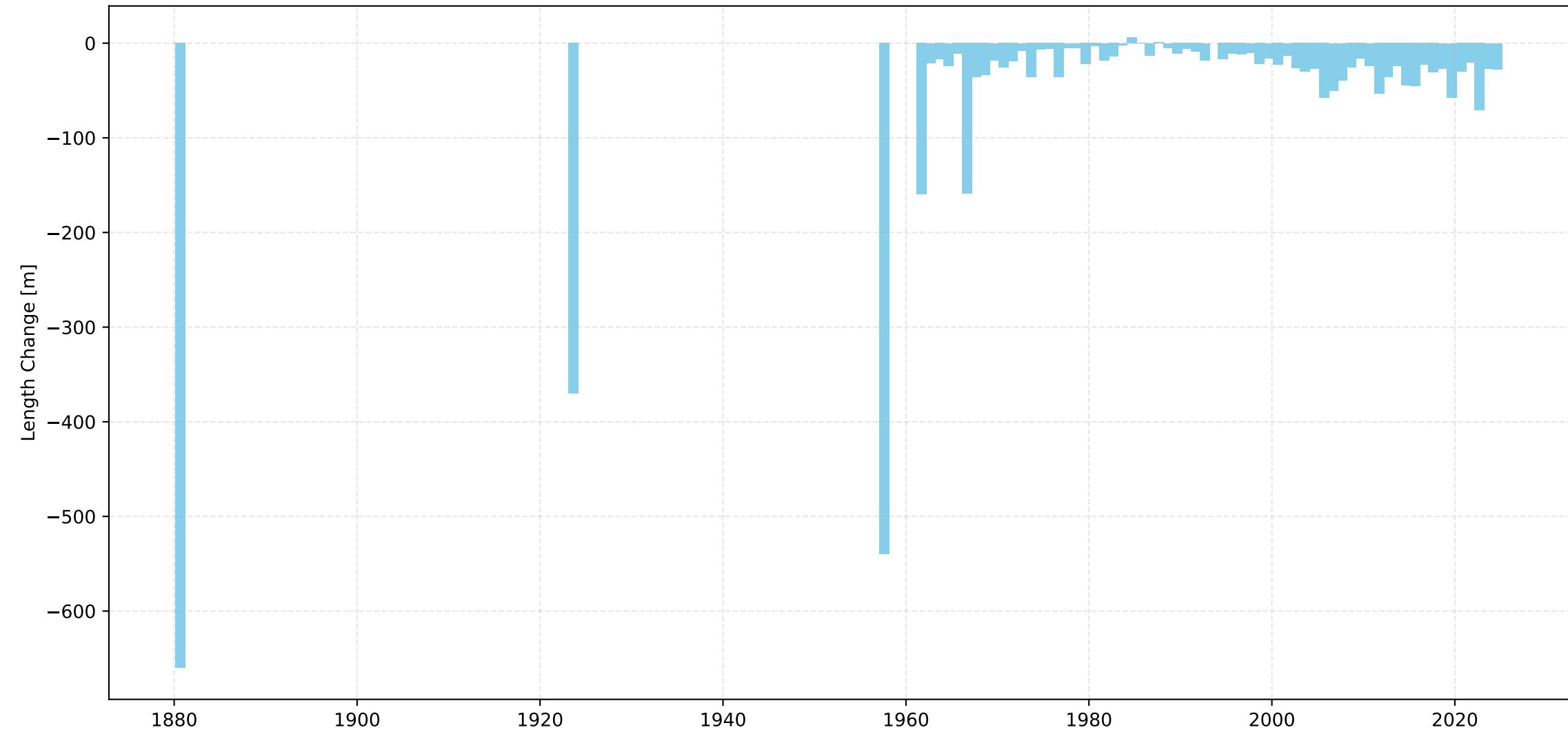
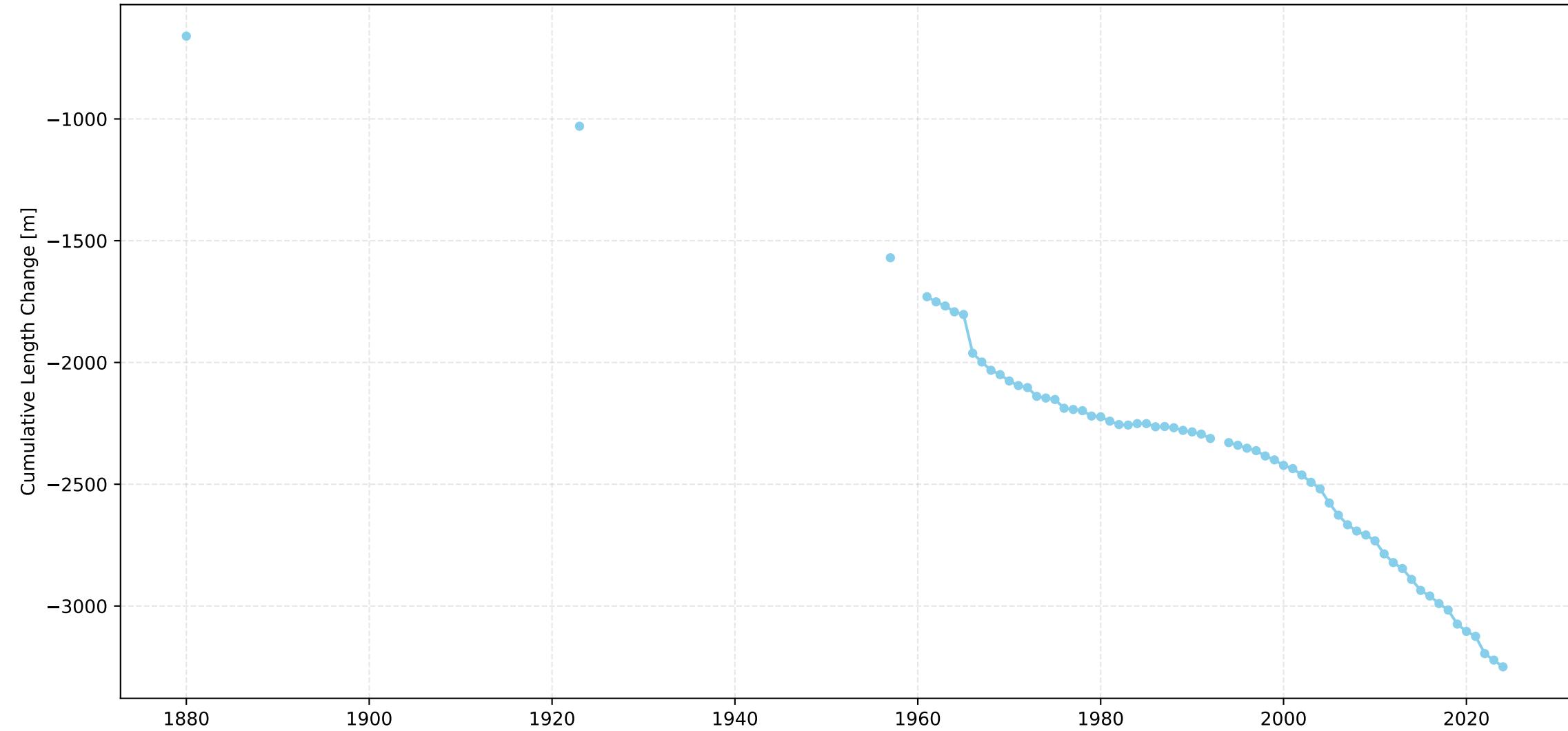


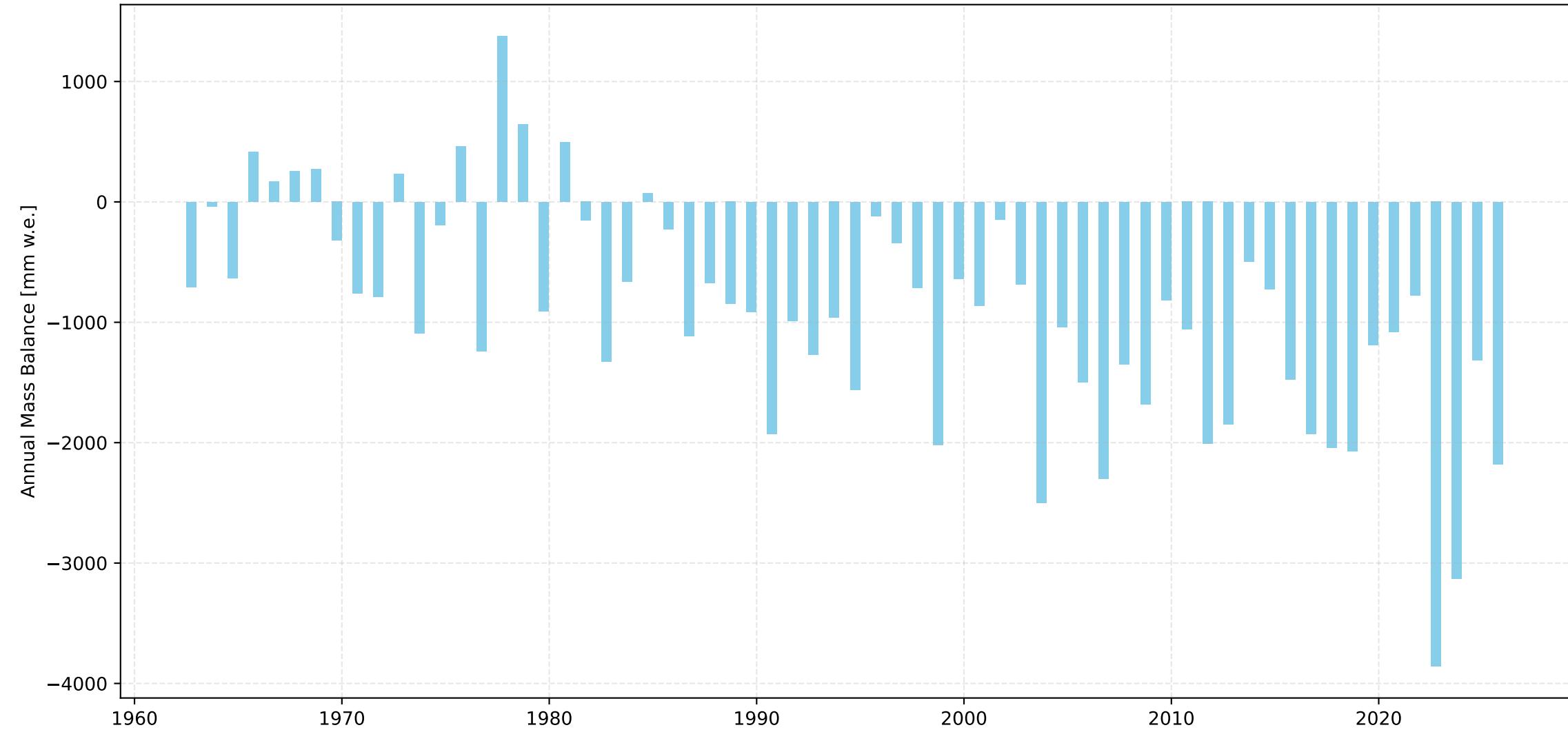
Griesgletscher Length Change Over Time



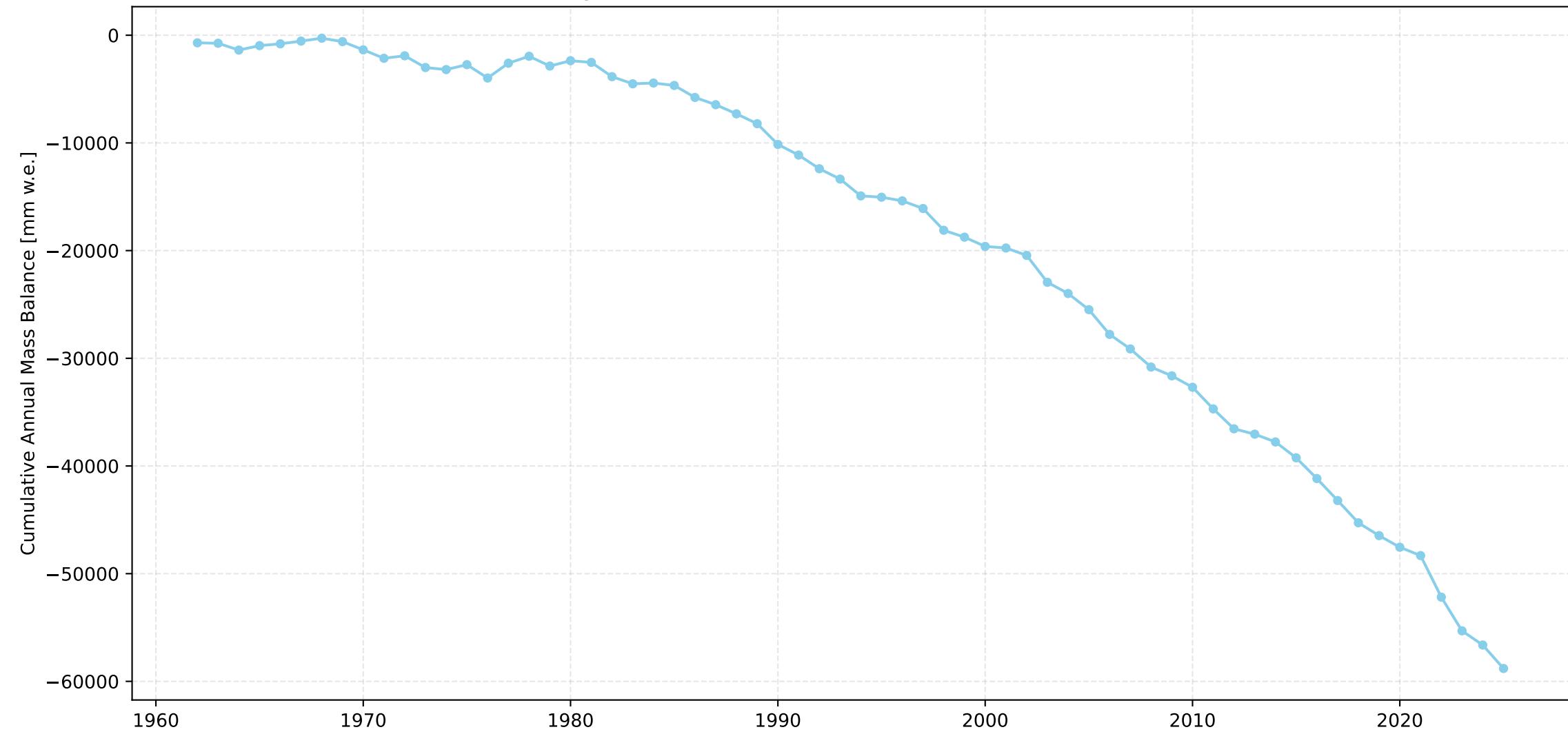
Griesgletscher Cumulative Length Change Over Time



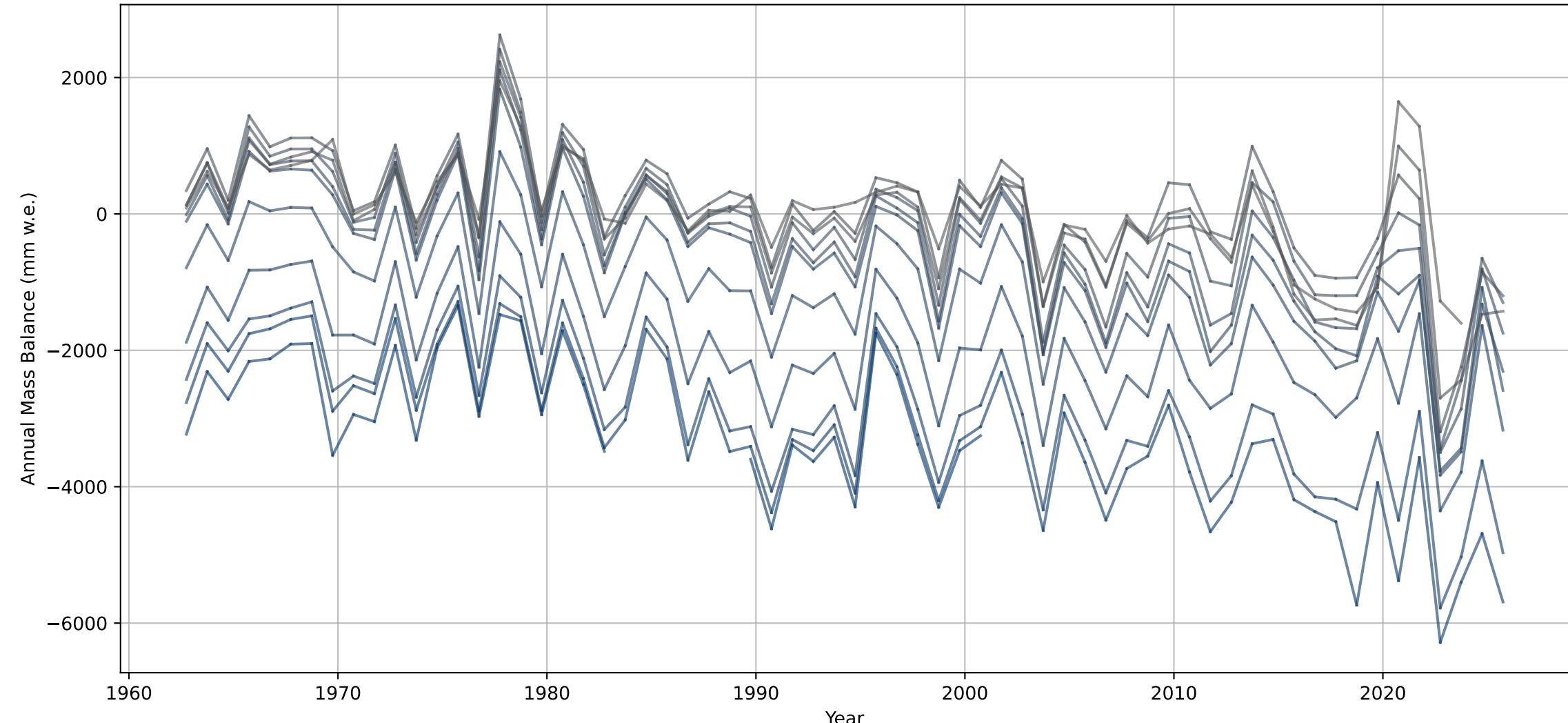
Griesgletscher Annual Mass Balance Over Time



Griesgletscher Cumulative Annual Mass Balance Over Time



Annual Mass Balance for each Elevation Bin over Time - Griesgletscher



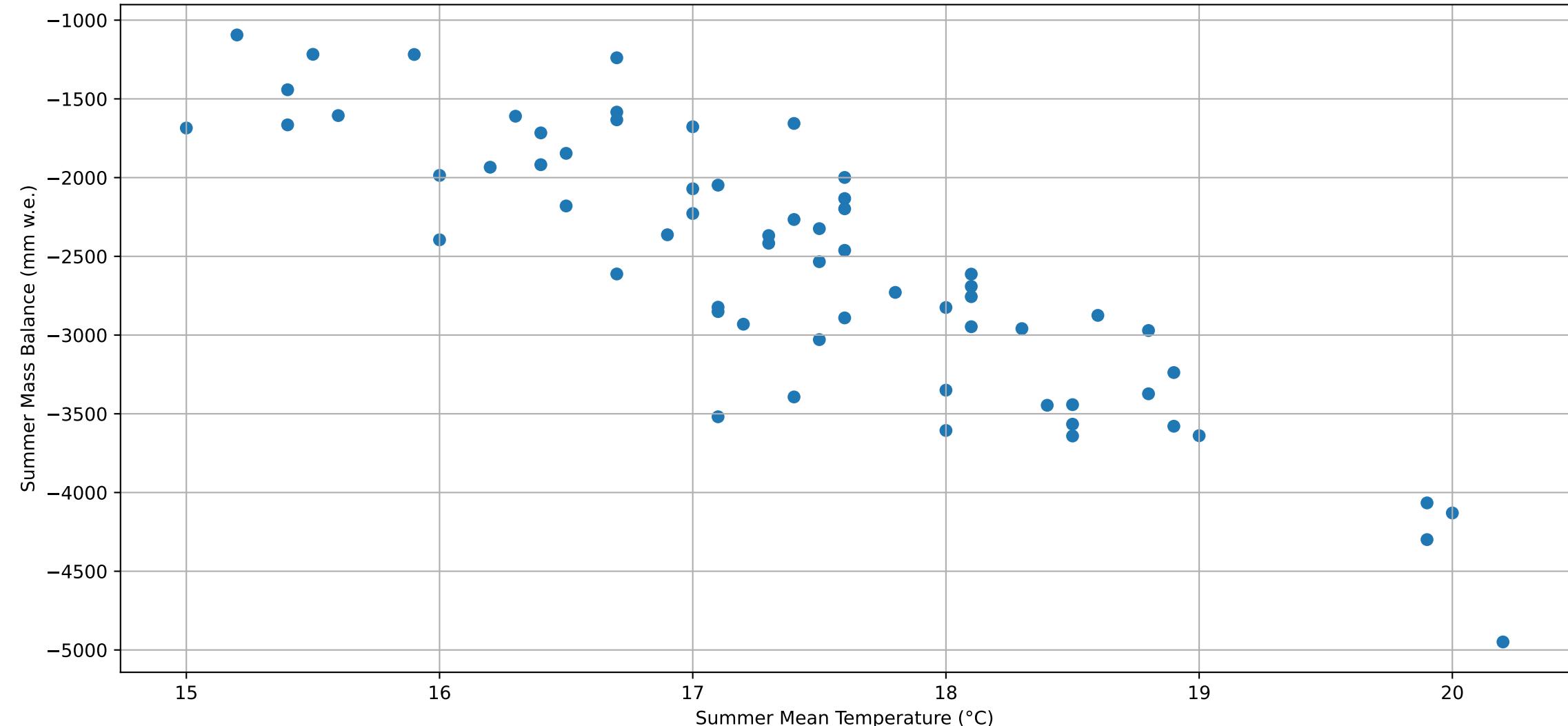
Sion Summer Mean Temperature



Sion Winter Total Precipitation



Griesgletscher Summer Mass Balance with relation to Temperature



Regression: Monthly 1961-1990

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MONTHLY DEVIATIONS ANALYSIS USING 1961-1990 CLIMATE NORMS

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MONTHLY DEVIATIONS for Griesgletscher (1961-1990 norms)

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Number of observations: 64

Regression Summary:

OLS Regression Results

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Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.773
Model:	OLS	Adj. R-squared:	0.719
Method:	Least Squares	F-statistic:	14.46
Date:	Mon, 08 Dec 2025	Prob (F-statistic):	1.74e-12
Time:	00:57:44	Log-Likelihood:	-480.43
No. Observations:	64	AIC:	986.9
Df Residuals:	51	BIC:	1015.
Df Model:	12		
Covariance Type:	nonrobust		

=====

	coef	std err	t	P> t	[0.025	0.975]
const	2.162e+04	1910.255	11.320	0.000	1.78e+04	2.55e+04
may_td	-152.9150	51.327	-2.979	0.004	-255.957	-49.873
june_td	-142.2344	47.185	-3.014	0.004	-236.963	-47.506
july_td	-106.0656	49.078	-2.161	0.035	-204.593	-7.538
august_td	-148.2455	58.751	-2.523	0.015	-266.194	-30.297
september_td	-119.6194	47.846	-2.500	0.016	-215.674	-23.565
october_pd	2.3939	2.245	1.066	0.291	-2.113	6.900
november_pd	3.3629	1.687	1.994	0.052	-0.023	6.749
december_pd	1.1490	1.424	0.807	0.424	-1.710	4.008
january_pd	2.1679	1.700	1.275	0.208	-1.245	5.581
february_pd	0.2412	1.452	0.166	0.869	-2.673	3.156
march_pd	-0.1632	1.979	-0.082	0.935	-4.137	3.811
april_pd	0.8314	3.074	0.270	0.788	-5.341	7.004

=====

Omnibus:	0.563	Durbin-Watson:	1.566
Prob(Omnibus):	0.755	Jarque-Bera (JB):	0.705
Skew:	0.160	Prob(JB):	0.703
Kurtosis:	2.597	Cond. No.	2.43e+03

=====

Notes:

- [1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
- [2] The condition number is large, 2.43e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Coefficient Interpretation:

Intercept (normal mass balance): 21624.11 (p=0.0000)

may_td: -152.91 (p=0.0044)

june_td: -142.23 (p=0.0040)

july_td: -106.07 (p=0.0354)

august_td: -148.25 (p=0.0148)

september_td: -119.62 (p=0.0157)

october_pd: 2.39 (p=0.2912)

november_pd: 3.36 (p=0.0515)

december_pd: 1.149 (p=0.1875)

Regression: Optimal 1961-1990

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OPTIMAL SEASONAL DEVIATIONS ANALYSIS USING 1961-1990 CLIMATE NORMS
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OPTIMAL SEASONAL DEVIATIONS for Griesgletscher (1961-1990 norms)
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Number of observations: 64

Regression Summary:

OLS Regression Results

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Dep. Variable: annual mass balance (mm w.e.) R-squared: 0.726
Model: OLS Adj. R-squared: 0.717
Method: Least Squares F-statistic: 80.80
Date: Mon, 08 Dec 2025 Prob (F-statistic): 7.13e-18
Time: 00:57:44 Log-Likelihood: -486.44
No. Observations: 64 AIC: 978.9
Df Residuals: 61 BIC: 985.4
Df Model: 2
Covariance Type: nonrobust
=====

	coef	std err	t	P> t	[0.025	0.975]
const	2.029e+04	1735.344	11.690	0.000	1.68e+04	2.38e+04
opt_season_td	-607.3401	49.746	-12.209	0.000	-706.814	-507.866
opt_season_pd	1.4129	0.746	1.893	0.063	-0.080	2.906

=====

Omnibus: 0.395 Durbin-Watson: 1.611
Prob(Omnibus): 0.821 Jarque-Bera (JB): 0.462
Skew: -0.176 Prob(JB): 0.794
Kurtosis: 2.778 Cond. No. 2.38e+03
=====

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 2.38e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Coefficient Interpretation:

Intercept (normal mass balance): 20286.48 (p=0.0000)
opt_season_td: -607.34 (p=0.0000)
opt_season_pd: 1.41 (p=0.0632)

Variance Inflation Factors (VIF):

	Variable	VIF
0	const	784.748728
1	opt_season_td	1.017886
2	opt_season_pd	1.017886

R-squared: 0.7260

Adjusted R-squared: 0.7170

Regression: Seasonal 1961-1990

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SUMMER/WINTER SEASONAL DEVIATIONS ANALYSIS USING 1961-1990 CLIMATE NORMS
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SUMMER/WINTER SEASONAL DEVIATIONS for Griesgletscher (1961-1990 norms)
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Number of observations: 64

Regression Summary:

OLS Regression Results

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Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.755
Model:	OLS	Adj. R-squared:	0.747
Method:	Least Squares	F-statistic:	93.97
Date:	Mon, 08 Dec 2025	Prob (F-statistic):	2.35e-19
Time:	00:57:44	Log-Likelihood:	-482.86
No. Observations:	64	AIC:	971.7
Df Residuals:	61	BIC:	978.2
Df Model:	2		
Covariance Type:	nonrobust		

=====

	coef	std err	t	P> t	[0.025	0.975]
const	2.158e+04	1705.414	12.653	0.000	1.82e+04	2.5e+04
summer_td	-663.0376	50.329	-13.174	0.000	-763.677	-562.399
winter_pd	1.3734	0.625	2.197	0.032	0.124	2.623

=====

Omnibus:	0.779	Durbin-Watson:	1.702
Prob(Omnibus):	0.677	Jarque-Bera (JB):	0.586
Skew:	-0.234	Prob(JB):	0.746
Kurtosis:	2.961	Cond. No.	2.81e+03

=====

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 2.81e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Coefficient Interpretation:

Intercept (normal mass balance): 21578.67 (p=0.0000)
summer_td: -663.04 (p=0.0000)
winter_pd: 1.37 (p=0.0318)

Variance Inflation Factors (VIF):

	Variable	VIF
0	const	847.583626
1	summer_td	1.014369
2	winter_pd	1.014369

R-squared: 0.7550

Adjusted R-squared: 0.7469

Regression: Monthly 1991-2020

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MONTHLY DEVIATIONS ANALYSIS USING 1991-2020 CLIMATE NORMS

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MONTHLY DEVIATIONS for Griesgletscher (1991-2020 norms)

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Number of observations: 64

Regression Summary:

OLS Regression Results

=====

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.773
Model:	OLS	Adj. R-squared:	0.719
Method:	Least Squares	F-statistic:	14.46
Date:	Mon, 08 Dec 2025	Prob (F-statistic):	1.74e-12
Time:	00:57:44	Log-Likelihood:	-480.43
No. Observations:	64	AIC:	986.9
Df Residuals:	51	BIC:	1015.
Df Model:	12		
Covariance Type:	nonrobust		

=====

	coef	std err	t	P> t	[0.025	0.975]
const	-1418.2957	73.361	-19.333	0.000	-1565.574	-1271.017
may_td	-152.9150	51.327	-2.979	0.004	-255.957	-49.873
june_td	-142.2344	47.185	-3.014	0.004	-236.963	-47.506
july_td	-106.0656	49.078	-2.161	0.035	-204.593	-7.538
august_td	-148.2455	58.751	-2.523	0.015	-266.194	-30.297
september_td	-119.6194	47.846	-2.500	0.016	-215.674	-23.565
october_pd	2.3939	2.245	1.066	0.291	-2.113	6.900
november_pd	3.3629	1.687	1.994	0.052	-0.023	6.749
december_pd	1.1490	1.424	0.807	0.424	-1.710	4.008
january_pd	2.1679	1.700	1.275	0.208	-1.245	5.581
february_pd	0.2412	1.452	0.166	0.869	-2.673	3.156
march_pd	-0.1632	1.979	-0.082	0.935	-4.137	3.811
april_pd	0.8314	3.074	0.270	0.788	-5.341	7.004

=====

Omnibus:	0.563	Durbin-Watson:	1.566
Prob(Omnibus):	0.755	Jarque-Bera (JB):	0.705
Skew:	0.160	Prob(JB):	0.703
Kurtosis:	2.597	Cond. No.	57.9

=====

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Coefficient Interpretation:

Intercept (normal mass balance): -1418.30 (p=0.0000)

may_td: -152.91 (p=0.0044)

june_td: -142.23 (p=0.0040)

july_td: -106.07 (p=0.0354)

august_td: -148.25 (p=0.0148)

september_td: -119.62 (p=0.0157)

october_pd: 2.39 (p=0.2912)

november_pd: 3.36 (p=0.0515)

december_pd: 1.15 (p=0.4235)

january_pd: 2.17 (p=0.2080)

Regression: Optimal 1991-2020

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OPTIMAL SEASONAL DEVIATIONS ANALYSIS USING 1991-2020 CLIMATE NORMS
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OPTIMAL SEASONAL DEVIATIONS for Griesgletscher (1991-2020 norms)
=====

Number of observations: 64

Regression Summary:

OLS Regression Results

=====
Dep. Variable: annual mass balance (mm w.e.) R-squared: 0.728
Model: OLS Adj. R-squared: 0.719
Method: Least Squares F-statistic: 81.73
Date: Mon, 08 Dec 2025 Prob (F-statistic): 5.53e-18
Time: 00:57:44 Log-Likelihood: -486.17
No. Observations: 64 AIC: 978.3
Df Residuals: 61 BIC: 984.8
Df Model: 2
Covariance Type: nonrobust
=====

	coef	std err	t	P> t	[0.025	0.975]
const	-1387.5375	71.772	-19.333	0.000	-1531.054	-1244.021
opt_season_td	-608.4661	49.547	-12.281	0.000	-707.542	-509.391
opt_season_pd	1.3504	0.744	1.815	0.074	-0.137	2.838

=====

Omnibus: 0.389 Durbin-Watson: 1.612
Prob(Omnibus): 0.823 Jarque-Bera (JB): 0.461
Skew: -0.175 Prob(JB): 0.794
Kurtosis: 2.774 Cond. No. 107.
=====

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Coefficient Interpretation:

Intercept (normal mass balance): -1387.54 (p=0.0000)
opt_season_td: -608.47 (p=0.0000)
opt_season_pd: 1.35 (p=0.0744)

Variance Inflation Factors (VIF):

	Variable	VIF
0	const	1.353603
1	opt_season_td	1.019714
2	opt_season_pd	1.019714

R-squared: 0.7282

Adjusted R-squared: 0.7193

Regression: Seasonal 1991-2020

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SUMMER/WINTER SEASONAL DEVIATIONS ANALYSIS USING 1991-2020 CLIMATE NORMS
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SUMMER/WINTER SEASONAL DEVIATIONS for Griesgletscher (1991-2020 norms)
=====

Number of observations: 64

Regression Summary:

OLS Regression Results

=====
Dep. Variable: annual mass balance (mm w.e.) R-squared: 0.761
Model: OLS Adj. R-squared: 0.753
Method: Least Squares F-statistic: 97.21
Date: Mon, 08 Dec 2025 Prob (F-statistic): 1.07e-19
Time: 00:57:44 Log-Likelihood: -482.04
No. Observations: 64 AIC: 970.1
Df Residuals: 61 BIC: 976.6
Df Model: 2
Covariance Type: nonrobust
=====

	coef	std err	t	P> t	[0.025	0.975]
const	-1402.5838	67.574	-20.756	0.000	-1537.707	-1267.460
summer_td	-664.4016	49.568	-13.404	0.000	-763.518	-565.285
winter_pd	1.3968	0.617	2.264	0.027	0.163	2.630

=====

Omnibus: 0.605 Durbin-Watson: 1.692
Prob(Omnibus): 0.739 Jarque-Bera (JB): 0.494
Skew: -0.211 Prob(JB): 0.781
Kurtosis: 2.912 Cond. No. 124.
=====

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Coefficient Interpretation:

Intercept (normal mass balance): -1402.58 (p=0.0000)
summer_td: -664.40 (p=0.0000)
winter_pd: 1.40 (p=0.0271)

Variance Inflation Factors (VIF):

Variable	VIF
0 const	1.365389
1 summer_td	1.013572
2 winter_pd	1.013572

R-squared: 0.7612

Adjusted R-squared: 0.7533