

FoG Submission instructions 2024

[Overview](#) · [Major changes](#)

[Special topics](#) : [Glacier identification](#) · [Units](#) · [Dates](#) · [Outlines](#) · [Investigators & agencies](#) · [References](#) · [Remarks](#)

[Tables](#) : [glacier](#) · [state](#) · [state_band](#) · [change](#) · [front_variation](#) · [mass_balance](#) · [mass_balance_band](#) · [mass_balance_point](#) · [event](#)

1 Overview

Follow these steps to determine which tables to fill out:

1. Check if the glacier already exists using this [online lookup table](#). If so, note its `id` and name (either `short_name` or one of the existing `names`). If not, add a row to `glacier` with a `name` and temporary `id`. Use this as the `glacier_name` and `glacier_id` in all other tables to refer to this glacier.
2. For measurements of glacier area, elevation (mean, lowest, highest), length, or terminus type, use `state`. Use different rows if measurements do not share the same metadata (e.g. area and elevation surveyed on different dates or by different investigators). For area and mean elevation of elevation bands, use `state_band` with the `glacier_id` and `date` of the corresponding `state`.
3. For glacier-wide elevation or volume change (from geodetic surveys), use `change`. Changes in area should be submitted as a series of glacier areas in `state`.
4. For changes in length, use `front_variation`.
5. Mass balance (measured only by the direct glaciological method) is split across three tables:
 - Add a row to `mass_balance` for each glacier (`glacier_id`) and hydrological year (`year`).
 - Add rows to `mass_balance_point` for point measurements and/or `mass_balance_band` for mass balance by elevation band, using the `glacier_id` and `year` of the corresponding `mass_balance` entry.
6. For extraordinary events concerning glaciers, use `event`.

Only include new data or deliberate updates to previously-submitted data. Including previous submissions risks overwriting the database with out-of-date information! For specific updates to existing data, we prefer if you download the most recent database version (https://wgms.ch/data_databaseversions), extract the rows of interest, make (and mark) your changes, and submit that instead. Since empty cells are ignored, use `NULL` if you want a cell's existing value to be deleted.

2 Major changes

- **All measurement units are standardized to the meter:** m, m w.e., m², m³, kg m⁻³ ([Units](#)).
- Accumulation-area ratio (AAR) is a fraction (0-1) rather than a percentage (0-100%).
- All table and column names are lowercase, although they can be submitted as lower or upper case.
- `WGMS_ID` is renamed `glacier_id`, `POLITICAL_UNIT` is renamed `country` and only needed to submit a new glacier, and `NAME` is renamed `glacier_name` and should be a full name – e.g. `Glacier du Giétro` rather than `GIETRO` ([Glacier identification](#)).
- Dates should be formatted as `yyyy`, `yyyy-mm`, or `yyyy-mm-dd` ([Dates](#)). The required `99` for unknown month/day is replaced by an optional `XX`. Columns are added to represent date uncertainties in days.
- Investigators and agencies ([Investigators & agencies](#)), references ([References](#)), and remarks ([Remarks](#)) should follow specific formats.
- Tables `MASS_BALANCE` (glacier and elevation-band balance) and `MASS_BALANCE_OVERVIEW` (overview) are renamed `mass_balance` (overview and glacier balance) and `mass_balance_band` (elevation-band balance).
- Glacier outlines ([Outlines](#)) can be linked to glacier-wide measurements using columns `*outline_id`.

3 Special topics

3.1 Glacier identification

An integer identifies each glacier in the WGMS Fluctuations of Glaciers database. It is stored in the `id` column of the `glacier` table (`glacier.id` for short), and required in all measurement tables as column `glacier_id` (formerly `WGMS_ID`). To prevent errors, measurement tables also require the glacier's name (`glacier_name`), which can either be the short name used historically (e.g. `GIETRO`) or a full name (preferred, e.g. `Glacier du Giétro`), but should be the same everywhere. If submitting a new name for the glacier in `glacier.name` (e.g. to replace a placeholder like 'UNNAMED 15157' or 'RGI60-05.20098'), `glacier_name` must match this new name. As an additional safeguard, a `country` is required when submitting a new glacier.

See the [online lookup table](#) or the [WGMS Fluctuations of Glaciers Browser](#) for help finding the `id` for your glacier.

3.2 Units

To reduce confusion around unit conversions, all measurements must be submitted in SI units:

- m (meter): elevation, length
- m² (square meter): area
- m³ (cubic meter): volume
- m w.e. (meter water equivalent): mass balance
- kg m⁻³ (kilogram per cubic meter): density

When this results in very small or very large numbers, it is recommended to use scientific notation during manual entry (1.23e6 m² instead of 1230000 m² to express 1.23 km²). The spreadsheet templates format numbers with a space between thousands (1 230 000) to improve readability.

3.3 Dates

Dates (columns named `*date`) must be formatted as `yyyy-mm-dd` (4-digit year, 2-digit month, 2-digit day). Dashes (-) are optional (but encouraged for clarity) and unknown month and/or day may be omitted or indicated by `XX`, so that the following are equivalent:

- 1986-09-30 (preferred) · 19860930
- 1986-09 (preferred) · 198609 · 1986-09-XX · 198609XX
- 1986 (preferred) · 1986-XX-XX · 1986XXXX

Every date has an optional uncertainty in days (column named `*date_unc`) to represent an estimated date (e.g. the date of the last summer horizon in a winter mass balance measurement) or an exact date range (e.g. the date of a multiday geodetic survey). For example, `date: 1986-09-30` and `date_unc: 1` represents the interval 1986-09-29 to 1986-10-01.

3.4 Outlines

Glacier-wide measurements (in tables `state`, `change`, and `mass_balance`) should be linked to the glacier outlines used to derive them, using columns named `*outline_id` (e.g. `state.outline_id`). Ideally the outline is included in Global Land Ice Measurements from Space (GLIMS) or a Randolph Glacier Inventory (RGI), in which case the `outline_id` must be the GLIMS *analysis* identifier (`anlys_id`) prefixed by `GLIMS:` (e.g. `GLIMS:754359`) or the RGI identifier (e.g. `RGI60-11.02773`, `RGI2000-v7.0-G-11-02773`). If not, outlines can be submitted as (multi)polygons in any file format readable by GDAL

(e.g. Shapefile, GeoJSON). In this case, the `outline_id` must match the `id` attribute of a polygon in this file.

When an outline is provided, the columns typically used to identify the glacier (`glacier_name` and `glacier_id`) may be omitted if unknown. This allows results from regional-scale geodetic studies to be submitted without the need for arbitrary glacier names or the tedious process of matching outlines to WGMS glacier identifiers.

3.5 Investigators & agencies

The WGMS maintains a structured directory of people and agencies who performed each measurement. To support this effort, columns `investigators` (author names) and `agencies` (author affiliations) should be formatted as illustrated by the following example:

```
investigators Michael Zemp (1, 2) | 李忠勤 [Li Zhongqin] | (3)
agencies 1. WGMS | 2. UZH > GIUZ: Geographisches Institut | 3. Tianshan Glaciological Station
```

- Separate people with a pipe (|). Each person can be affiliated with one or more agencies, given in parentheses and separated with a comma (Michael Zemp (1, 2)). Omit the person for agencies without a person ((3)).
- Provide the person's full name (Michael Zemp, not M. Zemp or Zemp, Michael). Names in non-Latin script are encouraged, but should be followed by the preferred latinization in square brackets (李忠勤 [Li Zhongqin]). The family name (for correct citation) can be indicated by curly braces ({Li} Zhongqin, Guillermo {Cobos Campos}). To resolve any ambiguity, an ORCID can be included after the name (Michael Zemp 0000-0003-2391-7877).
- Separate agencies with a pipe (|) and prefix each agency with its number and . (1. WGMS). Provide the agency's name, abbreviation, or both (GIUZ: Geographisches Institut). The original name is encouraged, and can be followed (especially for non-Latin names) by the English name in square brackets (名古屋大学 [Nagoya University]). Parent agencies can be provided by prefixing with > (UZH > GIUZ).
- Provide people and agency names from the time of the measurement, *not* those at the time of submission.

3.6 References

The WGMS maintains a structured bibliography in order to make your references more findable by users. To support this effort, references (columns named `references`) should be formatted as illustrated by the following example:

```
Villalba 1990 (https://doi.org/10.2307/1551585) | Freysteinnsson 1968 (https://timarit.is/page/6575323):  
Tungnárjökull. Jökull, vol. 18, p. 371-378
```

- For references with a DOI, include at least the DOI. The suggested format is {author} {year} (https://doi.org/{doi}), where `author` can be as simple as the first author's family name.
- For references without a DOI, include additional information. The suggested format (for a journal article) is {author} {year} ({url}): {title}. {journal}, {volume}, {issue}, {pages}, ...
- Separate references with a pipe (|).

3.7 Remarks

Remarks (columns named `remarks`) can contain anything, but some conventions are encouraged to make them more human and machine readable, as illustrated by the following example:

```
annual_balance: Includes -0.25 m due to calving | area: Surveyed on 1986-12-31
```

- Separate remarks with a pipe (|).
- For remarks specific to a column, prefix the remark with the column name.
- Do not include information that can be expressed elsewhere. For example, `Day and month unknown` can be expressed in the `date` column (see [Dates](#)).

4 Tables

[glacier](#) · [state](#) · [state_band](#) · [change](#) · [front_variation](#) · [mass_balance](#) · [mass_balance_band](#) · [mass_balance_point](#) · [event](#)

4.1 glacier

General information about each glacier. When submitting a new glacier, assign a temporary `id` and use this as the `glacier_id` in all other table rows that correspond to this glacier.

name	type	description
<code>country</code> (required)	string	English short name of the country in which the glacier is (primarily) located.
<code>name</code> (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
<code>id</code> (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database.
<code>latitude</code> (required)	number [degrees]	Latitude (EPSG:4326). Positive values indicate the northern hemisphere and negative values indicate the southern hemisphere. The point (<code>latitude</code> , <code>longitude</code>) should be in the main channel in the upper part of the glacier ablation area.
<code>longitude</code> (required)	number [degrees]	Longitude (EPSG:4326). Positive values indicate east of the zero meridian and negative values indicate west of the zero meridian. The point (<code>latitude</code> , <code>longitude</code>) should be in the main channel in the upper part of the glacier ablation area.
<code>glims_id</code>	string	Glacier identifier (<code>glac_id</code>) in the Global Land Ice Measurements from Space database (https://www.glims.org). It has the format <code>GxxxxxxEyyyyyθ</code> , where <code>xxxxxx</code> is longitude east of the zero meridian in millidegrees, <code>yyyyy</code> is north or south latitude in millidegrees, and <code>θ</code> is N or S depending on the hemisphere.
<code>rgi50_id</code>	string	Glacier identifier (<code>RGIId</code>) in the Randolph Glacier Inventory 5.0 (https://nsidc.org/data/nsidc-0770/versions/5) with format <code>RGI50-rr.nnnnn</code> , where <code>rr</code> is the first-order region (zero-padded), and <code>nnnnn</code> is an arbitrary numeric code.
<code>rgi60_id</code>	string	Glacier identifier (<code>RGIId</code>) in the Randolph Glacier Inventory 6.0 (https://nsidc.org/data/nsidc-0770/versions/6) with format <code>RGI60-rr.nnnnn</code> , where <code>rr</code> is the first-order region (zero-padded), and <code>nnnnn</code> is an arbitrary numeric code.
<code>rgi70_id</code>	string	Glacier or glacier complex identifier (<code>rgi_id</code>) in the Randolph Glacier Inventory 7.0 (https://nsidc.org/data/nsidc-0770/versions/7) with format <code>RGI2000-v7.0-p-rr-nnnnn</code> , where <code>p</code> is the product code (G: glacier or C: complex), <code>rr</code> is the first-order region (zero-padded), and <code>nnnnn</code> is an arbitrary numeric code.

name	type	description
wgi_id	string	Glacier identifier (wgi_glacier_id) in the World Glacier Inventory (https://nsidc.org/data/g01130/versions/1). It is constructed from the following elements: <ul style="list-style-type: none">- 2-character political unit- 1-character continent code- 4-character drainage code- 2-character free position code- 3-character local glacier code
parent_glacier_id	integer	Identifier (id) of the (present or former) parent glacier.
references	string	Literature references as a pipe-delimited list. See instructions for References .
remarks	string	Remarks and flags as a pipe-delimited list. See instructions for Remarks .

4.2 state

Measurements of glacier state – length, area, elevation, and terminus type.

name	type	description
glacier_name (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
glacier_id (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
outline_id	string	Identifier of the glacier outline used to derive the reported measurement(s). Either a Global Land Ice Measurements from Space (GLIMS) analysis identifier (<code>anlys_id</code>) prefixed by 'GLIMS:' (e.g. GLIMS:754359), a Randolph Glacier Inventory (RGI) identifier (e.g. RGI60-11.02773, RGI2000-v7.0-G-11-02773), or the <code>id</code> of a (multi)polygon in a file readable by GDAL (e.g. Shapefile, GeoJSON). See instructions for Outlines .
date (required)	string	Date of the reported measurements. Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
date_unc	number [days]	Estimated (or exact) range of date (e.g. 2020-10-02 ± 1 days = 2020-10-01 to 2020-10-03). See instructions for Dates .
highest_elevation	number [m]	Highest elevation on the glacier.
lowest_elevation	number [m]	Lowest elevation on the glacier.
mean_elevation	number [m]	Mean glacier elevation.
elevation_unc	number [m]	Estimated random error of reported elevations.
area	number [m ²]	Glacier area.
area_unc	number [m ²]	Estimated random error of area .
length	number [m]	Glacier length measured along the main flowline.
length_unc	number [m]	Estimated random error of length .

name	type	description
terminus_type	string	Condition at the terminus. <ul style="list-style-type: none"> - land: Dry land - cliff: Very steep dry land (subject to dry calving) - lake: Lake (freshwater) - marine: Sea or ocean (saltwater) - shelf: Ice shelf (which itself terminates in the ocean)
platform	string	Survey platform. <ul style="list-style-type: none"> - ground: Terrestrial - air: Airborne - space: Spaceborne - other: Other (see remarks)
method	string	Survey method. <ul style="list-style-type: none"> - direct: In-situ measurement (e.g. GPS, tape measure) - map: Maps and mapping - photo: Photographs and photogrammetry - laser: Laser scanning - radar: Radar - reconstruction: Reconstruction (from historical or dating methods) - historical: Historical (from texts or visuals) - text: Text - print: Print (from an engraving or etching). For photographic prints, use photo. - painting: Painting - drawing: Drawing - radiocarbon: Radiocarbon date - dendrochronology: Dendrochronology - surface exposure: Surface exposure dating (e.g. TCN) - other: Other (see remarks)
investigators	string	Pipe-delimited list of persons and their agency affiliations (linked by number to agencies) responsible for the measurements. See instructions for Investigators & agencies .
agencies	string	Numbered, pipe-delimited list of agencies referred to by number in investigators . See instructions for Investigators & agencies .
references	string	Literature references as a pipe-delimited list. See instructions for References .
remarks	string	Remarks and flags as a pipe-delimited list. See instructions for Remarks .

4.3 state_band

Measurements of glacier state by elevation band.

name	type	description
glacier_name (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
glacier_id (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
date (required)	string	Date of the reported measurements. Must match an entry in the <code>state</code> table. Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
lower_elevation (required)	integer [m]	Lower boundary of the surface elevation band.
upper_elevation (required)	integer [m]	Upper boundary of the surface elevation band.
mean_elevation	number [m]	Mean glacier elevation.
elevation_unc	number [m]	Estimated random error of reported elevations.
area	number [m ²]	Elevation band area.
area_unc	number [m ²]	Estimated random error of area .
remarks	string	Remarks and flags as a pipe-delimited list. See instructions for Remarks .

4.4 change

Measurements of glacier elevation change – typically from geodetic surveys.

name	type	description
glacier_name (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
glacier_id (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
begin_outline_id	string	Identifier of the glacier outline used to derive glacier state on begin_date . Either a Global Land Ice Measurements from Space (GLIMS) analysis identifier (anlys_id) prefixed by 'GLIMS:' (e.g. GLIMS:754359), a Randolph Glacier Inventory (RGI) identifier (e.g. RGI60-11.02773, RGI2000-v7.0-G-11-02773), or the id of a (multi)polygon in a file readable by GDAL (e.g. Shapefile, GeoJSON). See instructions for Outlines .
end_outline_id	string	Identifier of the glacier outline used to derive glacier state on end_date . Either a Global Land Ice Measurements from Space (GLIMS) analysis identifier (anlys_id) prefixed by 'GLIMS:' (e.g. GLIMS:754359), a Randolph Glacier Inventory (RGI) identifier (e.g. RGI60-11.02773, RGI2000-v7.0-G-11-02773), or the id of a (multi)polygon in a file readable by GDAL (e.g. Shapefile, GeoJSON). See instructions for Outlines .
begin_date (required)	string	Date of the earlier (reference) measurement. Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
begin_date_unc	number [days]	Estimated (or exact) range of begin_date (e.g. 2020-10-02 ± 1 days = 2020-10-01 to 2020-10-03). See instructions for Dates .
end_date (required)	string	Date of the later measurement. Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
end_date_unc	number [days]	Estimated (or exact) range of end_date (e.g. 2021-10-02 ± 1 days = 2021-10-01 to 2021-10-03). See instructions for Dates .
area	number [m ²]	Glacier area (presumably from begin_date , end_date , or an average) which should be used to estimate elevation_change from volume_change or vice versa.
elevation_change	number [m]	Change in surface elevation (averaged over the glacier) from begin_date to end_date .
elevation_change_unc	number [m]	Estimated random error of elevation_change .
volume_change	number [m ³]	Change in glacier volume from begin_date to end_date .

name	type	description
volume_change_unc	number [m ³]	Estimated random error of volume_change .
begin_platform	string	Survey platform used on begin_date . <ul style="list-style-type: none"> - ground: Terrestrial - air: Airborne - space: Spaceborne - other: Other (see remarks)
begin_method	string	Survey method used on begin_date . <ul style="list-style-type: none"> - direct: In-situ measurement (e.g. GPS, tape measure) - map: Maps and mapping - photo: Photographs and photogrammetry - laser: Laser scanning - radar: Radar - reconstruction: Reconstruction (from historical or dating methods) - historical: Historical (from texts or visuals) - text: Text - print: Print (from an engraving or etching). For photographic prints, use photo. - painting: Painting - drawing: Drawing - radiocarbon: Radiocarbon date - dendrochronology: Dendrochronology - surface exposure: Surface exposure dating (e.g. TCN) - other: Other (see remarks)
end_platform	string	Survey platform used on end_date . <ul style="list-style-type: none"> - ground: Terrestrial - air: Airborne - space: Spaceborne - other: Other (see remarks)

name	type	description
end_method	string	<p>Survey method used on end_date .</p> <ul style="list-style-type: none"> - direct: In-situ measurement (e.g. GPS, tape measure) - map: Maps and mapping - photo: Photographs and photogrammetry - laser: Laser scanning - radar: Radar - reconstruction: Reconstruction (from historical or dating methods) - historical: Historical (from texts or visuals) - text: Text - print: Print (from an engraving or etching). For photographic prints, use photo. - painting: Painting - drawing: Drawing - radiocarbon: Radiocarbon date - dendrochronology: Dendrochronology - surface exposure: Surface exposure dating (e.g. TCN) - other: Other (see remarks)
investigators	string	<p>Pipe-delimited list of persons and their agency affiliations (linked by number to agencies) responsible for the measurements. See instructions for Investigators & agencies.</p>
agencies	string	<p>Numbered, pipe-delimited list of agencies referred to by number in investigators . See instructions for Investigators & agencies.</p>
references	string	<p>Literature references as a pipe-delimited list. See instructions for References.</p>
remarks	string	<p>Remarks and flags as a pipe-delimited list. See instructions for Remarks.</p>

4.5 front_variation

Measurements of glacier front variation (length change).

name	type	description
glacier_name (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
glacier_id (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
begin_date (required)	string	Date of the earlier (reference) measurement, or null if no reference was used (e.g. glacier advance inferred from moraine condition). Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
begin_date_unc	number [days]	Estimated (or exact) range of begin_date (e.g. 2020-10-02 ± 1 days = 2020-10-01 to 2020-10-03). See instructions for Dates .
end_date (required)	string	Date of the later measurement. Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
end_date_unc	number [days]	Estimated (or exact) range of end_date (e.g. 2021-10-02 ± 1 days = 2021-10-01 to 2021-10-03). See instructions for Dates .
length_change	number [m]	Change in glacier length from begin_date to end_date (+ advance, - retreat).
length_change_unc	number [m]	Estimated random error of length_change .
length_change_direction	string	Length change direction (in the absence of a quantitative length_change) from begin_date to end_date . - advance: Glacier advanced (+) - retreat: Glacier retreated (-) - stationary: Glacier was stationary (0)
end_platform	string	Survey platform used on end_date . - ground: Terrestrial - air: Airborne - space: Spaceborne - other: Other (see remarks)

name	type	description
end_method	string	<p>Survey method used on end_date .</p> <ul style="list-style-type: none"> - direct: In-situ measurement (e.g. GPS, tape measure) - map: Maps and mapping - photo: Photographs and photogrammetry - laser: Laser scanning - radar: Radar - reconstruction: Reconstruction (from historical or dating methods) - historical: Historical (from texts or visuals) - text: Text - print: Print (from an engraving or etching). For photographic prints, use photo. - painting: Painting - drawing: Drawing - radiocarbon: Radiocarbon date - dendrochronology: Dendrochronology - surface exposure: Surface exposure dating (e.g. TCN) - other: Other (see remarks)
investigators	string	<p>Pipe-delimited list of persons and their agency affiliations (linked by number to agencies) responsible for the measurements. See instructions for Investigators & agencies.</p>
agencies	string	<p>Numbered, pipe-delimited list of agencies referred to by number in investigators . See instructions for Investigators & agencies.</p>
references	string	<p>Literature references as a pipe-delimited list. See instructions for References.</p>
remarks	string	<p>Remarks and flags as a pipe-delimited list. See instructions for Remarks.</p>

4.6 mass_balance

Glacier-wide mass balance and survey details. When submitting a mass balance survey, ensure that the corresponding rows in `mass_balance_band` and `mass_balance_point` have the same `glacier_id` and `year` as the survey.

name	type	description
<code>glacier_name</code> (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
<code>glacier_id</code> (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
<code>outline_id</code>	string	Identifier of the glacier outline used to derive the reported glacier-wide mass balance(s). Either a Global Land Ice Measurements from Space (GLIMS) analysis identifier (<code>anlys_id</code>) prefixed by 'GLIMS:' (e.g. GLIMS:754359), a Randolph Glacier Inventory (RGI) identifier (e.g. RGI60-11.02773, RGI2000-v7.0-G-11-02773), or the <code>id</code> of a (multi)polygon in a file readable by GDAL (e.g. Shapefile, GeoJSON). See instructions for Outlines .
<code>year</code> (required)	year	Calendar year associated with the last accumulation (winter) - ablation (summer) cycle. This is almost always the calendar year at the end of the measurement period unless the cycle extends only briefly into the following year (e.g. 2020-01-05 to 2021-01-17 ends in 2021 but is the 2020 hydrological year).
<code>time_system</code>	string	Time measurement system of the dates (<code>begin_date</code> , <code>midseason_date</code> and <code>end_date</code>) and balances (<code>winter_balance</code> , <code>summer_balance</code> , <code>annual_balance</code>). See Cogley 2011 (https://doi.org/10.5167/uzh-53475) for details. Both floating and fixed-date systems may include stratigraphic measurements, which should then result in higher date uncertainties (for floating) or balance uncertainties (for fixed). - floating: Floating-date. Dates are the dates of measurement, and balances are as measured. - fixed: Fixed-date. Dates are those to which the measured balances were corrected (typically the hydrological year), and balances are as corrected. Correction methods should be given in the <code>remarks</code> . - other: Other (explain in <code>remarks</code>)
<code>begin_date</code>	string	Begin (reference) date of the reported <code>winter_balance</code> and <code>annual_balance</code> . Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
<code>begin_date_unc</code>	number [days]	Estimated (or exact) range of <code>begin_date</code> (e.g. 2020-10-02 ± 1 days = 2020-10-01 to 2020-10-03). See instructions for Dates .
<code>midseason_date</code>	string	End date of the reported <code>winter_balance</code> and begin date of the reported <code>summer_balance</code> . Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .

name	type	description
midseason_date_unc	number [days]	Estimated (or exact) range of midseason_date (e.g. 2021-05-04 ± 2 days = 2021-05-02 to 2021-05-06). See instructions for Dates .
end_date	string	End date of the reported summer_balance and annual_balance . Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
end_date_unc	number [days]	Estimated (or exact) range of end_date (e.g. 2021-10-02 ± 1 days = 2021-10-01 to 2021-10-03). See instructions for Dates .
ela_position	string	Position of the equilibrium line altitude (ELA) relative to the glacier. <ul style="list-style-type: none"> - on: On the glacier - above: Above the glacier - below: Below the glacier
ela	number [m]	Mean elevation, averaged over the glacier, of the end-of-mass-balance-year equilibrium line. This can be outside the elevation range of the glacier if the ela_position was <code>below</code> or <code>above</code> .
ela_unc	number [m]	Estimated random error of ela .
aar	number	Accumulation area divided by the total glacier area.
area	number [m ²]	Area considered in the calculation of the glacier-wide mass balance.
winter_balance	number [m w.e.]	Mass balance over the winter (accumulation) season – from begin_date to midseason_date .
winter_balance_unc	number [m w.e.]	Estimated random error of winter_balance .
summer_balance	number [m w.e.]	Mass balance over the summer (ablation) season – from midseason_date to end_date .
summer_balance_unc	number [m w.e.]	Estimated random error of summer_balance .
annual_balance	number [m w.e.]	Mass balance over the hydrological year – from begin_date to end_date .
annual_balance_unc	number [m w.e.]	Estimated random error of annual_balance .
investigators	string	Pipe-delimited list of persons and their agency affiliations (linked by number to agencies) responsible for the measurements. See instructions for Investigators & agencies .
agencies	string	Numbered, pipe-delimited list of agencies referred to by number in investigators . See instructions for Investigators & agencies .
references	string	Literature references as a pipe-delimited list. See instructions for References .

name	type	description
remarks	string	Remarks and flags as a pipe-delimited list. See instructions for Remarks .

4.7 mass_balance_band

Glacier mass balance by elevation band.

name	type	description
glacier_name (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
glacier_id (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
year (required)	year	Calendar year associated with the last accumulation (winter) - ablation (summer) cycle. This is almost always the calendar year at the end of the measurement period unless the cycle extends only briefly into the following year (e.g. 2020-01-05 to 2021-01-17 ends in 2021 but is the 2020 hydrological year).
lower_elevation (required)	integer [m]	Lower boundary of the surface elevation band.
upper_elevation (required)	integer [m]	Upper boundary of the surface elevation band.
area	number [m ²]	Area of the elevation band.
winter_balance	number [m w.e.]	Mass balance over the winter (accumulation) season – from mass_balance.begin_date to mass_balance.midseason_date .
winter_balance_unc	number [m w.e.]	Estimated random error of winter_balance .
summer_balance	number [m w.e.]	Mass balance over the summer (ablation) season – from mass_balance.midseason_date to mass_balance.end_date .
summer_balance_unc	number [m w.e.]	Estimated random error of summer_balance .
annual_balance	number [m w.e.]	Mass balance over the hydrological year – from mass_balance.begin_date to mass_balance.end_date .
annual_balance_unc	number [m w.e.]	Estimated random error of annual_balance .
remarks	string	Remarks and flags as a pipe-delimited list. See instructions for Remarks .

4.8 mass_balance_point

Glacier mass balance measured at specific points (e.g. stakes or pits).

name	type	description
glacier_name (required)	string	Either the full name of the glacier (in English or a local language) as might appear on a map (e.g. Glacier du Giétro) or the WGMS short name (e.g. GIETRO).
glacier_id (required)	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
year (required)	year	Calendar year associated with the last accumulation (winter) - ablation (summer) cycle. This is almost always the calendar year at the end of the measurement period unless the cycle extends only briefly into the following year (e.g. 2020-01-05 to 2021-01-17 ends in 2021 but is the 2020 hydrological year).
original_id	string	Identifier for the point used by the original investigators.
begin_date (required)	string	Begin (reference) date of the reported balance . Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
begin_date_unc	number [days]	Estimated range of begin_date (e.g. 2020-10-02 ± 1 days = 2020-10-01 to 2020-10-03). See instructions for Dates .
end_date (required)	string	End date of the reported balance . Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
end_date_unc	number [days]	Estimated range of end_date (e.g. 2021-10-02 ± 1 days = 2021-10-01 to 2021-10-03). See instructions for Dates .
latitude (required)	number [degrees]	Point latitude (EPSG:4326). Positive values indicate the northern hemisphere and negative values indicate the southern hemisphere.
longitude (required)	number [degrees]	Point longitude (EPSG:4326). Positive values indicate east of the zero meridian and negative values indicate west of the zero meridian.
elevation (required)	number [m]	Glacier surface elevation at point.
balance (required)	number [m w.e.]	Point mass balance from begin_date to end_date (+ accumulation, - ablation).
balance_unc	number [m w.e.]	Estimated random error of balance .
density	number [kg m ⁻³]	Measured or estimated density used to convert height change to mass balance. If multiple density values were used (e.g. for snow and ice), they should be described in remarks .
density_unc	number [kg m ⁻³]	Estimated random error of density .

name	type	description
balance_code (required)	string	Whether and how the point balance was used in the calculation of glacier-wide (mass_balance) and elevation band (mass_balance_band) balance. <ul style="list-style-type: none">- annual: Used for annual balance.- summer: Used for summer balance.- winter: Used for winter balance.- index: Not used (index measurement).
remarks	string	Remarks and flags as a pipe-delimited list. See instructions for Remarks .

4.9 event

Noteworthy events concerning glacier hazards and dramatic glacier changes.

name	type	description
glacier_name	string	The name of the glacier.
glacier_id	integer	Integer identifying the glacier in the Fluctuations of Glaciers (FoG) database (see glacier.id).
date (required)	string	Date of the event. Events that span multiple days or represent a series of events should be further described with dates in description . Format as yyyy-mm-dd (4-digit year, 2-digit month, 2-digit day); unknown month and/or day can be omitted (e.g. 1986-12-31, 1986-12, 1986). See instructions for Dates .
date_unc	number [days]	Estimated (or exact) range of date (e.g. 2020-10-02 ± 1 days = 2020-10-01 to 2020-10-03). See instructions for Dates .
latitude	number [degrees]	Latitude (EPSG:4326). Positive values indicate the northern hemisphere and negative values indicate the southern hemisphere. The point (latitude , longitude) should be as close as possible to the event source, and is required if glacier_id is null.
longitude	number [degrees]	Longitude (EPSG:4326). Positive values indicate east of the zero meridian and negative values indicate west of the zero meridian. The point (latitude , longitude) should be as close as possible to the event source, and is required if glacier_id is null.
description	string	Summary description of the event sequence - including for example the type and scale of the damage, measures taken to mitigate glacier hazards, and studies carried out in connection with the event. Quantitative information should be included whenever possible. <ul style="list-style-type: none">- Surge: Date and location of onset, duration, flow velocity, discharge anomalies and periodicity- Calving: Rate of retreat, iceberg discharge, flow velocity and water depth at calving front- Flood: Volume, mechanism, peak discharge, sediment load, reach and propagation velocity of flood wave or flow front- Ice avalanche: Volume, runout distance, overall slope (ratio of vertical drop height to horizontal runout distance) of path- Tectonics: Volumes, runout distances and overall slopes (ratio of vertical drop height to horizontal runout distance) of rockfall on glacier surface, amount of geothermal melting in craters, etc.
surge	boolean	Whether a surge was involved.
calving	boolean	Whether calving was involved.
flood	boolean	Whether a flood (e.g. glacial-lake outburst flood) was involved.
avalanche	boolean	Whether an ice avalanche was involved.
rockfall	boolean	Whether rockfall was involved.

name	type	description
debris_flow	boolean	Whether a debris flow was involved.
earthquake	boolean	Whether an earthquake was involved.
volcanic_eruption	boolean	Whether a volcanic eruption was involved.
other	boolean	Whether any other event types were involved.
investigators	string	Pipe-delimited list of persons and their agency affiliations (linked by number to agencies) responsible for the measurements. See instructions for Investigators & agencies .
agencies	string	Numbered, pipe-delimited list of agencies referred to by number in investigators . See instructions for Investigators & agencies .
references	string	Literature references as a pipe-delimited list. See instructions for References .
remarks	string	Remarks and flags as a pipe-delimited list. See instructions for Remarks .