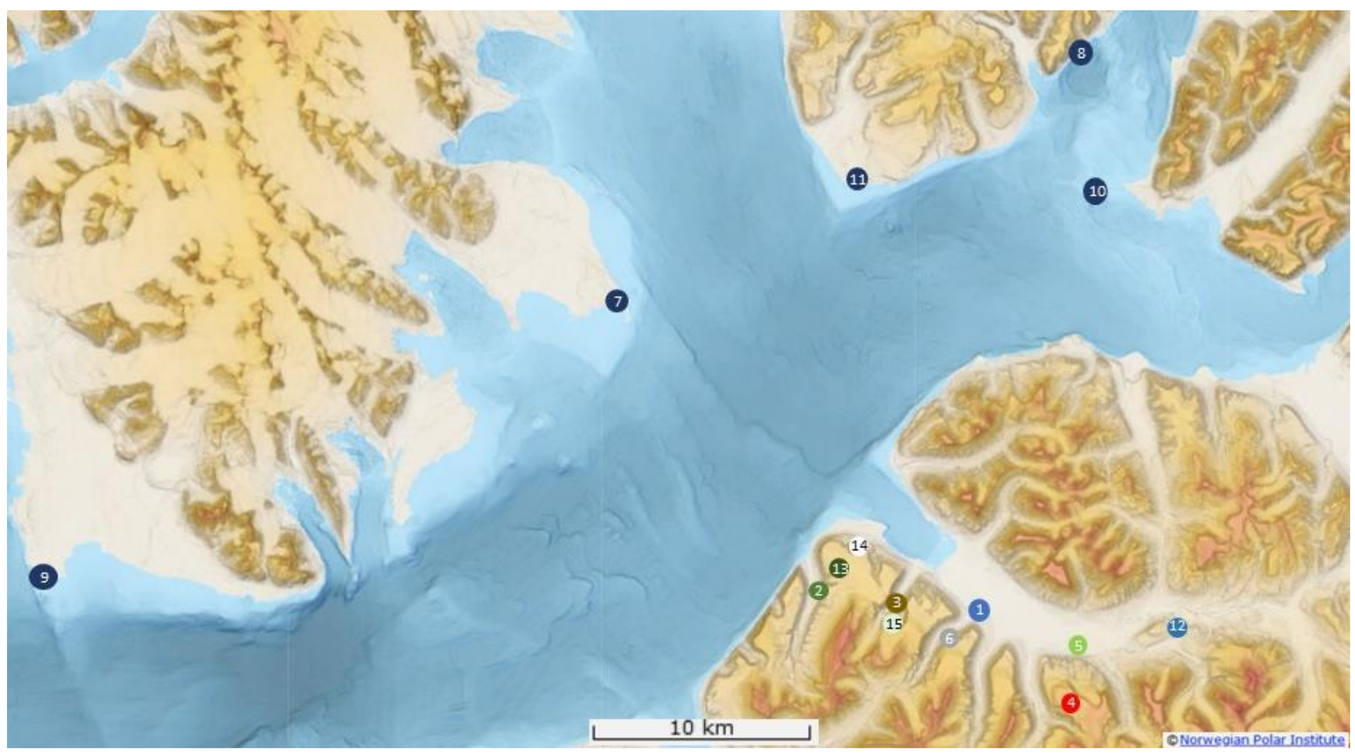
For three decades, scientists from The University Centre in Svalbard (UNIS) have been collecting Arctic environmental data. Throughout this period, numerous installations have been established, varying in their duration. While some installations have become more permanent fixtures, others may only endure for days, weeks, or even a single season.

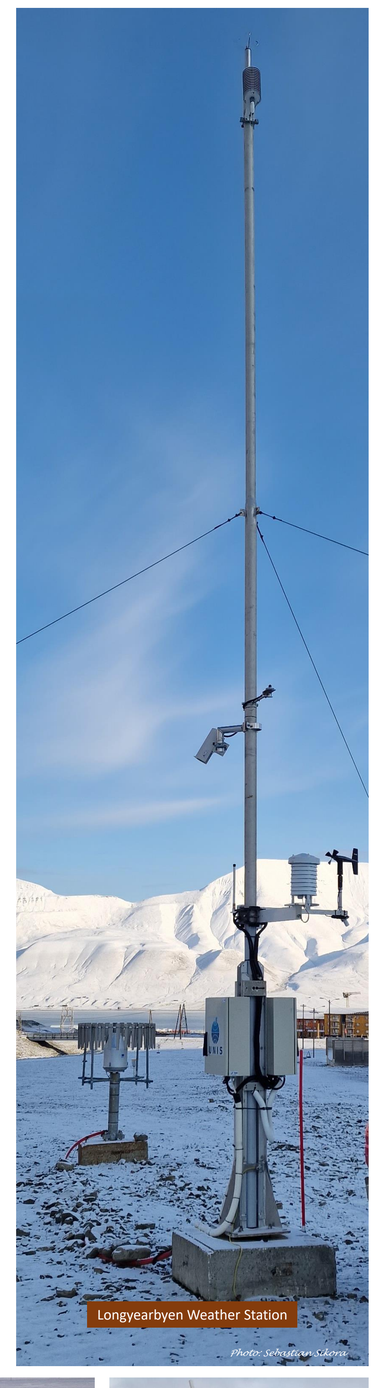
Weather data play a crucial role in both day-to-day activities and long-term perspectives. Recognizing their significance, researchers at the University Centre in Svalbard (UNIS) are actively working on expanding their network of automatic weather stations (AWS) in the region. These AWS units are designed to collect essential parameters such as air temperature, humidity, wind speed, and wind direction. Moreover, some stations are equipped with specialized devices like net radiometers, pyranometers installed at various angles, Eddy Covariance systems, methane probes, thermistor strings in bore holes, photosynthetic active radiation meters, icing detectors, and snow depth meters.

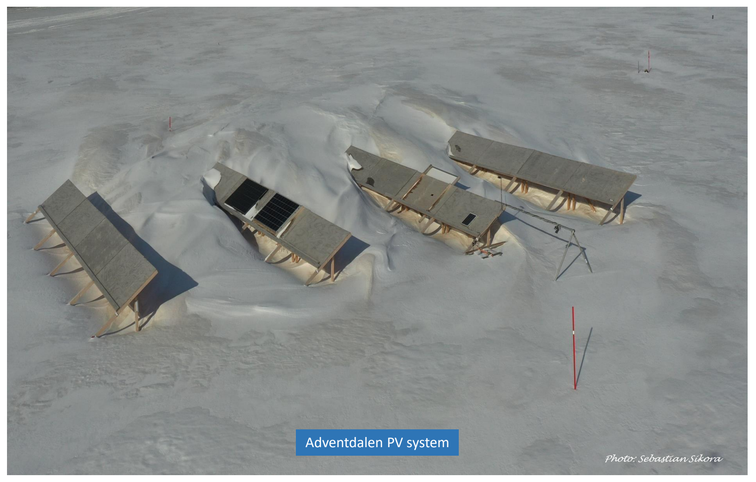
	Station name	Parameters	Components of the system	Since	Status	Coordinates	On-line access
1	Adventdalen Weather Station	T RH WS&WD SWI, SWR, LWI, LWO SD ST R P RS	CS215, PT1000 41342 RM Young CS215 05103 Young anemometer CNR1 Kipp&Zonnen SHM30 Luft Mess- und Regeltechnik SI-111 Apogee T-200B Geonor 278 Setra 5.4103.20.041 Thies Clima	(1993) 2016	active	78.20196°N 15.83377°E	
2	Bjørndalen Weather Station (BIG)	T RH WS&WD SWI, SWR, PAR ST VWC	HygroVUE10 probe HygroVUE10 probe 05103 Young anemometer SP-700 Apogee albedometer S2-141 Apogee PAR/FAR Sensor 107 Campbell Sci. thermistor probe CS655 Soil Water content	2021	active	78.20722°N 15.33472°E	
3	Longyeardalen Weather Station	T RH WS&WD SWI SD ST R P RS	HMP155D, PT100 HMP155D, PT100 05106-45 Young, Gill WindObserver SP110 Apogee SHM31 Luft Mess- und Regeltechnik SI-421 Apogee, PTSDI Campbell T-200B Geonor PTB330 5.4103.20.041 Thies Clima	2023	active	78.21297°N 15.61258°E	
4	Breinosa Weather Station (NEWS)	T RH WS&WD SWI, SWR, LWI, LWO EC	HygroVUE10 probe, PT-100 HygroVUE10 probe 05103 Young anemometer CNR4 albedometer IRGASSON Campbell Sci.	2022	active	78.15285°N 16.03787°E	
5	Adventdalen Tundra Microclimate	VWC ST HF	Teros11 SDI-12 Sensor Teros11 SDI-12 Sensor Hukseflux HFP01 Heat Flux Sensor	2022	active	78.17116°N 16.02900°E	
6	Endalen ITEX	T RH SWI PAR SM	HOBO S-THB-M00X Temp HOBO S-THB-M00X RH HOBO PAR sensor HOBO Solar Radiation Sensor HOBO S-SMx-M005 Soil Moisture	several years	active	78.18344°N 15.78147°E	
7	IWIN: Bohemanneset	T, RH, P, WS, WD	CS MetSens500	2021	active	78.38166°N 14.75300°E	
8	IWIN: Narveneset	T, RH, P, WS, WD	CS MetSens500	2022	active	78.56343°N 16.29687°E	
9	IWIN: Daudmannsodden	T, RH, P, WS, WD	CS MetSens500	2022	active	78.21056°N 12.98685°E	
10	IWIN: Gasoyane	T, RH, P, WS, WD	CS MetSens500	2022	active	78.45792°N 16.20082°E	
11	IWIN: Kapp Thordsen	T, RH, P, WS, WD	CS MetSens500	2023	active	78.45633°N 15.46774°E	
	IWIN: MS Bard/Berg	T, RH, P, WS, WD	Gill MaxiMet GMX 500	2021	active in summer	N/A	
	IWIN: MS Polargirl	T, RH, P, WS, WD	Gill MaxiMet GMX 500	2021	active in summer	N/A	
	IWIN: MS Billefjord	T, RH, P, WS, WD	Gill MaxiMet GMX 500	2022	active in summer	N/A	
12	Janssonhaugen Weather Station	T RH WS&WD SD P	HMP45A Vaisala HMP45A Vaisala 05103 Young anemometer SR50 Campbell 278 Setra	2006	active	78.17913°N 16.46747°E	
13	Platåberget Station	T RH WS SWI SWR SWI54 SWR54	HygroVUE10 probe HygroVUE10 probe 05103 Young anemometer SP110 Apogee pyranometer SP110 Apogee pyranometer SP110 Apogee pyranometer SP110 Apogee pyranometer	2020	active	78.22754°N 15.38547°E	
1	Adventdalen PV system	PVPP SWI30 SWR30	photovoltaic modules SP110 Apogee pyranometer SP110 Apogee pyranometer	2020	active	78.20168°N 15.82826°E	
1	Global short wave solar radiation monitoring system	SWI 24 x SWI	SP110 Apogee pyranometerr SP110 Apogee pyranometer	2023	active	78.20032°N 15.84031°E	
4	Breinosa PV testing station	PVPP SWI54 WS WD 4 x LC	photovoltaic module SP110 Apogee pyranometer VENTUS-X-UMB Ultrasonic Wind Sensor VENTUS-X-UMB Ultrasonic Wind Sensor HBM load cells	2023	active	78.15393°N 16.05442°E	
14	Snow Load Testing System	T RH 4 x LC SnT SD	HMP155 Vaisala probe HMP155 Vaisala probe HBM load cells 107 Campbell Sci. thermistor SR50A	2020	active	78.23444°N 15.464722°E	
1	Adventdalen Permafrost Station	GTP	Digital Temperature Cable 19 points/11 m	2019	active	78.20158°N 15.83428°E	
15	Gruvefjellet Station	T RH WS WD P SD GTP	HMP155 Vaisala probe, PT100 HMP155 Vaisala probe 05103 Young anemometer 05103 Young anemometer 278 Setra SR50 Campbell RST 6 points/10m thermistor string	2006	not active	78.20040°N 15.62438°E	

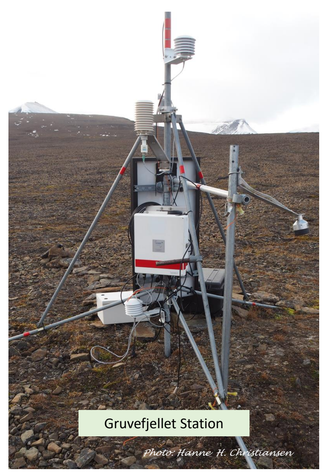

Adventdalen Weather Station
Photo: Sebastian Sikora


Breinosa PV testing station
Photo: Sebastian Sikora

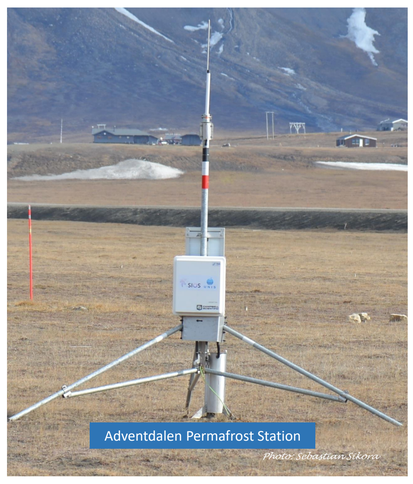


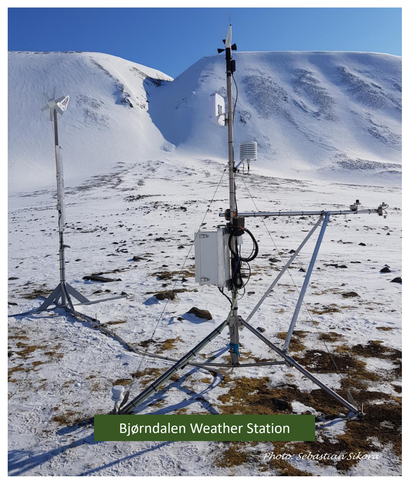

Longyearbyen Weather Station
Photo: Sebastian Sikora


Adventdalen PV system
Photo: Sebastian Sikora

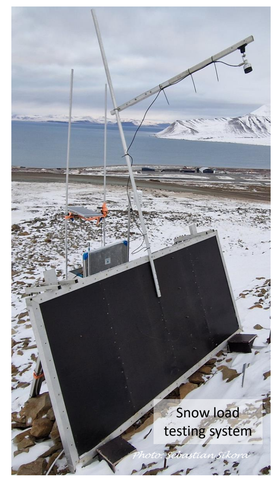

Gruvefjellet Station
Photo: Hanne H. Christiansen


Platåberget Station
Photo: Sebastian Sikora


Adventdalen Permafrost Station
Photo: Sebastian Sikora


Bjørndalen Weather Station
Photo: Sebastian Sikora


Global short wave solar radiation monitoring system
Photo: Sebastian Sikora


Snow load testing system
Photo: Sebastian Sikora

T	air temperature
RH	relative humidity
WS	wind speed
WD	wind direction

SWI	short wave radiation - incoming
SWR	short wave radiation - reflected
LWI	surface downward longwave radiation
LWO	surface upward longwave radiation

SD	snow depth
ST	surface temperature
R	precipitation
P	atmospheric pressure

RS	precpitation detector
VWC	volumetric water content in soil
SM	soil moisture
HF	heat flux from soil

PAR	photosynthetic active radiation
FAR	far infrared radiation
SWI54	short wave radiation - incoming on array plane 54 deg
SWR54	short wave radiation - reflected on array plane 54 deg

PVPP	photovoltaic module power production
LC	loads (force)
SnT	snow temperature
GTP	ground temperature profile
EC	eddy-covariance parameters

Most of the UNIS AWS stations are capable of transmitting data online, enabling real-time access to the collected information. In addition to standard observation systems, UNIS is pioneering the development of new systems to explore various aspects, including snow load on constructions, wind-related forces on photovoltaic panels, and the efficiency of photovoltaic modules in the Arctic.

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