



# PERMOS Data Base – Table Description

v. March 2021

## 1 Introduction

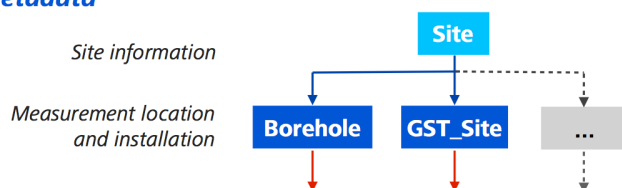
The PERMOS data base is organized in three levels of data (Fig. 1). The *Metadata Tables* include all information about the measurement sites and the installations, the *Data Tables* hold the data measured in the field, and the third level includes the so-called *Products*, i.e. data products derived from the data. Published data (DOI releases) include the products and relevant metadata.

Data quality control is applied to the data when it is written to the database (basic quality control) as well during repeated data curing activities by the data managers.

Products are created from the data tables to provide standardized versions of the data derived from the measurements, such as temporal aggregations or derived parameters like active layer thickness or creep velocity. Data with dubious quality are not included to calculate product tables (flag\_qual>2).

The PERMOS data base is a relational PostgreSQL data base running on an Ubuntu server at the Department of Geography at the University of Zurich (www.giuz.uzh.ch). Data can be visualised and downloaded via the PERMOS Data Portal at <http://newshinypermos.geo.uzh.ch/app/DataBrowser/>. All data are subject to an open data policy. Details regarding the use and citation of PERMOS data and graphs are described in the PERMOS Data Policy: [http://www.permos.ch/data\\_policy.html](http://www.permos.ch/data_policy.html).

### Metadata



### Data



ID	Borehole_ID	Depth	Time	Temp	PFlag	QFlag	Timestamp
1	3	10	2013-07-11 16:15:00	-1.256	b	1	2013-07-11 16:15:00

Proc. Quality Versioning

### Products

#### Aggregations

hourly | daily | annual | hydr. year | FDD

#### Standard views

Temps per borehole | gst-site

- ★ performance
- ★ easy access and standard views
- ★ data exchange with predefined data sets
- ★ standard processing

**no data manipulation!**

Fig. 1: Organisation of tables in the PERMOS Data Base: metadata, data and product tables.

## 2 Metadata Tables

### 2.1 General tables

#### 2.1.1 Site

General information about the measurement sites and data acquisition for all types of measurements

Field	Type	Default	Keys	Indexes	Description
<b>Id</b>	int4(32)	auto incr.	primary	unique	Site ID (only used for reference within the database) Auto increment: nextval('site_id_seq'::regclass)
abbr	text			unique	Site abbreviation
name	text			unique	Site name
alter_name	text	(NULL)			Other frequently used name for the site
permoss	int2(16)				Site of the PERMOS network and/or the TEMPS Project? 0: neither PERMOS nor TEMPS site 1: PERMOS site (i.e., it is also a TEMPS site) 2: PERMOS reference site (i.e., it is also a TEMPS site) 3: TEMPS site only
country	text				Country abbreviation
region	text	(NULL)			Region, where the site is situated. For the Swiss sites, the major political regions are used (see Fig. 2)
landforms	text	text			Observed landform(s) at the site
lithology	text	(NULL)			Lithology (predominant rock type) of the site
e	numeric(10,0)	(NULL)			Approximate location in Swiss national coordinates (LV03), E-W direction   non-CH sites: -999
n	numeric(10,0)	(NULL)			Approximate location in Swiss national coordinates (LV03), N-S direction   non-CH sites: -999
lat	numeric(10,6)	(NULL)			Geographic coordinates, latitude (decimal degrees)
lon	numeric(10,6)	(NULL)			Geographic coordinates, longitude (decimal degrees)
h_min	numeric(10,0)	(NULL)			Approximate altitude range (m a.s.l.) of the measurement installations, min elevation
h_max	numeric(10,0)	(NULL)			Approximate altitude range (m a.s.l.) of the measurement installations, max elevation
comment	text	(NULL)			Additional comments, such as a short site description or a reference to an article describing the site in more detail
created_at	timestampz	(CURRENT_TIMESTAMP)			Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestampz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.



Fig. 2: Political units as used in the field *Region*:  
Picture taken from  
[http://www.slf.ch/lawineninfo/zusatzinfos/interpretationshilfe/geographische\\_begriffe/karte\\_polit\\_geogr\\_e.gif](http://www.slf.ch/lawineninfo/zusatzinfos/interpretationshilfe/geographische_begriffe/karte_polit_geogr_e.gif).

### 2.1.2 *pi*

Information about the principal investigators (PI) or contact persons for the measurements

Field	Type	Default	Keys	Indexes	Notes
<b>id</b>	int4(32)	auto incr.	primary	unique	PI ID (only used for reference within the database)
abbr	text			unique	Abbreviation used for the PI
last_name	text			unique	Last name
first_name	text				First name
institute	text	(NULL)			Acronym for the responsible institute
email	text	(NULL)			Email address
office	text	(NULL)			Phone number office
created_at	timestampz	(CURRENT_TIMESTAMP)			Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)

## 2.2 Documentation tables

### 2.2.1 *flag\_qual*

Quality flags indicate the quality of the data stored in the database. The quality flag is applied in data tables. Only data with a *flag\_qual* < 2 is accessible in the data portal, processed to derive products, and published in DOI releases or other databases.

The quality flags used are based on the recommendations by the WMO.

Field	Type	Default	Keys	Indexes	Notes
<b>ID</b>	int(10)		primary		Flag value 0 no information 1 good 2 inconsistencies 3 dubious (suspect) 4 erroneous
Description	varchar(50)				Short description of the meaning of the flag_qual value according to the list above.
Comment	varchar(1000)	(NULL)			Additional information about the meaning of the flag_qual value.

### 2.2.2 *flag\_proc*

Flags to indicate the processing carried out on the data. The quality flag is only used in the data tables. The original value is stored in a separate column (e.g. raw\_temp in bht or gst).

Field	Type	Default	Keys	Indexes	Notes
<b>ID</b>	varchar(10)		primary		Flag value a original value b date/time corrected c value corrected (manually) e value corrected, zero curtain calibration p calibration correction (manually) x no processing information available / as received by the PI
Description	varchar(50)				Short description of the meaning of the flag_proc value
Comment	varchar(1000)	(NULL)			Additional information about the meaning of the flag_proc value

### 3 Borehole tables

#### 3.1 Metadata tables

##### 3.1.1 Borehole

Information about the individual boreholes and their location.

Field	Type	Default	Keys	Indexes	Notes
<b>id</b>	int4(32)	auto incr.	primary	unique	Borehole ID (only used for reference within the database)
name	text			unique	Borehole name: site abbreviation, underscore, number of the borehole, year drilled, e.g. SCH_5198
alter_name	text	(NULL)			Alternative name(s) of the borehole
site_id	int4(32)		foreign		ID of the corresponding measurement site.
year	int2(16)	(NULL)			Year, when the borehole was drilled (YYYY)
active	bool	(NULL)			Measurements ongoing? Either 1 or the year, when measurements were stopped (YYYY).
project	text	(NULL)			Network / project, the borehole is affiliated with
gtnp_id	text	(NULL)		unique	ID the borehole is addressed within GTN-P (GTN-P Code)
gtnp_dms_id	int4(32)	(NULL)		unique	ID of the GTN-P data management system (Borehole Code)
calm_id	text	(NULL)			ID of the borehole within the Circumpolar Active Layer Monitoring CALM
e	numeric(10,3)	(NULL)			Exact location in Swiss national coordinates (LV03 reference frame)   non-CH sites: –999
n	numeric(10,3)	(NULL)			Exact location in Swiss national coordinates (LV03 reference frame)   non-CH sites: –999
h	numeric(10,3)	(NULL)			Altitude (m a.s.l.)
lat	numeric(10,6)	(NULL)			Geographic coordinates, latitude (decimal degrees)
lon	numeric(10,6)	(NULL)			Geographic coordinates, longitude (decimal degrees)
depth	numeric(10,3)	(NULL)			Original depth of the borehole, when it was drilled (m)
inc	numeric(5,0)	(NULL)			Inclination (i.e., deviation from the vertical) of the borehole (°)
slp	numeric(5,0)	(NULL)			Slope of the borehole site (°). For boreholes all the way through a crest, the information for the slope closest to the «uppermost» sensor is given.
asp	numeric(5,0)	(NULL)			Aspect of the borehole site (°) For flat locations: –999
morphology	text	(NULL)			Morphology of the measurement location [crest   moraine   rock glacier   solifluction lobe   talus slope]
surf_type	text	(NULL)			Surface (material) at the measurement location [bedrock   coarse blocks   debris   vegetation]
pf_thick	text	(NULL)			Estimated permafrost thickness at the borehole location
class	text	(NULL)			Borehole class according to GTN-P: SU: Surface: <10 m SH: Shallow: 10–25 m IB: Intermediate: 25–125 m DB: Deep: >125 m
comment	text	(NULL)			Additional comments
created_at	timestampz	(CURRENT_TIMESTAMP)			Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestampz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

##### 3.1.2 bh\_inst

Information about the instrumentation of the boreholes.

Field	Type	Default	Keys	Indexes	Notes
<b>id</b>	int2(16)	auto incr.	primary	unique	Record ID (only used for reference within the database)
borehole_id	int2(16)		foreign		ID of the corresponding borehole.
beg_date	date				Date from when the installation information is valid.
end_date	date				Date until when the installation information is valid. For currently valid records TO is set to '2100-01-01'.
pi_id	int2(16)		foreign		ID of the responsible PI

low_sensor	numeric(10,3)	(NULL)			Depth of the lowest working thermistor (m)
sensor_type	text	(NULL)			Type of sensor used for the temperature measurements
log_system	text	(NULL)			Type of logging system used
last_calib	int2(16)	(NULL)			Year of last calibration of the thermistor chain (YYYY)
data_access	text	(NULL)			Means of data access
changes	text	(NULL)			Information about major changes to the measurement configuration (not necessarily exhaustive!)
comment	text	(NULL)			Additional comments and possibly a reference to more detailed documentation of the installation
created_at	timestampz	(CURRENT_TIMESTAMP)			Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestampz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

### 3.2 Data Table

#### 3.2.1 bht

Main table of borehole temperature time series. All borehole data is stored in the original temporal resolution available. Data integration and quality control are performed on this table only. Aggregations are calculated based on this data.

Field	Type	Default	Keys	Indexes	Notes
borehole_id	Int(5)		foreign	unique	ID of the corresponding borehole
time	datetime				Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD HH:MM:SS)
depth	decimal(20,5)	(NULL)			Depth of the measurement (m)
temp	decimal(20,5)	(NULL)			Measured borehole temperature (°C), processed and checked value
raw_temp	decimal(20,5)	(NULL)			Measured borehole temperature (°C), original value
flag_qual	int(5)	(NULL)	foreign		Flag noting the quality of the value stored in the field <i>temp</i>
flag_proc	int(5)	(NULL)	foreign		Flag noting the processing performed on the value stored in the field <i>temp</i>
created_at	timestampz	(CURRENT_TIMESTAMP)			Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestampz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

### 3.3 Products

#### 3.3.1 Aggregations: bht\_day, bht\_month, bht\_year, bht\_hyear

Measured data are stored in the highest available temporal resolution, which differs between different installations between 1h and 24h. Aggregated data tables are named *DataTable\_AggregationLevel*: Daily means of borehole temperatures are stored in the table **bht\_day**, monthly means in the table **bht\_month**, etc.

Available aggregation levels are: *day*, *month*, *year*, *hyear*.

#### Notes:

- Daily means are calculated from the original data table *bht* and *gst* based on all original data with a quality flag  $\leq 2$ . The quality of the aggregated monthly and annual means is assessed based on the available number of values (count) as well as the maximum gap length. The thresholds for accepting an aggregated value is distinguished for three different depth classes (near surface < 2 m / down to ZAA 2 m to < 20 m / deep > 20 m).
- The time field for tables with annual means is called year (hyear) and is of type year(4).
- The hydrological year in the European Alps is defined from 01.10. to 30.09.

Field	Type	Default	Keys	Indexes	Notes
borehole_id	Int(5)		foreign	unique	ID of the corresponding borehole
time	datetime				Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD HH:MM:SS)
depth	decimal(20,5)	(NULL)			Depth of the measurement (m)

temp	decimal(20,5)	(NULL)			Measured borehole temperature (°C)
t_min	decimal(20,5)	(NULL)			Minimum borehole temperature in aggregation period (°C)
t_max	decimal(20,5)	(NULL)			Maximum borehole temperature in aggregation period (°C)
count	int(5)	(NULL)			Number of measurements available for the calculation of the aggregated value.

### 3.3.2 ALT

The active layer thickness (ALT) for each year and borehole is calculated by linear interpolation between neighbouring sensors (sensors with positive and negative temperatures above and below the permafrost table, respectively).

Field	Type	Default	Keys	Indexes	Notes
id	int(5)	auto incr.	primary	unique	Unambiguous identifier for the data point (primary key)
borehole_id	int(5)		foreign	unique	ID of the corresponding borehole
year	year				Year
alt	decimal(20,5)	(NULL)			Maximum active layer thickness (m)
date	date	(NULL)			Date of the max ALT (YYYY-MM-DD)
guess	varchar(45)	(NULL)			Set to 1 if ALT value is a guess by the PI or the PERMOS Office
upper_therm	decimal(10,2)	(NULL)			Depth of upper thermistor used for the interpolation (m)
lower_therm	decimal(10,2)	(NULL)			Depth of lower thermistor used for the interpolation (m)
comment	varchar(45)	(NULL)			Additional information about the calculation of the max. ALT
created_at	timestamptz	(CURRENT_TIMESTAMP)		NN	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestamptz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

## 3.4 Documentation Tables

Documentation tables are used to document and archive manipulations made on the data in the database. They are important to understand and archive the history of a data series. The documentation tables are only available for changes from the year 2019 and newer. Earlier processing steps are not systematically documented and can be found in different files and folders related to the observation sites. Documentation tables are not published in DOIs.

### 3.4.1 bht\_manipulations

Manipulation on borehole temperatures, e.g., setting of quality or processing flags, error correction, manual calibration, etc.

Field	Type	Default	Keys	Indexes	Notes
id	Serial	auto incr.	primary	unique	
borehole_id	int4	(NULL)		NN	borehole_id of the time series
pi_id	int4	(NULL)		NN	PI performing the manipulation
description	text	(NULL)		NN	Description of the manipulation, changes in the time series
depth	text				Depth: can be one, many or all
beg_manip	timestamp	(NULL)			Begin time when manipulation was applied, if NULL from the start of the time series
end_manip	timestamp	(NULL)			End time when manipulation was applied, if NULL to the end of the time series.
created_at	timestamptz	(CURRENT_TIMESTAMP)		NN	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)

### 3.4.2 bh\_sensor\_state

Information on each sensor about state, problems, and limits for basic QC (value range, time consistency).

Field	Type	Default	Keys	Indexes	Notes
id	Serial	auto incr.	primary	Unique	
borehole_id	int4	(NULL)		NN	borehole_id of the time series

depth	numeric				Depth: can be one, many or all
chain	numeric				Number of the temperature sensor chain of the sensor
default_flag_qual	numeric	(NULL)			Default flag_qual to be used for this sensor for data written to the data base.
comment	text	(NULL)		NN	Description of the state or problem of the sensor
begin_state	timestamp	(NULL)			Begin time when manipulation was applied, if NULL from the start of the time series
end_state	timestamp	(NULL)			End time when manipulation was applied, if NULL until the end of the time series
created_at	timestampz	(CURRENT_TIMESTAMP)		NN	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestampz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

## 4 GST tables

### 4.1 Metadata tables

#### 4.1.1 gst\_loc

Information on the locations of ground surface temperature (GST) measurements

Field	Type	Default	Keys	Indexes	Notes
id	int8(64)	auto incr.	primary	unique	GST location ID (only used for reference within the database)
name	text			unique	GST location name: site abbreviation, underscore, S (scree) or R (rock), consecutive number, e.g. SCH_R001
alter_name	text	(NULL)			Alternative name(s) of the GST location as used by PI
alter_name2	text	(NULL)			Alternative name(s) of the GST location
site_id	int4(32)		foreign		ID of the corresponding measurement site.
pi_id	int4(32)		foreign		ID of the responsible PI
year	int4(32)	(NULL)			Year, when the GST location was installed (YYYY)
active	bool	(NULL)			Measurements ongoing? Either 1 or the year, when measurements were stopped (YYYY).
project	text	(NULL)			Network / project, the GST location is affiliated with
e	numeric(10,3)	(NULL)			Exact location in Swiss national coordinates (LV03 reference frame)   non-CH sites: -999
n	numeric(10,3)	(NULL)			Exact location in Swiss national coordinates (LV03 reference frame)   non-CH sites: -999
h	numeric(10,3)	(NULL)			Altitude (m a.s.l.)
lat	numeric(10,6)	(NULL)			Geographic coordinates, latitude (decimal degrees)
lon	numeric(10,6)	(NULL)			Geographic coordinates, longitude (decimal degrees)
slp	numeric(10,3)	(NULL)			Slope of the GST location (°)
asp	numeric(10,3)	(NULL)			Aspect of the GST location (°) For flat locations: -999
morphology	text	(NULL)			Morphology of the measurement location [crest   grassland   moraine] rock glacier   solifluction lobe   talus slope   rock wall]
surf_type	text	(NULL)			Surface (material) at the measurement location [bedrock   coarse blocks   debris   soil   vegetation]
depth	numeric(10,3)	(NULL)			Depth of the logger [m]
sky_view	numeric(10,3)	(NULL)			Sky fraction (fraction 0–1) visible to the GST logger (measured on-site)
log_type	text	(NULL)			Type of logger device used
changes	text	(NULL)			Information about major changes to the measurement configuration (not necessarily exhaustive!)
comment	text	(NULL)			Additional comments
used_in_report	boolean	(NULL)			Time series used in the PERMOS reports, defined based on length and completeness of the data series.
report_group	boolean	(NULL)			For sites with more than one report group, e.g. due to different aspect or rock glaciers lobes.

created_at	timestampz	(CURRENT_TIMESTAMP)		NN	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestampz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

## 4.2 Data Table

### 4.2.1 gst

Main table of ground surface temperature time series. All GST data is stored in the original temporal resolution available. Data integration and quality control are performed on this table only. Aggregations are calculated based on this data.

Field	Type	Default	Keys	Indexes	Notes
gst_loc_id	int(5)		foreign	unique	ID of the corresponding gst location
time	datetime				Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD HH:MM:SS)
depth	decimal(20,5)	(NULL)			Depth of the measurement (m)
temp	decimal(20,5)	(NULL)			Measured gst temperature (°C), processed and checked value
raw_temp	decimal(20,5)	(NULL)			Measured gst temperature (°C), original value
flag_qual	int(5)	(NULL)	foreign		Flag noting the quality of the value stored in the field <i>temp</i>
flag_proc	int(5)	(NULL)	foreign		Flag noting the processing performed on the value stored in the field <i>temp</i>
created_at	timestampz	(CURRENT_TIMESTAMP)		NN	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	timestampz	(NULL)			Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

## 4.3 Products

### 4.3.1 Aggregations

Measured data are stored in the highest available temporal resolution, which differs between different installations and time periods. Tables with aggregated data are named *DataTable\_AggregationLevel*. That is, daily means of GST are stored in the table **gst\_day**, annual means of calendar years are stored in the table **gst\_year** etc.

Available aggregation levels are: *day*, *month*, *year*, *hyear*.

#### Notes:

- Daily means are calculated from the original data table based on all original data with a quality flag ≤2. Monthly and annual data are calculated based on thresholds for the number of available values (count) as well as the maximum length of consecutive data gaps.
- The time field for tables with annual means is called year (hyear) and is of type year(4).
- Hydrological year: 01.10. to 30.09.

Field	Type	Default	Keys	Indexes	Notes
gst_loc_id	Int(5)		foreign	unique	ID of the corresponding gst location
time	datetime				Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD HH:MM:SS)
temp	decimal(20,5)	(NULL)			Measured gst temperature (°C)
t_min	decimal(20,5)	(NULL)			Minimum gst temperature in aggregation period (°C)
t_max	decimal(20,5)	(NULL)			Maximum gst temperature in aggregation period (°C)
count	int(5)	(NULL)			Number of measurements available for the calculation of the aggregated value.
max_gap	int(5)	(NULL)			Maximum length of data gaps in aggregation period.



## 5 TGS tables

### 5.1 Metadata tables

#### 5.1.1 tgs\_site

Information on terrestrial geodetic surveys (TGS) on rock glaciers.

Field	Type	Default	Keys	Indexes	Notes
id	Int8(64)	auto incr.	primary	unique	TGS site ID (only used for reference within the database)
name	text			Unique NN	TGS site name: site abbreviation, underscore, TGS, consecutive number, e.g. MUR_TGS1
alter_name	text	(NULL)			Alternative name(s) of the TGS site as used by the PI
site_id	int4(32)		foreign		ID of the corresponding measurement site.
pi_id	int4(32)		foreign		ID of the responsible PI
year	int2(16)	(NULL)			Year of start of measurements (YYYY)
active	bool	(NULL)			Measurements ongoing? Either TRUE or FALSE
project	text	(NULL)			Network / project, the TGS location is affiliated with
e	int4(32)	(NULL)			Approximate location in Swiss national coordinates, east coordinate (LV03 reference frame)   non-CH sites: –999
n	int4(32)	(NULL)			Approximate location in Swiss national coordinates, north coordinate (LV03 reference frame)   non-CH sites: –999
h_min	int4(32)	(NULL)			Approximate altitude range (m a.s.l.) of the tgs site, min elevation
h_max	int4(32)	(NULL)			Approximate altitude range (m a.s.l.) of the tgs site, max elevation
lat	numeric(10,6)	(NULL)			Geographic coordinates, latitude (decimal degrees)
lon	numeric(10,6)	(NULL)			Geographic coordinates, longitude (decimal degrees)
asp	text	(NULL)			General aspect of the landform observed (S, SE, etc.)
morphology	text	(NULL)			Morphology of the measurement location
n_meas_year	int2(16)	(NULL)			Number of measurements per year, 0.5 means every second year
n_ref_points	int4(32)	(NULL)			Number of reference points
n_obs_points	int4(32)	(NULL)			Number of observed points (reference, monitoring and control points)
crs	text	(NULL)			Coordinate system/reference frame of TGS data in the DB: LV03 Swiss national coordinates in LV03 (y, x) LV95 Swiss national coordinates in LV95 (E, N) If not specified, by default crs is LV03
changes	text	(NULL)			Information about major changes to the measurement configuration (not necessarily exhaustive!)
comment	text	(NULL)			Additional comments and possibly a reference to more detailed documentation of the installation
method	text	(NULL)			Method of survey: TS total station dGPS differential GPS

#### 5.1.2 tgs\_point

Information on measurement points at the TGS Sites.

Field	Type	Default	Keys	Indexes	Notes
id	int8(64)	auto incr.	primary	unique	TGS point ID (only used for reference within the database)
name	text	(NULL)			TGS point name: site abbreviation, underscore, consecutive number, consecutive letter (only if new points have been measured to substitute an existing one), e.g. GFU_202
alter_name	text	(NULL)			Alternative point name used by the PI
tgs_site_id	int4(32)		foreign	unique	id of the corresponding TGS site
p_group	text	(NULL)			Name of the group of point constituting a coherent time series, e.g. GFU_302 and his replacement point GFU_302b constitute the group GFU_302
active	bool	(NULL)			Is the point currently measured? t or f

zone	text				Zone on rock glacier, where the point is located, e.g front, center, rooting zone, zone1, etc.
type	int2(16)	(NULL)			Type of measurement point: 0: control point (stable, not moving points) 1: monitoring point (moving points not used as reference) 2: reference monitoring point (used to compute the site mean)
comment	text	(NULL)			Additional comments

### 5.1.3 tgs\_survey

Information on individual surveys at the TGS Sites.

Field	Type	Default	Keys	Indexes	Notes
id	int8(64)	auto incr.	primary	unique	TGS survey ID (only used for reference within the database)
tgs_site_id	int4(32)		foreign	unique	ID of the corresponding tgs_site.
survey_date	date			NN	Date of survey ((YYYY-MM-DD))
e_corr	numeric(20,4)	(NULL)			Easting correction value in metres (RAW - x)
n_corr	numeric(20,4)	(NULL)			Northing correction value in metres (RAW - y)
h_corr	numeric(20,4)	(NULL)			Elevation correction value in metres (RAW - z)
equipment	text	(NULL)			Equipment used for survey
operator	text	(NULL)			Full name of survey operator (first name last name)
uncertainty	numeric(10,4)	(NULL)			Estimated uncertainty
espg	int4(32)	(NULL)			EPSG-NR. of Coordinate Reference System (CRS). Default: CH1903/LV03 (21781)
comment	text	(NULL)			Additional comments
corr_point_id	int4(32)	(NULL)			array with all ids of tgs_point used for correction

## 5.2 Data table

### 5.2.1 tgs\_data

The location of each surveyed **tgs\_point** is stored. E and N coordinates and H values are corrected when necessary using the E\_corr, N\_corr and H\_corr values, respectively, that are stored in the table **tgs\_survey**.

Field	Type	Default	Keys	Indexes	Notes
Id	Int8(64)	Auto incr.	Primary	Unique NN	TGS data ID (only used for reference within the database)
point_name	text			Unique NN	TGS point name: site abbreviation, underscore, consecutive number, consecutive letter Inherited from the table tgs_point (name)
tgs_survey_id	Int4(32)		foreign	NN	ID of the corresponding tgs_survey Inherited from the table tgs_survey (id)
e	numeric(10,6)	(NULL)			Exact location in Swiss national coordinates, east coordinate (LV03 reference frame)   non-CH sites: –999 Corrected using e_corr from the tgs_survey table
n	numeric(10,6)	(NULL)			Exact location in Swiss national coordinates, north coordinate (LV03 reference frame)   non-CH sites: –999 Corrected using n_corr from the tgs_survey table
h	numeric(10,6)	(NULL)			Exact altitude (m a.s.l.) of the surveyed point at the date of the survey Corrected using h_corr from the tgs_survey table

## 6 ERT tables

### 6.1 Metadata tables

#### 6.1.1 ert\_site

Information about the sites, where electrical resistivity tomography (ERT) profiles are present.

Field	Type	Default	Keys	Indexes	Notes
id	int(4)32	auto incr.	primary	unique	ERT site ID (only used for reference within the database)
name	Text			Unique NN	ERT site name: site abbreviation, underscore, V (vertical) or H (horizontal), consecutive number, e.g. SCH_H1.
alter_name	Text	(NULL)			Alternative (file) name(s) of the ERT profile as used by the PI
site_id	int(5)		foreign		ID of the corresponding PERMOS measurement site.
pi_id	int(5)		foreign		ID of the responsible PI
year	Int(2)6	(NULL)			Year of start of measurements (YYYY)
surf_type	text	(NULL)			Surface (material) at the measurement location
ert_add	bool	(NULL)			Additional ERT-measurements are available (t=TRUE, f=FALSE)
rst	bool	(NULL)			Seismic profile(s) along this ERT profile (t=TRUE, f=FALSE)
pf_x1	int(2)	(NULL)			X coordinate of the upper left corner of the ZOI (distance in meters in true horizontal)
pf_z1	int(2)	(NULL)			Z coordinate of the upper left corner of the ZOI (depth in meters relative to the topography)
pf_x2	int(2)	(NULL)			X coordinate of the upper right corner of the ZOI (distance in meters in true horizontal)
pf_z2	int(2)	(NULL)			Z coordinate of the upper right corner of the ZOI (depth in meters relative to the topography)
pf_x3	int(2)	(NULL)			X coordinate of the lower right corner of the ZOI (distance in meters in true horizontal)
pf_z3	int(2)	(NULL)			X coordinate of the lower right corner of the ZOI (depth in meters relative to the topography)
pf_x4	int(2)	(NULL)			X coordinate of the lower left corner of the ZOI (distance in meters in true horizontal)
pf_z4	int(2)	(NULL)			X coordinate of the lower left corner of the ZOI (depth in meters relative to the topography)

#### 6.1.2 ert\_profile

Information about the profiles along which electrical resistivity tomography (ERT) surveys are performed.

Field	Type	Default	Keys	Indexes	Notes
id	int(4)32	auto incr.	primary	unique	ERT profile ID (only used for reference within the database)
name	text			Unique NN	ERT profile name: ert_site abbreviation, underscore consecutive number (i.e. number of the profile) e.g. SCH_H1_1.
ert_site_id	int(5)		foreign		ID of the corresponding ert site.
start_date	date	(NULL)			Date of the first measurement on this profile (YYYY-MM-DD)
active	bool	(NULL)			Measurements ongoing? t = TRUE, f = FALSE
n_elec	int(5)	(NULL)			Number of electrodes in the ERT profile
spacing	numeric(5,2)	(NULL)			Spacing of the electrodes (m)
e_first	numeric(10,1)	(NULL)			Exact location in Swiss national coordinates of first electrode, east coordinate (LV03 reference frame)   non-CH sites: -999
n_first	numeric(10,1)	(NULL)			Exact location in Swiss national coordinates of first electrode, north coordinate (LV03 reference frame)   non-CH sites: -999
h_first	numeric(10,1)	(NULL)			Altitude of first electrode (m a.s.l.)
e_last	numeric(10,1)	(NULL)			Exact location in Swiss national coordinates of last electrode, east coordinate (LV03 reference frame)   non-CH sites: -999
n_last	numeric(10,1)	(NULL)			Exact location in Swiss national coordinates, north coordinate (LV03 reference frame) of last electrode   non-CH

					sites: -999
h_last	numeric(10,1)	(NULL)			Altitude of last electrode (m a.s.l.)
bh1	text	(NULL)			Name of BH1 along the profile (used for plotting)
bh1_dist	numeric(4,1)	(NULL)			Horizontal distance of BH1 along ERT-Profile from first electrode (m)
bh2	text	(NULL)			Name of BH2 along the profile (used for plotting)
bh2_dist	numeric(4,1)	(NULL)			Horizontal distance of BH2 along ERT-Profile from first electrode (m)
bh3	text	(NULL)			Name of BH3 along the profile (used for plotting)
bh3_dist	numeric(4,1)	(NULL)			Horizontal distance of BH3 along ERT-Profile from first electrode (m)
aert	bool	(NULL)			Automated ERT monitoring (t=TRUE, f=FALSE)
changes	text	(NULL)			Information about major changes to the measurement configuration (not necessarily exhaustive!)
comment	text	(NULL)			Additional comments and possibly a reference to more detailed documentation of the installation

### 6.1.3 ert\_survey

Information about the survey performed along the electrical resistivity tomography (ERT) profiles.

Field	Type	Default	Keys	Indexes	Notes
id	int(5)	auto incr.	primary	unique	ERT survey ID (only used for reference within the database)
ert_profile_id	int(5)		foreign		ID of the corresponding ERT profile.
survey_date	date			NN	Date of the measurement (format YYYY-MM-DD)
config	Int(2)	(NULL)		NN	Configuration of survey: 1: Wenner 3: Dipole-Dipole 7: Wenner-Schlumberger
Survey_type	int(2)	(NULL)			Type of measurement: 1: monitoring survey 2: annual reference survey
quality	bool	(NULL)			Quality of the ERT survey (bad = 'f' or good = 't'). The quality is defined according to the automatic filtering procedure defined in Mollaret et al. 2018 <sup>1</sup> . (good > 80% of data left, bad < 80% of data left)
rms	Numeric(10,4)				Root Mean Squared (RMS) error of the inversion model. Value is only given for quality = 't'
rst	bool	(NULL)			Additional RST measurements available along the same profile at the same date (t=TRUE, f=FALSE)
operator	text	(NULL)			Full name of survey operator (first name last name)
instrument	text	(NULL)			Instrument used for survey
Comment	text	(NULL)			Additional comments and possibly a reference to more detailed documentation of the survey

### 6.1.4 ert\_topo

Topography data of the ERT sites. An ERT site can be composed of several profiles of different electrode spacing and length located along the same line (ert\_site). The topography is given for the total length of the line (ert\_site).

Field	Type	Default	Keys	Indexes	Notes
id	int(5)	auto incr.	primary	unique	ERT topography point ID (only used for reference within the database)
ert_site_id	int(5)		foreign		ID of the corresponding ERT site.
x	decimal(5,2)				Horizontal distance (true horizontal) from first electrode (m)
z	decimal(5,2)				Height of electrode (m). Heights can be given as absolute or relative values

<sup>1</sup> Mollaret, C., Hilbich, C., Pellet, C., Flores-Orozco, A., Delaloye, R., & Hauck, C. (2018). Mountain permafrost degradation documented through a network of permanent electrical resistivity tomography sites. The Cryosphere Discussions, 1–34. <https://doi.org/10.5194/tc-2018-272>

## 6.2 Data Tables

### 6.2.1 ert\_raw

Measured apparent resistivity data along the ERT profiles. The data within this table are “raw” (i.e. measured apparent resistivity) data and they have not been processed in any way

Field	Type	Default	Keys	Indexes	Notes
id	int(5)	auto incr.	primary	unique	ERT raw measurement ID (only used for reference within the database)
ert_survey_id	int(5)		foreign		ID of the corresponding ERT survey.
x	numeric(5,2)				Horizontal distance (along the surface) of the first electrode of the measured quadrupole (m)
a	numeric(5,2)				Spacing between the electrodes of the measured quadrupole (array dependent, m) Wenner: spacing in-between each of the four electrodes Dipole-dipole: spacing in-between the potential electrodes and in-between the current electrodes Wenner-Schlumberger: spacing in-between the potential electrodes
n	numeric(5,2)				Integer multiplying the electrode spacing (array dependent, m) Wenner: NA Dipole-Dipole: multiplier applied to the spacing in-between the current and potential electrode groups Wenner schlumberger: multiplier applied to the spacing in-between the current and potential electrodes
u	numeric(10,3)				Measured electrical potential difference (V)
I	numeric(10,3)				Intensity of the injected current (mA)
rho_a	numeric(12,3)				Measured apparent resistivity (Ohm m)