| Name | Description | Formula | Symbols in the formula |
|---|---|---|---|
| *gl_melt_cumul* | • This is the **cumulative melt** (of snow, firn, and ice) **averaged over the entire glacier surface.**<br>• It starts from 0.0 on the first day of the simulation, and is updated every day.<br>• The unit is either (1) meter water equivalent, or (2) millimeter water equivalent: this is decided in set_params (output_unit, under "PLOTTING parameters") | $gl\_melt\_cumul_i = \frac{\sum_{j=1}^{i}\sum_{k=1}^{N} M(j,k)}{N}$ | • *i* is the number of the day up to which the cumulative value is calculated (so for example in your XLS file, if *i* = 6, $gl\_melt\_cumul_i$ = 0.0095).<br>• *j* is the number of each day in the model, from 1 (the start) until *i* (so for example if *i = 6*, *j* will be 1, 2, 3, 4, 5, 6).<br>• *k* is the number of each grid cell of the model, considering only grid cells inside the glacier.<br>• *N* is the total number of grid cells in the model which are inside the glacier.<br>• *M(j, k)* is the melt calculated by the model at day *j* for grid cell *k*. Melt is calculated depending on surface type, following the equations in file ***melt_surface_equations.pdf***. |
| *gl_melt_cumul_bandcorr* | • This is the same as the previous one *(gl_melt_cumul)*, but with an additional correction based on the contour-line method.<br>• The model calculates the error of the simulated mass balance compared to the stake measurements, within each altitude band (for example, the error at 3500-3600 m, the error at 3600-3700 m, and so on). Then from this error the model calculates a correction factor which is applied to the grid cells of that elevation band.<br>• This correction factor is **local** (one different correction for each elevation band), but it can also change the **total** mass balance (usually small change, because the model is calibrated against the stakes). | $gl\_melt\_cumul\_bandcorr = gl\_melt\_cumul \cdot f_{corr}$<br><br>$f_{corr} = MB_{cc} / MB_{orig}$ | • *gl_melt_cumul* is the previous one.<br>• $f_{corr}$ is the correction factor.<br>• $MB_{cc}$ is the glacier mass balance calculated by the model and corrected with the elevation bands (see description).<br>• $MB_{orig}$ is the original glacier mass balance, as calculated by the model. |
| *gl_melt_daily_m3* | • This is the daily melt (of snow, firn and ice located on the glacier) expressed in cubic meters.<br>• It is shown in red ("Melt") in the plot of "Water fluxes" (page 8 of PDF file *massbalance_2021.pdf*, under *annual_results*) | $gl\_melt\_daily\_m3 = gl\_melt\_daily \cdot A_{gl}$ | • *gl_melt_daily* is the average glacier-wide melt simulated on a certain day, expressed in meters water equivalent.<br>• $A_{gl}$ is the total surface area of the glacier, in square meters. |
| *gl_melt_daily_m3_bandcorr* | • This is the same as the previous one *(gl_melt_daily_m3)*, but it is calculated after the contour-line correction (see description of *gl_melt_cumul_bandcorr*). | $gl\_melt\_daily\_m3\_bandcorr = gl\_melt\_daily\_m3 \cdot f_{corr}$ | • *gl_melt_daily_m3* is the previous one.<br>• $f_{corr}$ is the correction factor (the same as for *gl_melt_cumul_bandcorr*). |
| *gl_rainfall_daily_m3* | • This is the amount of rain which falls on the glacier in one day.<br>• It is calculated from the total precipitation, the temperature (to select liquid/solid precipitation) and the surface area of the glacier.<br>• It is shown in light blue ("Rainfall") in the plot of "Water fluxes" (page 8 of PDF file *massbalance_2021.pdf*, under *annual_results*) | $gl\_rainfall\_daily\_m3 = \frac{\sum_{k=1}^{N} P(k)\cdot(1-f_s(k))}{N} \cdot A_{gl}$ | • *P(k)* is the total precipitation (solid + liquid) which falls on cell *k* on a certain day, expressed in meters water equivalent.<br>• $f_s$ is the fraction of solid precipitation at cell *k;* it depends on temperature.<br>• See the formulas in file ***DMBSim_model_description.pdf*** for the calculation of *P* and $f_s$ from the station data (that file uses cell coordinates *x* and *y* instead of cell number *k*, but the calculation is the same).<br>• *N* is the total number of grid cells in the model which are inside the glacier.<br>• $A_{gl}$ is the total surface area of the glacier, in square meters. |
| *gl_scaf* | • This is the fraction of the glacier surface which is covered by snow at the beginning of each day.<br>• It is expressed in percent (%). | $gl\_scaf = 100 \cdot \frac{N_{snow} \cdot A_{cs}}{A_{gl}}$ | • $N_{snow}$ is the number of cells which have surface type "snow" at the start of the day.<br>• $A_{cs}$ is the surface area of each grid cell.<br>• $A_{gl}$ is the total surface area of the glacier. |

**Glacier runoff** from the model can be calculated as the **sum** of *gl_melt_daily_m3* and *gl_rainfall_daily_m3*. The result is expressed in $m^3$/day. Note that the model does not consider water refreezing in the body of the glacier.