Hereafter are referred all the results for the 30 monitoring glaciers. Studies on each glacier have been run independently but with exactly the same method to process, filter the images as well as for the encompassed calculations.

- (a) shows the complete albedo cycle for the monitored ~16-yr in continuous black line. Shaded grey envelopes illustrate the uncertainty on the glacier-wide albedo expressed as the internal variability (further explained in the main text of the article). Green dots represent for each summer the computed minimum albedo, and have been manually verified as cloud-free. Thin and dashed red and blue lines stand for the beginning of the ablation and accumulation season (May and October 1st respectively).

- (b) shows a map of each glaciers. Background corresponds to high resolution 2014 SPOT6 satellites images. Glaciers outlines from 1985-87 are represented in black and have been taken from Rabatel et al., 2013. Glaciers mask used in the computation are displayed in red.

- (c) Albedo cycles as a function of the solar zenith angle. Each point corresponds to glacier-wide averaged albedo for each available image. The 16 years are displayed. Color scale gives indication on the date of the used image. The thick grey line describes the weekly albedo averaged over the entire study period. For readability purpose, the averaged albedo has been smoothed, using a 7 points running average.

- (d) Annual surface mass balances as a function of the MODIS retrieved summer minimum glacier-wide average albedo. Error bars on each point result on the dispersion of the available annual surface mass balance data and on the quadratic sum of the systematic errors made on each albedo measurement. The thin dashed grey line illustrates the line of best fit, along with regression coefficients and significance.

- (e) Summer surface mass balance $b_s$ expressed as a function of the integrated albedo over the entire ablation season. Error bars result from the uncertainties related to the glaciological method (measurements and interpolation at the glacier scale of the punctual measurements, $\pm 20 \text{ cm w.e.}$ in total), and on the quadratic sum of the systematic errors made on each albedo measurement. Thin dashed grey line represents the linear regression showing the best correlation between the two variables, together with correlation coefficients.

- (f) Winter surface mass balance, $b_w$, expressed as a function of the integrated albedo over the entire accumulation season. Winter balance of 2001 corresponds to the winter 2000/2001. Error bars result from the uncertainties related to the glaciological method and on the quadratic sum of the systematic errors made on each albedo measurement. Thin dashed grey line represents the linear regression showing the best correlation between the two variables, together with correlation coefficients.
Figure S1: Tour

(a) Glacier-wide albedo over time from 2000 to 2015, showing MODIS albedo and summer minimum, beginning of winter, and beginning of summer.

(b) Map showing the area with MODIS mask and contour of GLACIOCLIM legend.

(c) Scatter plot showing MODIS albedo vs. winter month angle, with smoothed and weekly averaged data.

(d) Scatter plot showing relationship between two parameters with regression line and equation $r^2 = 0.78$, $b = 14.9$, $\bar{\alpha}_{min} = -7.8$, RMSE = 0.61 m w.e., $\sigma_{slope} = 4.7$ m w.e., and $\sigma_{intercept} = 2.1$ m w.e.
Figure S2: Argentiere

![Figure S2: Argentiere](image-url)
\( r^2 = 0.76 \)
\( b_s = 12.3 \overline{\alpha}_{\text{int}} \)
\( \text{RMSE} = 0.27 \text{ m w.e.} \)
\( \sigma_{\text{slope}} = 5.2 \text{ m w.e.} \)
\( \sigma_{\text{intercept}} = 3.1 \text{ m w.e.} \)

\( r^2 = 0.88 \)
\( b_w = 3.5 \overline{\alpha}_{\text{int}} - 0.3 \)
\( \text{RMSE} = 0.13 \text{ m w.e.} \)
\( \sigma_{\text{slope}} = 1.1 \text{ m w.e.} \)
\( \sigma_{\text{intercept}} = 0.6 \text{ m w.e.} \)
Figure S3: Talèfre

(a) Glacier-wide albedo

(b) Map showing MODIS and GLACIOCLIM contours

(c) Scatter plot of MODIS albedo with regression line

(d) Error plot showing RMSE and other parameters
\( r^2 = 0.46 \)
\( b_s = 15.9 \bar{\alpha}_{\text{int}} - 12.1 \)
\( \text{RMSE} = 0.69 \text{ m w.e.} \)
\( \sigma_{\text{slope}} = 12.9 \text{ m w.e.} \)
\( \sigma_{\text{intercept}} = 7.5 \text{ m w.e.} \)

\( r^2 = 0.51 \)
\( b_w = 2.4 \bar{\alpha}_{\text{int}} - 0.5 \)
\( \text{RMSE} = 0.26 \text{ m w.e.} \)
\( \sigma_{\text{slope}} = 1.9 \text{ m w.e.} \)
\( \sigma_{\text{intercept}} = 0.9 \text{ m w.e.} \)
Figure S4: Mer de Glace

(a) Glacier-wide albedo

(b) Satellite image showing the Mer de Glace glacier with MODIS and GLACICLIM analysis masks.

(c) Scatter plot showing MODIS albedo and summer minimum, beginning of winter and summer.

(d) Linear regression analysis with correlation coefficient $r^2 = 0.16$, slope $b_a = 8.7$, $\bar{\alpha}_{\text{min}} - 5.8$, RMSE = 0.89 m w.e., $\sigma_{\text{slope}} = 12.2$ m w.e., $\sigma_{\text{intercept}} = 6.0$ m w.e.
\begin{align*}
\bar{\alpha}_{\text{int}} & = 4.9 \ \text{m w.e.} \\
\bar{\alpha}_{\text{int}} & = -12.1 \\
\text{RMSE} & = 0.31 \ \text{m w.e.} \\
\sigma_{\text{slope}} & = 7.7 \ \text{m w.e.} \\
\sigma_{\text{intercept}} & = 4.9 \ \text{m w.e.}
\end{align*}

\begin{align*}
\bar{\alpha}_{\text{int}} & = 15.3 \ \bar{\alpha}_{\text{int}} - 12.1 \\
\text{RMSE} & = 0.31 \ \text{m w.e.} \\
\sigma_{\text{slope}} & = 7.7 \ \text{m w.e.} \\
\sigma_{\text{intercept}} & = 4.9 \ \text{m w.e.}
\end{align*}

\begin{align*}
\bar{\alpha}_{\text{int}} & = -7.5 \\
\text{RMSE} & = 0.14 \ \text{m w.e.} \\
\sigma_{\text{slope}} & = 3.5 \ \text{m w.e.} \\
\sigma_{\text{intercept}} & = 2.6 \ \text{m w.e.}
\end{align*}
Figure S5: Tré la Tête

(a) Glacier-wide albedo

(b) Mask MODIS Contour GLACIOCLIM

Legend

250 500 750 1000 m

(c) 0.28 0.35 0.41 0.48

−4 −2.3 −0.7 1

¯α_{min} a b [m w.e.]


r^2 = 0.43

b = 22.8 \; \bar{α}_{min} a - 10.0

RMSE = 1.25 m w.e.

σ_{slope} = 15.6 m w.e.

σ_{intercept} = 6.0 m w.e.
Figure S6: Savinaz

(a)

(b)

(c)

(d)
Figure S7: Gurraz

(a) Glacier-wide albedo

(b) MODIS albedo, Summer minimum, Beginning of winter, Beginning of summer

(c) 2000-2015 smoothed and weekly averaged

(d) $r^2 = 0.29$, $\bar{\alpha}_{min} = 9.8$, $\bar{\alpha}_{intercept} = -5.8$, RMSE = 0.77 $m$ w.e., $\sigma_{slope} = 9.2$ $m$ w.e., $\sigma_{intercept} = 4.3$ $m$ w.e.
Figure S8: Sassière

(a) Glacier-wide albedo

(b) MODIS albedo, Summer minimum, Beginning of winter, Beginning of summer

(c) MODIS albedo, Summer minimum, Beginning of winter, Beginning of summer

(d) MODIS albedo, Summer minimum, Beginning of winter, Beginning of summer

Legend

Mask MODIS
Contour GLACIOCLIM

Legend

250 m, 0 m, 250 m, 500 m, 750 m, 1000 m

\[ \alpha_{\text{min}} \]

\[ a - b \]

\[ \text{RMSE} = 0.67 \text{ m w.e.} \]

\[ \sigma_{\text{slope}} = 4.7 \text{ m w.e.} \]

\[ \sigma_{\text{intercept}} = 2.1 \text{ m w.e.} \]
Figure S9: Grande Motte

(a) Glacier-wide albedo

(b) Satellite image with MODIS and GLACIOCLIM contours

(c) Plot of MODIS albedo with summer minimum and winter and summer beginnings

(d) Scatter plot with regression line

Legend

- MODIS albedo
- Summer minimum
- Beginning of winter
- Beginning of summer

Legend

- Mask MODIS
- Contour GLACIOCLIM

Legend

- 250 m
- 500 m
- 750 m
- 1000 m

Legend

- 0.28
- 0.42
- 0.55

Legend

- $\bar{\alpha}_{\min}$

Legend

- $r^2 = 0.83$
- $b = 13.6$
- $\bar{\alpha}_{\min} = -6.5$
- RMSE = 0.53 m w.e.
- $\sigma_{\text{slope}} = 3.7$ m w.e.
- $\sigma_{\text{intercept}} = 1.4$ m w.e.
Figure S10: Mulinen

(a) Glacier-wide albedo

(b) Map of Mulinen with MODIS and GLACIOCLIM contour lines.

(c) Scatter plot showing MODIS albedo and glacial albedo.

(d) Line graph showing correlation between MODIS and glacial albedo with regression line.

Legend:
- MODIS albedo
- Summer minimum
- Beginning of winter
- Beginning of summer

Legend for images:
- Red: MODIS
- Green: GLACIOCLIM

Regression line details:
- $r^2 = 0.33$
- $b = 7.7$
- $\bar{\alpha}_{\text{min}} = -4.5$
- RMSE = 0.62 m w.e.
- $\sigma_{\text{slope}} = 6.9$ m w.e.
- $\sigma_{\text{intercept}} = 3.1$ m w.e.
Figure S11: Grand Mean

(a) Glacier-wide albedo

(b) Mask MODIS Contour GLACIOCLIM

Legend

(c) 

(d) 

\[ r^2 = 0.44 \]

\[ \bar{\alpha}_{\text{min}} = 7.8 \] 

RMSE = 0.64 m w.e.

\[ \sigma_{\text{slope}} = 5.5 \text{ m w.e.} \]

\[ \sigma_{\text{intercept}} = 2.2 \text{ m w.e.} \]
Figure S12: Arcelin

(a) Glacier-wide albedo over time from 2000 to 2015. The graph shows MODIS albedo data with summer minimum, beginning of winter, and beginning of summer marked.

(b) A satellite image of the Arcelin glacier with MODIS and contour lines indicated.

(c) Scatter plot of MODIS albedo against slope angle for the years 2000-2015. The data points are color-coded by month.

(d) Regression analysis with linear trend line. The equation of the trend line is given as $y = 0.64x - 3.7$. Other statistics include RMSE = 0.52 m w.e., $\sigma_{slope} = 3.0$ m w.e., and $\sigma_{intercept} = 1.2$ m w.e.
Figure S13: Pelve

(a) Glacier-wide albedo over time from 2000 to 2015. MODIS albedo is shown in gray, summer minimum in green, beginning of winter in blue, and beginning of summer in red. The linear regression equation is also provided: $r^2 = 0.41, b = 8.7, \alpha_{min} = 5.7$, with $RMSE = 0.75$ m w.e. 

(b) Map of the study area with MODIS and GLACIOCLIM contour lines.

(c) Scatter plot of MODIS albedo vs. winter threshold angle. The data is smoothed and weekly averaged over 2000-2015.

(d) Linear regression plot with correlation coefficient $r = 0.41$.
Figure S14: Arpont

(a) Glacier-wide albedo

(b) Image of Arpont

(c) Scatter plot of MODIS albedo vs. Glacier albedo

(d) Scatter plot of MODIS albedo vs. Glacier albedo

Legend:
- MODIS albedo
- Summer minimum
- Beginning of winter
- Beginning of summer

$r^2 = 0.28$
$b = 9.8$
$\bar{\alpha}_{\text{min}} = -5.8$
RMSE = 1.00 m w.e.
$\sigma_{\text{slope}} = 9.8$ m w.e.
$\sigma_{\text{intercept}} = 4.6$ m w.e.
Figure S15: Mahure

(a) Glacier-wide albedo

(b) Contour GLACIOCLIM

(c) Mask MODIS

(d) Water Temperature
Figure S16: Vallonnet

(a) Glacier-wide albedo

(b) Mask MODIS Contour GLACIOCLIM

Legend

(c) 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2013 2014

\( r^2 = 0.36 \)

\( b_a = 3.4 \)

\( \bar{\alpha}_{\text{min}} = -2.0 \)

RMSE = 0.66 m w.e.

\( \sigma_{\text{slope}} = 2.8 \) m w.e.

\( \sigma_{\text{intercept}} = 1.1 \) m w.e.

(d)
Figure S17: Gebroulaz

(a) MODIS albedo, Summer minimum, Beginning of winter, Beginning of summer

(b) Satellite image with MODIS and Contour GLACIOCLIM

(c) Glacier-wide albedo

(d) Scatter plot with regression line

Legend:
- MODIS albedo
- Summer minimum
- Beginning of winter
- Beginning of summer

\[ \bar{\alpha}_{\text{min}} = 0.62 \]
\[ b_a = 9.1 \]
\[ \bar{\alpha}_{\text{min}} - 4.6 \]
\[ \text{RMSE} = 0.45 \text{ m w.e.} \]
\[ \sigma_{\text{slope}} = 4.1 \text{ m w.e.} \]
\[ \sigma_{\text{intercept}} = 1.7 \text{ m w.e.} \]
(e) $\hat{b}_s = 9.8 \bar{\alpha}_{int} - 7.9$
RMSE = 0.28 m w.e.
$\sigma_{slope} = 4.1$ m w.e.
$\sigma_{intercept} = 2.5$ m w.e.

(f) $\hat{b}_w = 1.6 \bar{\alpha}_{int} + 0.1$
RMSE = 0.19 m w.e.
$\sigma_{slope} = 1.8$ m w.e.
$\sigma_{intercept} = 1.2$ m w.e.
Figure S19: Rochemelon

(a) Glacier-wide albedo

(b) Mask MODIS Contour GLACIOCLIM

Legend

(c) Winter & Summer Minimum & Beginning of Winter & Beginning of Summer

(d) $r^2 = 0.31$, $b_0 = 4.3$, $\bar{\alpha}_{\text{min}} = -2.8$, $\text{RMSE} = 0.67$ m w.e.

$\sigma_{\text{slope}} = 4.0$ m w.e.

$\sigma_{\text{intercept}} = 1.3$ m w.e.
Figure S20: Saint-Sorlin

(a) Glacier-wide albedo over time from 2000 to 2015. The x-axis represents years, and the y-axis represents the glacier-wide albedo.

(b) Satellite image showing the area of interest with contour lines for MODIS and GLACIOCLIM.

(c) Scatter plot between winter solstice and summer solstice angles. The x-axis represents the winter solstice angle in degrees, and the y-axis represents the summer solstice angle in degrees.

(d) Graph showing the relationship between two variables with a linear fit and error bars.
Figure S21: Quirlies

(a) Glacier-wide albedo

(b) Mask MODIS Contour GLACIOCLIM

Legend

(c) 

(d) 

$\bar{\alpha}_{\text{min}} = 11.4$ m w.e.

$\sigma_{\text{slope}} = 5.6$ m w.e.

$\sigma_{\text{intercept}} = 1.8$ m w.e.

$r^2 = 0.60$

RMSE = 0.54 m w.e.
Figure S22: Mont de Lans

(a) Glacier-wide albedo over time from 2000 to 2015. The graph shows a MODIS albedo curve with data points indicating the summer minimum, the beginning of winter, and the beginning of summer.

(b) A satellite image showing a MODIS MODIS albedo and a contour GLACIOCLIM.

Legend:
- Mask MODIS
- Contour GLACIOCLIM

(c) A scatter plot of MODIS albedo vs. albedo over time with a linear trend line and data points.

(d) A scatter plot with a linear trend line and annotations.
Figure S23: Girose

(a) Glacier-wide albedo over the years 2000-2015. The data shows fluctuations in albedo with time, indicating changes in surface conditions. The graph includes markers for specific events:
- MODIS albedo
- Summer minimum
- Beginning of winter
- Beginning of summer

(b) Map showing the geographic location of Girose with relevant data points and annotations.

(c) Scatter plot illustrating the relationship between MODIS albedo and other environmental factors. The plot includes annotations for specific data points.

(d) Line graph depicting changes in a variable over time, with annotations for key points and statistical metrics:
- $R^2 = 0.72$
- $b = 9.1$
- $\bar{\alpha}_{\text{min}} = -4.7$
- RMSE = 0.43 m w.e.
- $\sigma_{\text{slope}} = 3.4$ m w.e.
- $\sigma_{\text{intercept}} = 1.4$ m w.e.
Figure S24: Selle

(a) Glacier-wide albedo

(b) Map of Selle area

(c) Scatter plot of MODIS albedo vs. Summer minimum

(d) Line graph with regression line and error bars
Figure S26: Blanc

(a) Glacier-wide albedo

(b) Map showing a specific area

(c) Scatter plot with MODIS albedo and other data points

(d) Graph with various data points and regression line
\( r^2 = 0.72 \)
\( b_s = 9.2 \bar{\alpha}_{int} - 7.3 \)
RMSE = 0.26 m w.e.
\( \sigma_{slope} = 4.3 \) m w.e.
\( \sigma_{intercept} = 2.5 \) m w.e.

\( r^2 = 0.33 \)
\( b_w = 2.4 \bar{\alpha}_{int} - 0.9 \)
RMSE = 0.41 m w.e.
\( \sigma_{slope} = 2.7 \) m w.e.
\( \sigma_{intercept} = 0.9 \) m w.e.
Figure S28: Runes

(a) Glacier-wide albedo

(b) Image showing various contours and labels

(c) Scatter plot with color-coded points

(d) Graph with linear trend
Figure S29: Sélé

(a) Glacier-wide albedo

(b) Contour map

(c) Scatter plot

(d) Line chart

Legend

- MODIS albedo
- Summer minimum
- Beginning of winter
- Beginning of summer

\[ \bar{\alpha}_{\text{min}} \approx -5.1 \]

\[ r^2 = 0.63 \]

\[ b_a = 10.9 \]

\[ \sigma_{\text{slope}} = 5.0 \text{ m w.e.} \]

\[ \sigma_{\text{intercept}} = 1.8 \text{ m w.e.} \]