



Project of Strategic Interest NEXTDATA

Deliverable D1.1.2

**Report describing the activities, data transfer to archives
and to the General Portal**

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Within WP1.1, some of the in-situ activities of mountain meteo-climatic measurements in the regions of interest (Alps, Italian Apennines, Hindu-Kush Karakoram Himalayas, Rwenzori, Andes), originally conducted in the framework of the SHARE project, have been continued in the framework of the NextData project, favoring and extending the technical and scientific implementation of the measurement activities which are already ongoing (Tab. 1). The SHARE activities at the GAW-WMO Global Station “Ottavio Vittori” -Monte Cimone and “Nepal Climate Observatory – Pyramid”, are now carried out under the NextData WP1.2.

Measurement site	Country/Continent		Class	Elevation (m a.s.l.)
Forni glacier (Central Alps,)	Italy	Europe	AWS	2,669
Dosdè Glacier (Central Alps,)	Italy	Europe	AWS	2,740
Gigante Glacier (Western Alps)	Italy	Europe	AWS	3,500
Italian Climate Observatory “O. Vittori” (northern Apennines)	Italy	Europe	ATM	2,165
Osservatorio Portella del Gran Sasso (central Apennines)	Italy	Europe	ATM	
Nepal Climate Observatory – Pyramid (Khumbu valley, Himalayas)	Nepal	Asia	ATM	5,079
Pyramid Laboratory Observatory (Khumbu valley, Himalayas)	Nepal	Asia	AWS	5,050
Pheriche (Khumbu valley, Himalayas)	Nepal	Asia	AWS	4,258
Namche Bazaar (Khumbu valley, Himalayas)	Nepal	Asia	AWS	3,560
Lukla (Khumbu valley, Himalayas)	Nepal	Asia	AWS	2,660
Kala Patthar (Khumbu valley, Himalayas)	Nepal	Asia	AWS	5,600
Changri Nup Station (Khumbu valley, Himalayas)	Nepal	Asia	AWS	5,700
South Col (Mt. Everest, Himalayas)	Nepal	Asia	AWS	8,000
Urdukas (Baltoro glacier, Karakorum)	Pakistan	Asia	AWS	3,926
Askole (Baltoro glacier, Karakorum)	Pakistan	Asia	AWS	3,015
Concordia (Baltoro glacier, Karakorum)	Pakistan	Asia	AWS	4,700
Chacaltaya (Cordillera Real, Ande)	Bolivia	South America	ATM	5,200
Mt. Stanley (Elena glacier, Rwenzori)	Uganda	Africa	AWS	4,700

Table 1. Measurement stations (AWS: automatic weather stations, ATM: observatory for atmospheric composition measurements) activated in the framework of the SHARE Project and supported by NextData.

Thanks to the collaboration with CNR-ISAC, the URT Ev-K2-CNR was directly in charge of the station management and data handling/validation for the automatic weather stations (AWS) listed in Table 1 and Figure 1. These data are gathered in the archive of the SHARE monitoring network, currently hosted at the URT Ev-K2-CNR HDs, and will be shared with the General Portal (WP 2.6), once it will be operational. Annex 1 reports, for each AWS, the current status of the available measurements together with the availability of validated data.

In the following, for each mountain region covered by the Project, a summary of the measurement and implementation activities is provided.

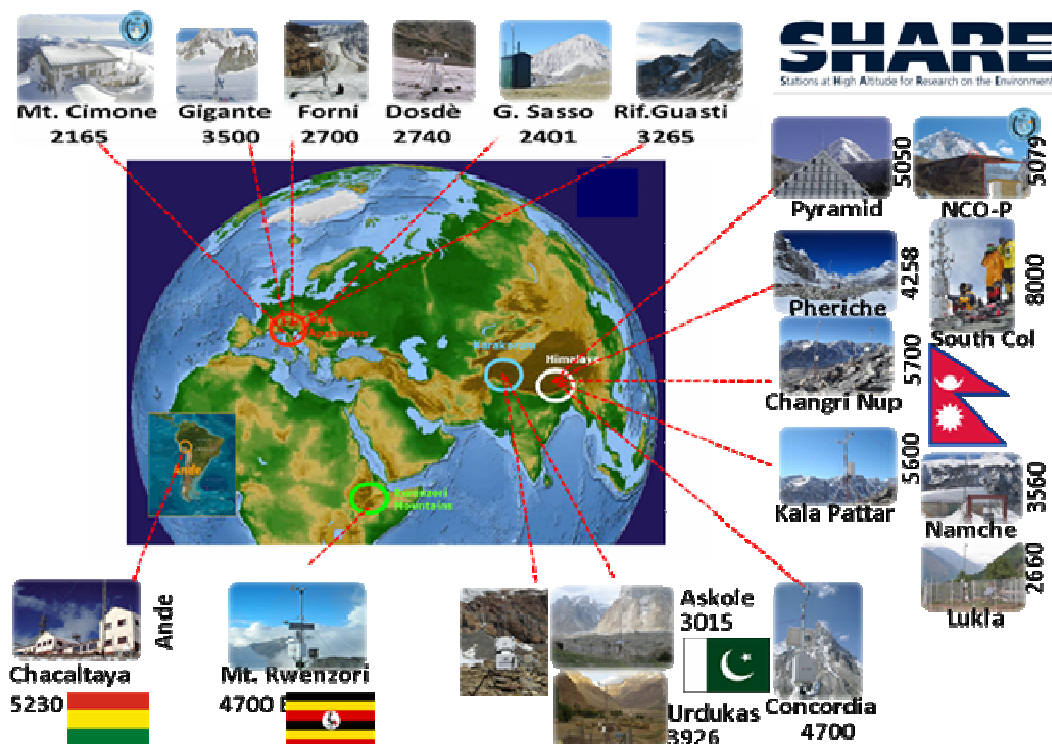


Figure 1. Overview of the measurement stations operating in the framework of the SHARE Project and supported by NextData.

Himalayas

Activities carried out in the Himalayan areas are concentrated mainly in *Nepal*, at the International Pyramid Laboratory-Observatory, installed by Ev-K2-CNR in 1990, at 5,050 m asl in the Sagarmatha National Park, in collaboration with the Nepal Academy of Science and Technology. This facility represents a strategic logistic base for supporting monitoring activities carried out along the Khumbu Valley, in the region of Mt. Everest, where a network of meteo-climate monitoring stations and the GAW-WMO Nepal Climate Observatory Pyramid are installed (Tab. 1). The observation sites require daily checks, as well as periodical technical interventions, also concerning the management of the data transmission systems both in Nepal and Italy.

The Laboratory, which is able to host up to 20 persons, is used as scientific/operative base for researchers and technicians involved in research

activities and pilot projects carried out in Sagarmatha National Park region. During the reference period, about 80 researchers and technicians involved in several international projects were hosted.

Moreover, thanks to its satellite communication systems, the Pyramid is able to transmit in real time data collected by the monitoring stations located in the Khumbu valley. Environmental conditions above 5,000 m a.s.l, in the remote Khumbu valley, demand a regular supervision, careful maintenance and periodic upgrade in order to guarantee a correct operation of this facility as a unique resource for the international scientific community. The management of the Pyramid Laboratory-Observatory is entrusted to URT Ev-K2-CNR. It makes use of Nepalese technicians at the field site. The team is currently composed of eight members, who daily manage the facility and all the 8 monitoring stations. The staff's duty is to identify possible anomalies in the operation of instruments, in order to permit timely interventions of restoration, which are often coordinated by remote intervention from Italian technicians, thanks to the use of technology for remote checking.

During 2012, the measurement activities of the AWSs along the Khumbu Valley were guaranteed, thanks to the intervention of the local technical staff, who work in close collaboration with the Italian staff. Moreover, the calibration and checking activities were performed by using a "travelling standard", which was set-up in 2011 in the framework of the SHARE activities. This "special" AWS was expressly equipped with high-quality standard sensors for meteorological parameters (Vaisala PTB330, HMP155, WA15) and radiation flux (Kipp&Zonen CMP-21 and CGR-4) measurements. Data have been acquired every minute using a Campbell Scientific CR-1000 data logger with certified accuracy. In particular, during 2012 intercomparison exercises have been carried out at the AWS Periche, Kala-Patthar and Lukla, allowing the identification of possible sensor malfunctioning. URT Ev-K2-CNR, in close collaboration with CNR-ISAC, was in charge of the analysis of the intercomparison results, also performing the necessary actions to re-establish the correct operation of the AWSs (e.g. by changing sensors not working properly) or to improve the AWS functionality (e.g. by modifying data acquisition procedures). For this purpose, collaboration with ENEA-UTMEA was also undertaken in order to define the correct methodology for checking and calibrating the broadband short-wave and long-wave radiation sensors working at the AWSs. During 2013, the "reference" AWS will be sent to Italy for carrying out the scheduled maintenance activity and to recalibrate the sensor. The methodologies and guidelines for the validation of meteorological data have been defined. Moreover, in compliance with the recommendations of the Dipartimento di Scienze della Terra dell'Università di Milano, methods were implemented for validating surface albedo data recorded in the high Khumbu valley (on the Changri Nup Glacier).

In 2012 Italian researchers from ISE-CNR carried out a mission in Nepal in order to collect water samples of lakes in mountain regions and to study the effects of climate change on physical-chemical and biological aspects of these ecosystems.

Moreover, personnel from IRSA-CNR collected hydrological information and water samples of the main streams and their tributaries along Khumbu Valley in order to highlight possible issues related to water quality.

Karakorum

In **Pakistan**, in collaboration with the Pakistan Meteorological Department (PMD), URT Ev-K2-CNR, continued the operation of the AWS network already existing in the Baltoro region: Askole, Urdukas and Concordia (Tab. 1).

During summer 2012, URT Ev-K2-CNR re-established and upgraded the Urdukas AWS by repairing the power supply system, upgrading the data acquisition and by replacing sensors not working properly.



Figure 2. A view of the NANO-SHARE at the Urdukas campsite during August 2012

In the framework of the activities related to the feasibility study for the installation of a new climatic observatory in Pakistan, scheduled during the second year of the project, the group of CNR-ISAC in Bologna analysed the data from the NANO-SHARE system which worked at Askole from August to October 2012. NANO-SHARE (Fig. 2) is a compact embedded station for climate monitoring, developed in the framework of the SHARE Project. It is characterized by a limited power consumption (50W) that allows the use of renewable energy source. Further information on this system is provided in the deliverable D1.1.3. During the Askole field campaign simultaneous measurements of surface ozone, carbon dioxide, aerosol number particle and meteorological parameters were carried out. Data were recorded with a 15-minute time resolution, permitting a first continuous characterization of summer atmospheric composition variability in this mountain area also testing the performance of the transportable system. The resulting information and data were shared with URT Ev-K2-CNR in order to contribute to the deliverable D1.1.3. Surface ozone data were recorded from August, 24 to October 3; carbon dioxide from August, 21 to November, 9 (data gap: October, 19-30); total particle number (with $10\text{ nm} < D_p < 3\text{ }\mu\text{m}$) from August, 21 to September, 22. In particular, the preliminary analysis of atmospheric tracer variability indicated that, in spite of the baseline conditions usually characterizing the measurement site, clear influence of the domestic emissions from the near Askole village can be detected (Fig. 3). Even if further investigation is necessary, these first observations raised the serious issue of the possible threat of domestic emissions to the Karakorum mountain environment and population health.

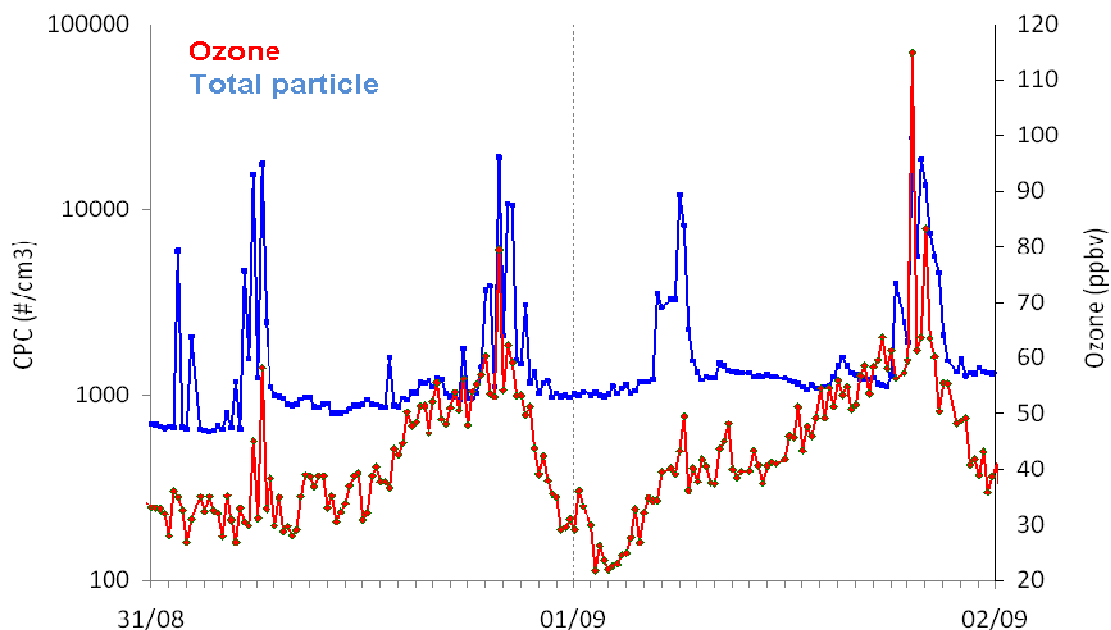


Figure 3. Total particle number ($10 \text{ nm} < D_p < 3 \text{ }\mu\text{m}$) from a condensation particle counter (blue line) and surface ozone mixing ratio (red line) for 31 August – 1 September 2012 at Askole. Particle number and ozone peaks are well discernable in the morning and evening in concomitance with domestic cooking at Askole village.

Rweznori

In **Uganda**, the Automatic Weather Station installed at 4.700 m a.s.l on Rweznori in the framework of SHARE project, has been periodically checked by local technicians from the Uganda Meteorological Department, trained to manage the equipment. At present, this station is not operational due to technical problems related to failures of the power systems (photovoltaic panels) and of the data storage systems.

Alps and Apennines

In **Italy**, analysis of data collected by the stations at Forni, Dosedè and Gigante-Mt. Bianco Glaciers continued, allowing an advancement of knowledge regarding Alpine glacier micrometeorology. These data permit the quantification of the energy balance of the Forni Glacier (Fig. 4) and of the Dosedè Glacier. Moreover, it was possible to test a few models of snow accumulation by snow pits, sonic ranger and georadar data. The retrieval of data collected at the SHARE glacial stations is regularly managed by URT Ev-K2-CNR staff.

In June and October 2012, two missions on the Forni Glacier were organized and on these occasions technical interventions were carried out in order to restore the AWS operation and the data delivery service to Ev-K2-CNR HQs.

CNR-ISAC, in close synergy with WP1.2, shared technical information with CETEMPS – Aquila University for the implementation of a new mountain measurement station at Campo Imperatore – Monte Portella, which operates in the framework of the SHARE-Italia network (Gran Sasso d'Italia, Abruzzo, see Figure 5).



Figure 4. A view of the Forni AWS.



Figure 5. External view of the atmospheric observatory at Campo Imperatore – Monte Portella

In particular, based on the Monte Cimone and NCO-P know-how, the technical design of the air intake for trace gas sampling was shared and indications were provided on the wind sensors and instrumentation for monitoring atmospheric aerosol number size distribution, thus contributing to the feasibility study for the station installation. At the current stage, this station, which was already (partially) supported by the SHARE Project, is continuously measuring meteorological parameters, ozone and NO_x mixing ratios, and aerosol size distribution (with diameters from 0.3 μm to 10 μm , using an optical particle counter). A sub-set of these data is also transmitted in near real-time and plotted at <http://cetemps.aquila.infn.it/Cetemps/it/portella.html>. A detailed analysis of the summer ozone variability at Campo Imperatore – Monte Portella, as deduced from preliminary measurements carried out on August 2009 in the framework of SHARE Project, has been performed and it is currently in press (Cristofaneli et al., *Analysis of Summer Ozone Observations at a High Mountain Site in Central Italy (Campo Imperatore, 2388 m a.s.l.)*, Pure and Applied Geophysics, in press). The analysis generated the first information on typical ozone mixing ratios (Fig. 6) and variability (at diurnal and synoptic time frames) in a high mountain region of central Italy.

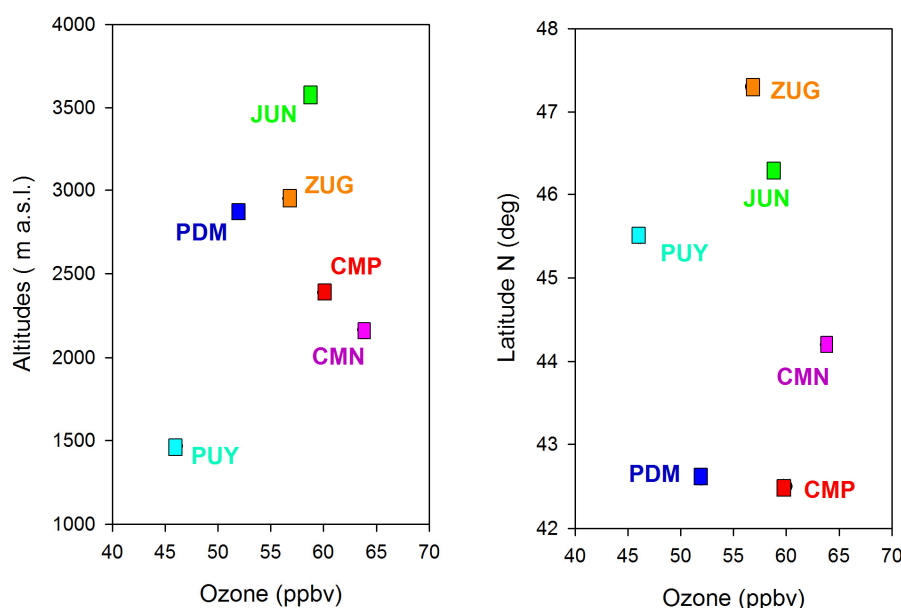


Figure 6. Summertime mean O_3 values of ozone at Campo Imperatore – Monte Portella (CMP) during the experimental campaign in comparison with the climatological values (period 2001-2008) for five European mountain stations: Jungfrauoch (JFJ, Swiss Alps), Zugspitze (ZUG, German Alps), Pic du Midi (PDM, Pyrennès), Monte Cimone (CMN, Italian Apennines), Puy de Dôme (PUY, Massif Central). On the left (right): the y-axis reports the altitudes (latitudes) of the measurement sites.

Database availability:

At the Ev-K2-CNR HDs, the following databases are available on request (only validated data):

- Database of measurements and meteo-climatic variables recorded at the AWS stations reported in Table 1. For information about format and validation status, please refer to ANNEX 1.
- Database of surface ozone, carbon dioxide, total particle number ($10 \text{ nm} < D_p < 3 \text{ }\mu\text{m}$), meteorological parameters at Askole from August to October, 2012 (format: Excel; status: preliminary validation; data provider: URT EV-K2-CNR);
- Database of surface ozone, NO_x , aerosol size distribution ($0.3 - 10 \mu\text{m}$), meteorological parameters, global short-wave solar radiation at Campo Imperatore – Monte Portella on July – December 2012 (format: ascii; status: raw data; data provider: CETEMPS, URT EV-K2-CNR);
- Database LTER of meteorological, chemical (P, N, main anions and cations, metals) and biological (Phytoplankton, Zooplankton, Benthos) parameters at two Pyramid Lakes (Superior and Inferior) from 1992 to 2012.
- Database of river discharge measurement at Pheriche and at Pyramid Lake superior emissary (June 2012-ongoing)



Project of Strategic Interest NEXTDATA

Scientific report for the reference period 01/01/2012 - 31/12/2012

WP 1.1 – High altitude climate observation system (Resp: Paolo Cristofanelli)

Partners: URT Ev-K2-CNR, CNR-ISAC

ANNEX 1 STATUS OF DATA AVAILABILITY FROM THE SHARE-AWS NETWORK

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Himalaya AWS – 1

Station	Parameters	Measurement period	Availability of validated data
AWS Pyramid <i>File Format : excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	1994-ongoing	1994-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	1994-ongoing	1994-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	1994-ongoing	1994-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	1994-ongoing	1994-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	1994-ongoing	1994-2011 <i>from 2012 validation ongoing</i>
	Precipitation	1994-ongoing	1994-2011 <i>from 2012 validation ongoing</i>
	Global Radiation	2000-ongoing	2000-2011 <i>from 2012 validation ongoing</i>
	Incoming Shortwave	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Outgoing Shortwave	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Incoming Longwave	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Outgoing Longwave	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Soil Temperature 5 cm	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Soil Temperature 20 cm	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Soil Heat Flux	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Soil Moisture	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
	Snow Depth	2002-ongoing	2002-2009 <i>from 2010 validation ongoing</i>
AWS Periche <i>File Format : excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Precipitation	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Global Radiation	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
AWS Namche <i>File Format : excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Precipitation	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>
	Global Radiation	2001-ongoing	2001-2011 <i>from 2012 validation ongoing</i>

Himalaya AWS – 2

Station	Parameters	Measurement period	Availability of validated data
AWS Lukla <i>File Format : excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2002-ongoing	2002-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2002-ongoing	2002-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2002-ongoing	2002-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	2002-ongoing	2002-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	2002-ongoing	2002-2011 <i>from 2012 validation ongoing</i>
	Precipitation	2002-ongoing	2002-2011 <i>from 2012 validation ongoing</i>
	Global Radiation	2002-ongoing	2002-2011 <i>from 2012 validation ongoing</i>
	Incoming Shortwave	2009-ongoing	2009 <i>from 2010 validation ongoing</i>
	Outgoing Shortwave	2009-ongoing	2009 <i>from 2010 validation ongoing</i>
	Incoming Longwave	2009-ongoing	2009 <i>from 2010 validation ongoing</i>
	Outgoing Longwave	2009-ongoing	2009 <i>from 2010 validation ongoing</i>
	Soil Temperature 5 cm	2008-ongoing	2008-2009 <i>from 2010 validation ongoing</i>
	Soil Temperature 20 cm	2008-ongoing	2008-2009 <i>from 2010 validation ongoing</i>
	Soil Heat Flux	2009-ongoing	2009 <i>from 2010 validation ongoing</i>
	Soil Moisture	2008-ongoing	2008-2009 <i>from 2010 validation ongoing</i>
AWS Kala Patthar <i>File Format : excel</i> <i>Data resolution: 10 min</i>	Atmospheric Pressure	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
	Precipitation	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
	Global Radiation	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
	UVA Radiation	2008-ongoing	2009-2011 <i>from 2012 validation ongoing</i>
AWS Chungri Nup <i>File Format : excel</i> <i>Data resolution: 30 min</i>	Air Temperature	2010-ongoing	<i>validation ongoing</i>
	Relative Humidity	2010	<i>validation ongoing</i>
	Wind Speed	2010-ongoing	<i>validation ongoing</i>
	Wind Direction	2010-ongoing	<i>validation ongoing</i>
	Incoming Shortwave	2010-ongoing	<i>validation ongoing</i>
	Outgoing Shortwave	2010-ongoing	<i>validation ongoing</i>
	Incoming Longwave	2010-ongoing	<i>validation ongoing</i>
	Outgoing Longwave	2010-ongoing	<i>validation ongoing</i>

Himalaya AWS – 3

Station	Parameters	Measurement period	Availability of validated data
AWS Colle Sud <i>File Format : excel</i> <i>Data resolution: 10 min</i>	Station Pressure	2008-2011	2008-2011
	Air Temperature	2008-2011	2008-2011
	Relative Humidity	2008-2011	2008-2011
	Wind Speed	2008-2011	2008-2011
	Wind Direction	2008-2011	2008-2011
	Global Radiation	2008-2011	2008-2011
	UVA Radiation	2008-2011	2008-2011

Karakorum AWS

Station	Parameters	Measurement period	Availability of validated data
AWS Concordia <i>File Format: Excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2011-ongoing	<i>validation ongoing</i>
	Air Temperature	2011-ongoing	<i>validation ongoing</i>
	Relative Humidity	2011-ongoing	<i>validation ongoing</i>
	Wind Speed	2011-ongoing	<i>validation ongoing</i>
	Wind Direction	2011-ongoing	<i>validation ongoing</i>
	Precipitation	2011-ongoing	<i>validation ongoing</i>
	Incoming Shortwave	2011-ongoing	<i>validation ongoing</i>
	Outgoing Shortwave	2011-ongoing	<i>validation ongoing</i>
	Incoming Longwave	2011-ongoing	<i>validation ongoing</i>
	Outgoing Longwave	2011-ongoing	<i>validation ongoing</i>
	Snow Depth	2011-ongoing	<i>validation ongoing</i>
AWS Askole <i>File Format : Excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Precipitation	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Global Radiation	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
AWS Urdukas <i>File Format: Excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2004-ongoing	2004-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2004-ongoing	2004-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2004-ongoing	2004-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	2004-ongoing	2004-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	2004-ongoing	2004-2011 <i>from 2012 validation ongoing</i>
	Precipitation	2004-ongoing	2004-2011 <i>from 2012 validation ongoing</i>
	Incoming Shortwave	2011-ongoing	<i>validation ongoing</i>
	Outgoing Shortwave	2011-ongoing	<i>validation ongoing</i>
	Incoming Longwave	2011-ongoing	<i>validation ongoing</i>
	Outgoing Longwave	2011-ongoing	<i>validation ongoing</i>
	Snow Depth	2011-ongoing	<i>validation ongoing</i>

Rwenzori AWS

Station	Parameters	Measurement period	Availability of validated data
AWS Elena Glacier <i>File Format: Excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2006 to June 2009	2006 to June 2009
	Air Temperature	2006 to June 2009	2006 to June 2009
	Relative Humidity	2006 to June 2009	2006 to June 2009
	Wind Speed	2006 to June 2009	2006 to June 2009
	Wind Direction	2006 to June 2009	2006 to June 2009
	Precipitation	2006 to June 2009	2006 to June 2009
	Global Radiation	2006 to June 2009	2006 to June 2009

Italian Alps AWS

Station	Parameters	Measurement period	Availability of validated data
AWS Bianco - Osrám <i>File Format : Excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Incoming Shortwave	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Outgoing Shortwave	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Incoming Longwave	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Outgoing Longwave	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Snow Depth	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
AWS Dosd� - Levissima <i>File Format : Excel</i> <i>Data resolution: hourly</i>	Atmospheric Pressure	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Incoming Solar Radiation	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Outgoing Solar Radiation	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Incoming Infrared Radiation	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
	Outgoing Infrared Radiation	2007-ongoing	2007-2011 <i>from 2012 validation ongoing</i>
AWS 1 Forni <i>File Format: Excel</i> <i>Data resolution: 30 min</i>	Atmospheric Pressure	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Air Temperature	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Relative Humidity	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Wind Speed	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Wind Direction	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Precipitation	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Incoming Solar Radiation	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Outgoing Solar Radiation	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Incoming Infrared Radiation	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Outgoing Infrared Radiation	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>
	Snow Depth	2005-ongoing	2005-2011 <i>from 2012 validation ongoing</i>