Continuous meteorological and snow hydrological measurements since 2013 from three automatic weather stations (AWS) in the upper Rofental, Ötztal Alps, Austria – Version 2.0

(https://doi.org/10.5880/fidgeo.2023.037)

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1. Licence

2. Citation

When using the data please cite:

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Site description Rofental LTER: https://www.lter-austria.at/rofental/

Site in DEIMS-SDR database: https://deims.org/02ee24e5-d25e-4aa6-b6a2-9d08a12992df

Site description Rofental INARCH: https://inarch.usask.ca/science-basins/rofental.php

3. Version history

1 November 2023: publication of initial version

5 March 2026: release of Version 2.0

- Changelog:
  - This update reproduces the first version of the time series to August 31, 2023 (unchanged) and extends it for the period from September 1, 2023, to September 30, 2025. The setup of the stations and sensors remains unchanged in the new time period.
  - The first version of the data and data description are available in the “previous-versions” subfolder in the data download folder.
  - Change of title removing the end year of measurements (from “for 2013-2023” to “since 2013”)

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4. Data Description

The data comprises time series from three automatic meteorological and snow-hydrological stations situated in the upper Rofental (1891–3772 m a.s.l., Ötztal Alps, Austria, Warscher et al., 2024). The Rofental catchment is part of several international research initiatives (UNESCO IHP, GEWEX INARCH, ERB, LTSER) as a dedicated research basin. An extensive data collection and the existing measurement infrastructure is described in Strasser et al. (2018).

Three automatic weather stations have been installed in the upper part of the catchment to complement the scientific monitoring infrastructure. They are equipped with a specific set of sensors continuously recording snow cover properties. The data is collected to support I) improved process understanding of snow drift, accumulation and melt dynamics in high mountain regions, II) process model development, evaluation, and application on different scales and for different purposes (regional climate and weather, glaciology, hydrology, ecology) and III) operational avalanche warning and flood forecasting services.

The stations are situated at 2737, 2805, and 2919 m a.s.l. and include automatic measurements of meteorological (temperature, precipitation, humidity, wind speed, and radiation fluxes) and snow-hydrological variables (snow depth, snow water equivalent, volumetric solid and liquid water content, snow density, layered snow temperature profiles, snow surface temperature, and snow drift). The recordings at the three automatic stations are continuously recording with different starting dates, the first beginning in Sep 2013. The data collection of version 2.0 ends in September 2025 and will be updated annually.

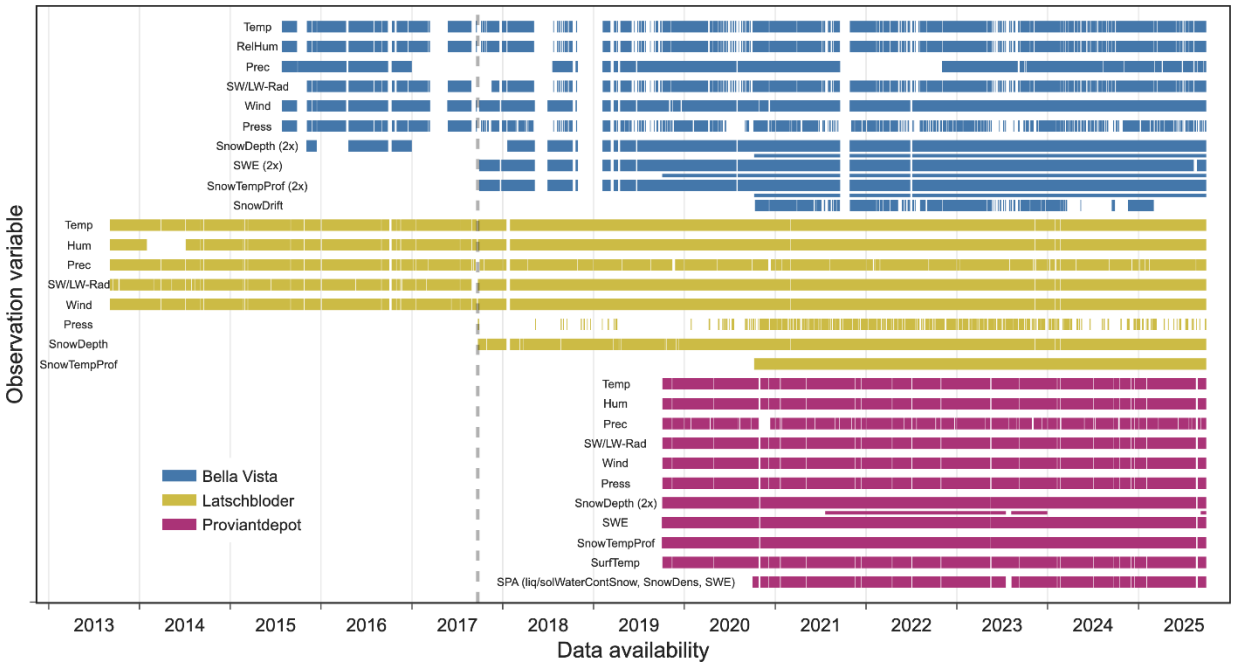

Figure 1: data availability for the three Rofental AWS sites Bellavista, Latschbloder, Proviantdepot.

4.1.Sampling method

The data is sampled by fully automatic weather stations (AWS). The data retrieved by the sensors is stored on a logger in 10 min. temporal resolution. The data is continuously transferred by GSM transmitter to a server.

4.2.Data processing

The data processing consists of transfer of the raw data from the logger to a data server, basic processing steps (e.g., temperature correction long-wave radiation, decumulating precipitation measurements), and a semi-automatic correction for erroneous values.

5. File description

The data are provided as csv-files, one per station. Each table includes the complete measurement period and all measured variables at the respective station. In addition, there is a csv-File containing coordinates and names of the stations.

The files are named with an ID, station name, measurement interval, and temporal range as following:

ID_name_interval_range.csv

with: *1_BellaVista_10min_2015-2025.csv*

- *2_Latschbloder_10min_2013-2025.csv*
- *3_Proviantdepot_10min_2019-2025.csv*

Metadata file:

- *stations_Rofental_UIBK.csv*

5.1.Description of data tables

5.1.1. File: 1_BellaVista_10min_2015-2025.csv

Column header	unit	Description
Date and time		
Vaisala air temperature (deg C)	°C	air temperature (sensor Vaisala)
Vaisala air humidity (per cent)	%	relative air humidity (sensor Vaisala)
Vaisala precipitation (mm/interval)	mm	precipitation (sensor Vaisala)
Vaisala mean wind speed (m/s)	W/m^2	mean wind speed (sensor Vaisala)
Vaisala mean wind direction (deg)	deg	mean wind direction (sensor Vaisala)
Vaisala maximum wind speed (m/s)	W/m^2	maximum wind speed (sensor Vaisala)
Vaisala air pressure (hPa)	hPa	atmospheric pressure (sensor Vaisala)
EE08 air temperature (deg C)	°C	air temperature (sensor EE08)
EE08 air humidity (per cent)	%	relative air humidity (sensor EE08)
Ott Pluvio precipitation (mm/interval)	mm	precipitation (sensor Ott)
K&Z CNR4 shortwave in (W/m2)	W/m^2	incoming shortwave radiation (sensor CNR4)
K&Z CNR4 shortwave out (W/m2)	W/m^2	outgoing shortwave radiation (sensor CNR4)
K&Z CNR4 longwave in (W/m2)	W/m^2	incoming longwave radiation (sensor CNR4)
K&Z CNR4 longwave out (W/m2)	W/m^2	outgoing longwave radiation (sensor CNR4)
Kroneis mean wind speed (m/s)	m/s	mean wind speed (sensor Kroneis)
Kroneis mean wind direction (deg)	deg	mean wind direction (sensor Kroneis)
Kroneis maximum wind speed (m/s)	m/s	maximum wind speed (sensor Kroneis)
Kroneis maximum wind direction (deg)	deg	direction of max. wind speed (sensor Kroneis)
Young 61302V air pressure (hPa)	hPa	atmospheric pressure (sensor Young)
USH8 snow depth (mm)	mm	snow depth location 1
Snow pillow pressure (mbar)	mbar	snow pillow pressure location 1
Snow pillow snow water equivalent (mm)	mm	snow water equivalent pillow location 1
SCA snow temperature 0 cm (deg C)	°C	snow temperature 0cm location 1
SCA snow temperature 20 cm (deg C)	°C	snow temperature 20cm location 1
SCA snow temperature 40 cm (deg C)	°C	snow temperature 40cm location 1
SCA snow temperature 60 cm (deg C)	°C	snow temperature 60cm location 1
SCA snow temperature 80 cm (deg C)	°C	snow temperature 80cm location 1
SCA snow temperature 100 cm (deg C)	°C	snow temperature 100cm location 1
SSG-2 snow water equivalent (mm)	mm	snow water equivalent scale location 1
USH9 snow depth II (mm)	mm	snow depth location 1
SSG-2 snow water equivalent II (mm)	mm	snow water equivalent location 1
SCA snow temperature 0 cm II (deg C)	°C	snow temperature 0cm location 2
SCA snow temperature 20 cm II (deg C)	°C	snow temperature 20cm location 2
SCA snow temperature 40 cm II (deg C)	°C	snow temperature 40cm location 2
SCA snow temperature 60 cm II (deg C)	°C	snow temperature 60cm location 2
SCA snow temperature 80 cm II (deg C)	°C	snow temperature 80cm location 2
SCA snow temperature 100 cm II (deg C)	°C	snow temperature 100cm location 2
SND min. snow drift (g/m2)	g/m^2	snow drift min. location 1
SND avg. snow drift (g/m2)	g/m^2	snow drift avg. location 1
SND max. snow drift (g/m2)	g/m^2	snow drift max. location 1
SND std. snow drift (g/m2)	g/m^2	snow drift std. location 1
SND cum. snow drift (g/m2)	g/m^2	snow drift cum. location 1

5.1.2. File: 2_Latschbloder_10min_2013-2025.csv

Column header	unit	Description
Date and time		
Vaisala air temperature (deg C)	°C	air temperature (sensor Vaisala)
Vaisala air humidity (per cent)	%	relative air humidity (sensor Vaisala)
Vaisala precipitation (mm/interval)	mm	precipitation (sensor Vaisala)
Vaisala mean wind speed (m/s)	W/m^2	mean wind speed (sensor Vaisala)
Vaisala mean wind direction (deg)	deg	mean wind direction (sensor Vaisala)
Vaisala maximum wind speed (m/s)	W/m^2	maximum wind speed (sensor Vaisala)
Vaisala air pressure (hPa)	hPa	atmospheric pressure (sensor Vaisala)
EE08 air temperature (deg C)	°C	air temperature (sensor EE08)
EE08 air humidity (per cent)	%	relative air humidity (sensor EE08)
Ott Pluvio precipitation (mm/interval)	mm	precipitation (sensor Ott)
K&Z CNR4 shortwave in (W/m2)	W/m^2	incoming shortwave radiation (sensor CNR4)
K&Z CNR4 shortwave out (W/m2)	W/m^2	outgoing shortwave radiation (sensor CNR4)
K&Z CNR4 longwave in (W/m2)	W/m^2	incoming longwave radiation (sensor CNR4)
K&Z CNR4 longwave out (W/m2)	W/m^2	outgoing longwave radiation (sensor CNR4)
Young mean wind speed (m/s)	m/s	mean wind speed (sensor Young)
Young mean wind direction (deg)	deg	mean wind direction (sensor Young)
Young maximum wind speed (m/s)	m/s	maximum wind speed (sensor Young)
Young maximum wind direction (deg)	deg	direction of max. wind speed (sensor Young)
USH8 snow depth (mm)	mm	snow depth
Young 61302V air pressure (hPa)	hPa	atmospheric pressure (sensor Young)
SCA snow temperature 0 cm (deg C)	°C	snow temperature 0cm
SCA snow temperature 20 cm (deg C)	°C	snow temperature 20cm
SCA snow temperature 40 cm (deg C)	°C	snow temperature 40cm
SCA snow temperature 60 cm (deg C)	°C	snow temperature 60cm
SCA snow temperature 80 cm (deg C)	°C	snow temperature 80cm
SCA snow temperature 100 cm (deg C)	°C	snow temperature 100cm

5.1.3. File: 3_Proviantdepot_10min_2019-2025.csv

Column header	unit	Description
Date and time		
EE08 air temperature (deg C)	°C	air temperature (sensor EE08)
EE08 air humidity (per cent)	%	relative air humidity (sensor EE08)
Ott Pluvio precipitation (mm/interval)	mm	precipitation (sensor Ott)
K&Z CNR4 shortwave in (W/m2)	W/m^2	incoming shortwave radiation (sensor CNR4)
K&Z CNR4 shortwave out (W/m2)	W/m^2	outgoing shortwave radiation (sensor CNR4)
K&Z CNR4 longwave in (W/m2)	W/m^2	incoming longwave radiation (sensor CNR4)
K&Z CNR4 longwave out (W/m2)	W/m^2	outgoing longwave radiation (sensor CNR4)
Young mean wind speed (m/s)	m/s	mean wind speed (sensor Young)
Young mean wind direction (deg)	deg	mean wind direction (sensor Young)
Young maximum wind speed (m/s)	m/s	maximum wind speed (sensor Young)
Young maximum wind direction (deg)	deg	direction of max. wind speed (sensor Young)
Young 61302V air pressure (hPa)	hPa	atmospheric pressure (sensor Young)
USH9 snow depth (mm)	mm	snow depth
SCA snow temperature 0 cm (deg C)	°C	snow temperature 0cm
SCA snow temperature 20 cm (deg C)	°C	snow temperature 20cm
SCA snow temperature 40 cm (deg C)	°C	snow temperature 40cm
SCA snow temperature 60 cm (deg C)	°C	snow temperature 60cm

SCA snow temperature 80 cm (deg C)	°C	snow temperature 80cm
SCA snow temperature 100 cm (deg C)	°C	snow temperature 100cm
SSG-2 snow water equivalent (mm)	mm	snow water equivalent scale
SIR surface temperature (deg C)	°C	surface temperature (infrared sensor)
SPA ice content S1 (per cent)	%	snow ice content (diagonal band)
SPA liquid water content S1 (per cent)	%	snow liquid water content (diagonal band)
SPA snow density S1 (kg/m^3)	kg/m^3	snow density (diagonal band)
SPA snow water equivalent S1 (mm)	mm	snow water equivalent (diagonal band)
SPA ice content S2 (per cent)	%	snow ice content (horizontal band, 10 cm from the ground)
SPA liquid water content S2 (per cent)	%	snow liquid water content (horizontal band, 10 cm from the ground)
SPA snow density S2 (kg/m^3)	kg/m^3	snow density (horizontal band, 10 cm from the ground)
SPA snow water equivalent S2 (mm)	mm	snow water equivalent (horizontal band, 10 cm from the ground)
SPA snow depth (mm)	mm	snow depth at the SPA

6. References

Strasser, U., Marke, T., Braun, L. N., Escher-Vetter, H., Juen, I., Kuhn, M., Maussion, F., Mayer, C., Nicholson, L., Niedertscheider, K., Sailer, R., Stötter, J., Weber, M., & Kaser, G. (2017). The Rofental: a high Alpine research basin (1890 m - 3770 m a.s.l.) in the Ötztal Alps (Austria) with over 150 years of hydro-meteorological and glaciological observations. PANGAEA. https://doi.org/10.1594/PANGAEA.876120

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