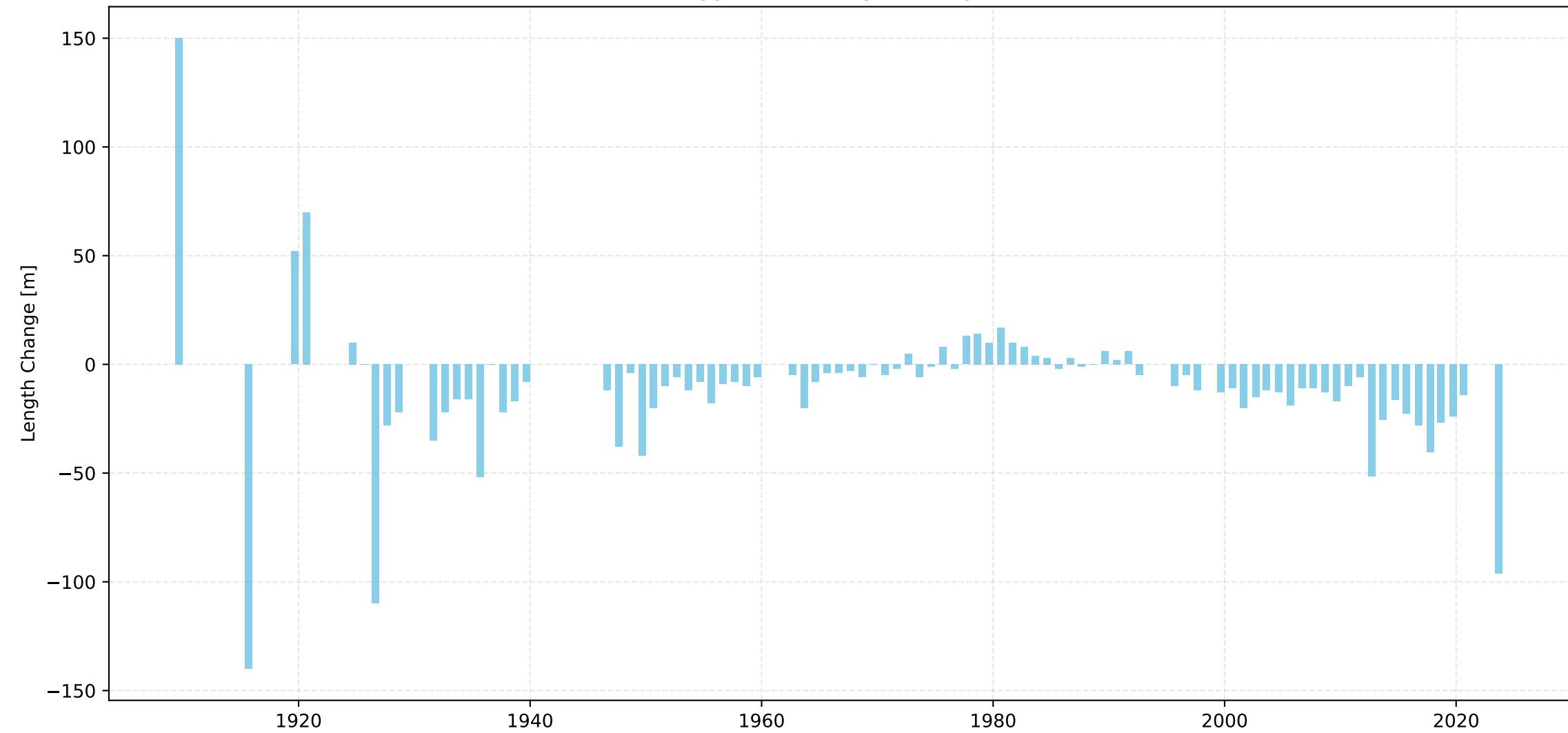
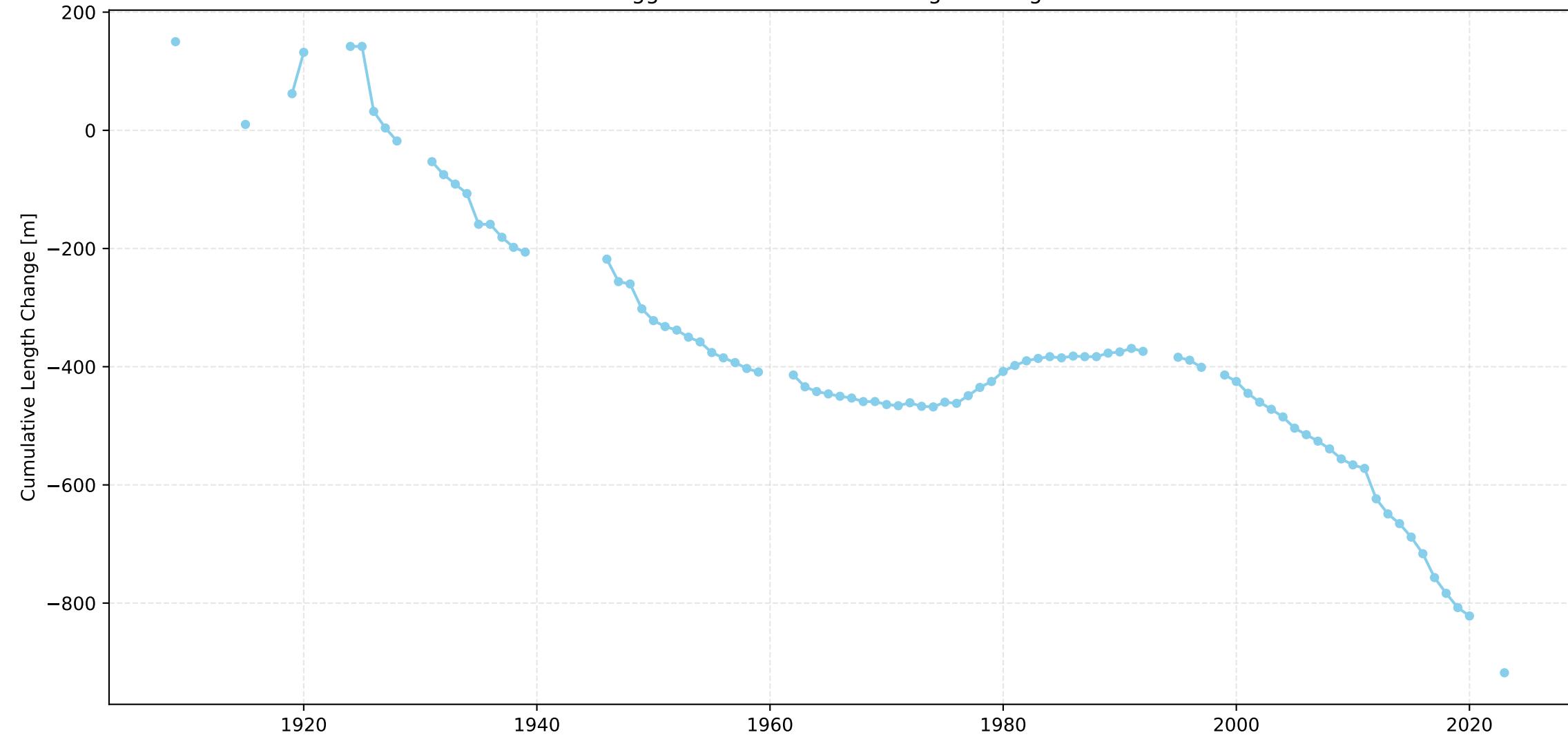


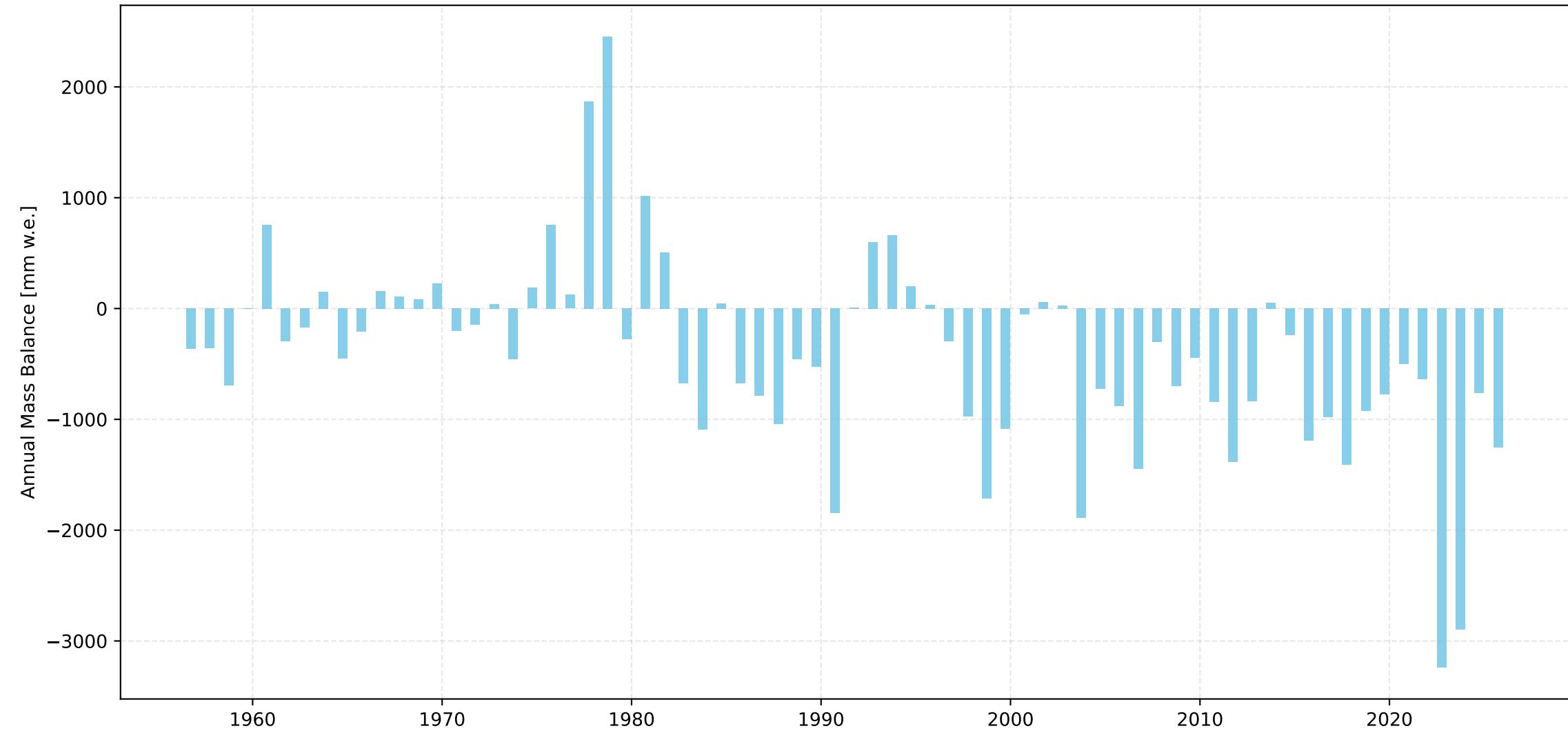
Schwarzberggletscher Length Change Over Time



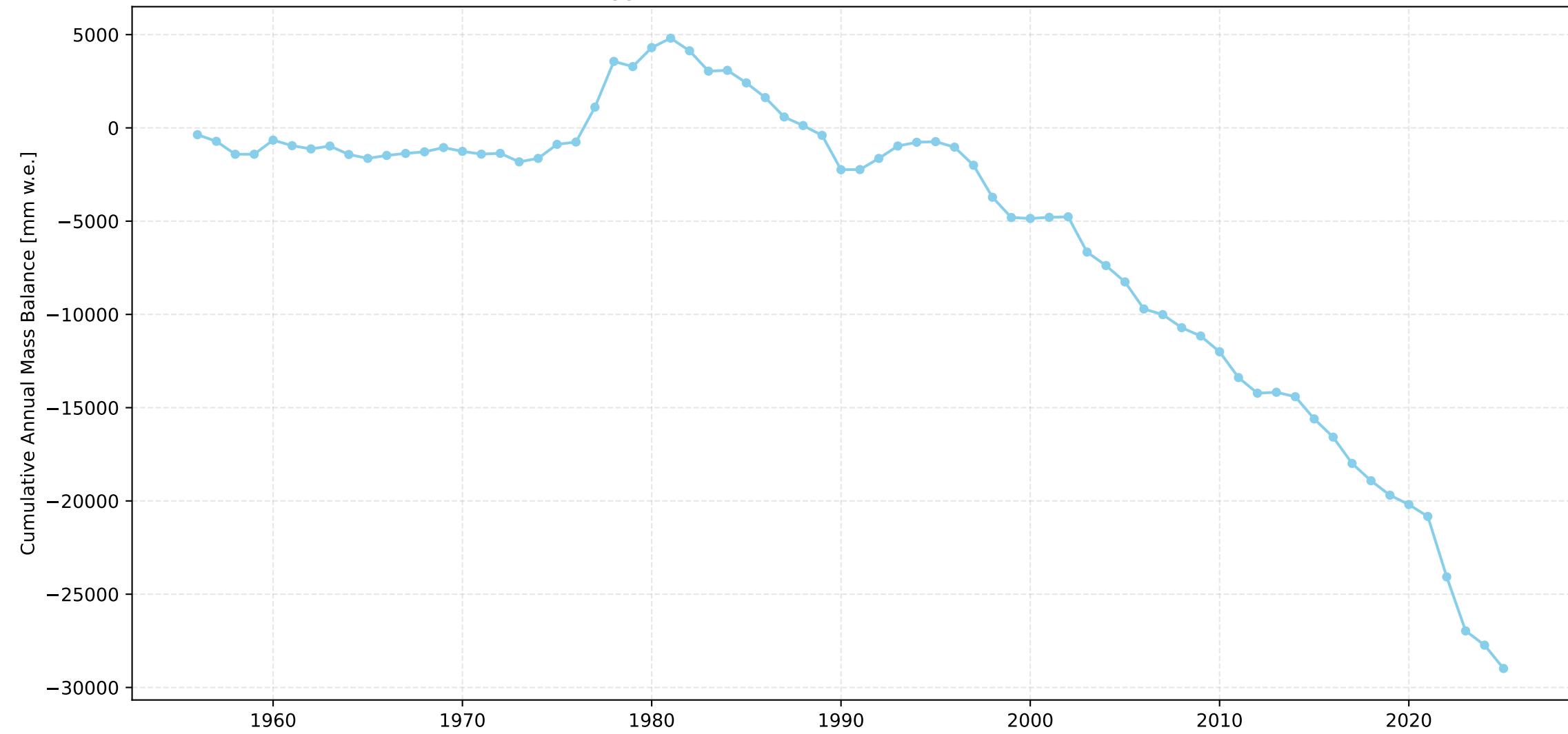
Schwarzberggletscher Cumulative Length Change Over Time



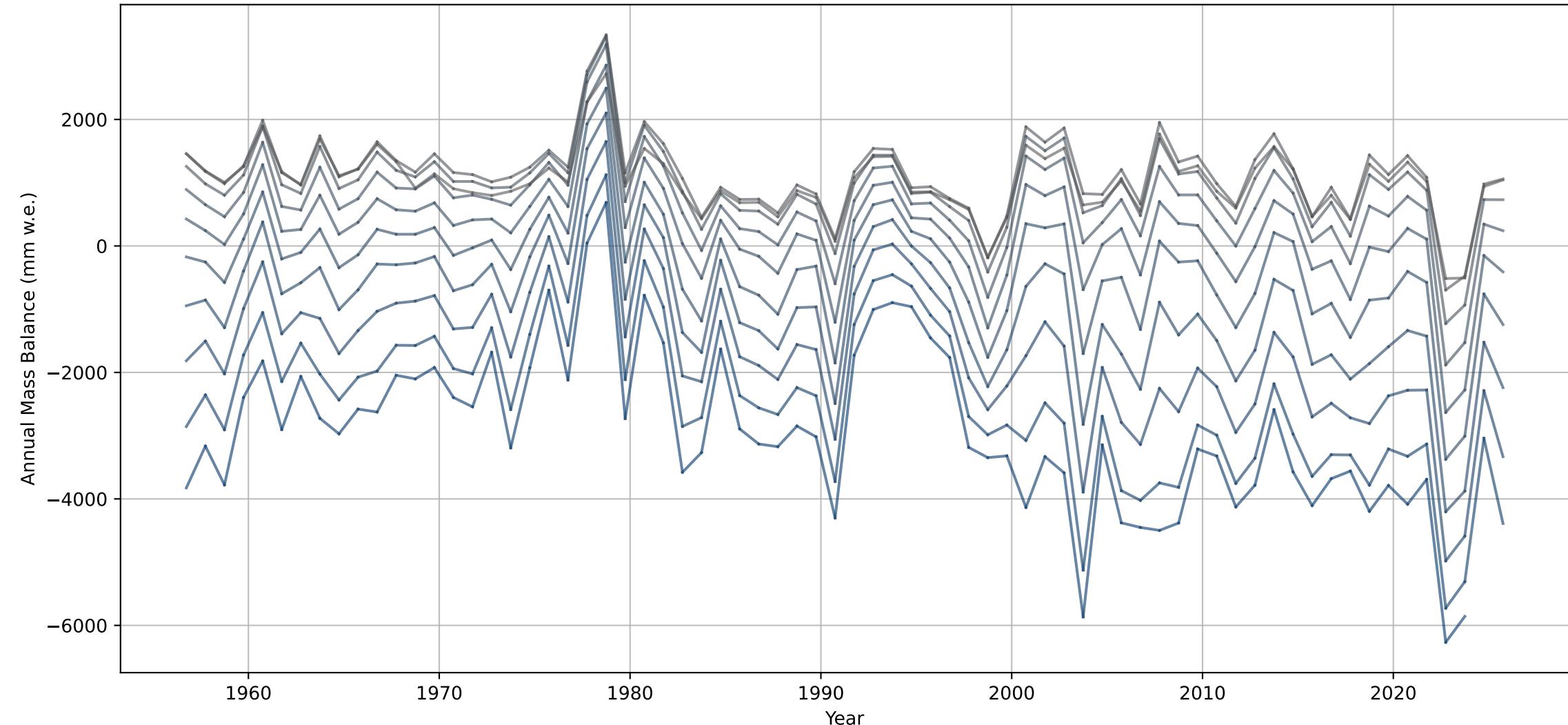
Schwarzberggletscher Annual Mass Balance Over Time



Schwarzberggletscher Cumulative Annual Mass Balance Over Time



Annual Mass Balance for each Elevation Bin over Time - Schwarzberggletscher



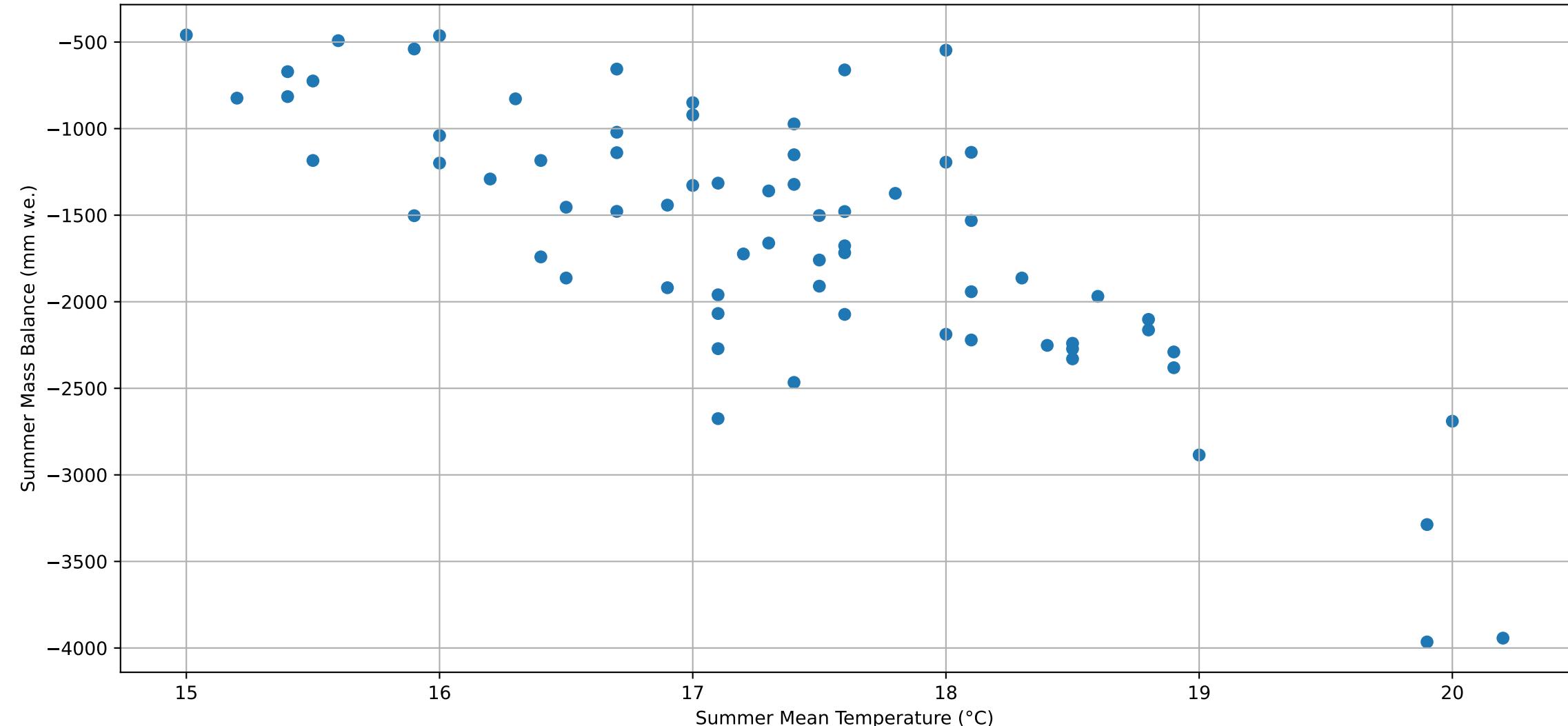
Sion Summer Mean Temperature



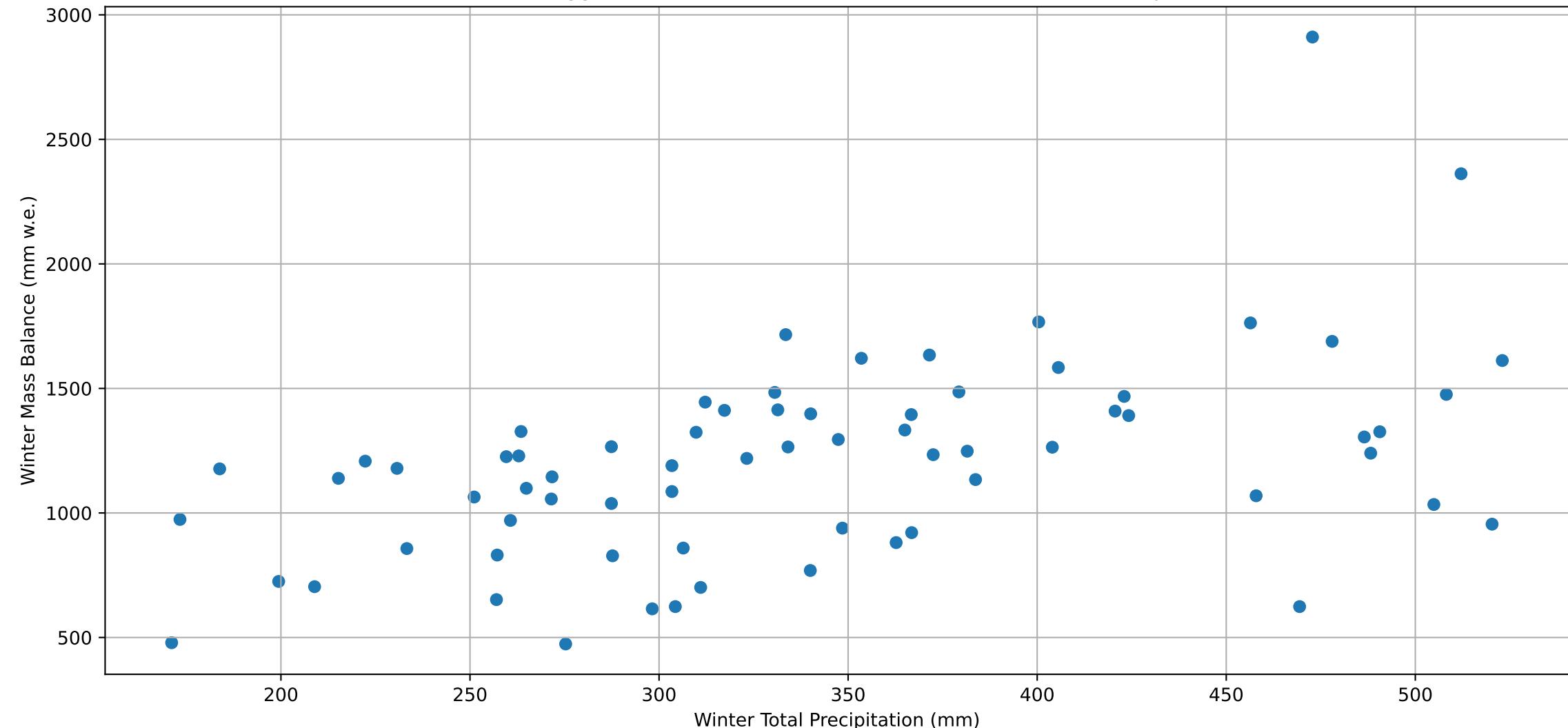
Sion Winter Total Precipitation



Schwarzberggletscher Summer Mass Balance with relation to Temperature



Schwarzberggletscher Winter Mass Balance with relation to Precipitation



Regression: Monthly 1961-1990

=====
MONTHLY DEVIATIONS for Schwarzberggletscher using 1961-1990 climate norms
=====

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
2	july_td	-0.570124	2.579128e-07	True
1	june_td	-0.544123	1.123852e-06	True
3	august_td	-0.517207	4.552076e-06	True
4	september_td	-0.453572	8.035801e-05	True
0	may_td	-0.437913	1.499031e-04	True
5	october_pd	0.136419	2.601277e-01	False
10	march_pd	0.125403	3.009506e-01	False
6	november_pd	0.122187	3.136170e-01	False
9	february_pd	0.101011	4.053910e-01	False
7	december_pd	0.070149	5.639044e-01	False
8	january_pd	0.060120	6.210324e-01	False
11	april_pd	-0.053554	6.597125e-01	False

Number of observations: 70

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.582
Model:	OLS	Adj. R-squared:	0.494
Method:	Least Squares	F-statistic:	6.623
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	3.05e-07
Time:	10:30:26	Log-Likelihood:	-543.16
No. Observations:	70	AIC:	1112.
Df Residuals:	57	BIC:	1142.
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	81.2746	97.680	0.832	0.409	-114.327	276.876
may_td	-93.5242	60.040	-1.558	0.125	-213.752	26.704
june_td	-87.6040	56.599	-1.548	0.127	-200.941	25.733
july_td	-161.3010	60.725	-2.656	0.010	-282.901	-39.701
august_td	-83.2476	71.653	-1.162	0.250	-226.730	60.234
september_td	-141.9432	57.014	-2.490	0.016	-256.111	-27.775
october_pd	2.2736	2.793	0.814	0.419	-3.319	7.866
november_pd	3.1229	2.075	1.505	0.138	-1.033	7.278
december_pd	3.7424	1.734	2.158	0.035	0.269	7.215
january_pd	2.0974	2.111	0.994	0.325	-2.129	6.324
february_pd	-0.6711	1.639	-0.409	0.684	-3.953	2.611
march_pd	1.7394	2.413	0.721	0.474	-3.092	6.571
april_pd	2.0444	3.685	0.555	0.581	-5.335	9.424

Omnibus:	0.273	Durbin-Watson:	1.180
Prob(Omnibus):	0.872	Jarque-Bera (JB):	0.042
Skew:	-0.051	Prob(JB):	0.979
Kurtosis:	3.063	Cond. No.	68.7

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

Regression: Optimal 1961-1990

=====
OPTIMAL SEASONAL DEVIATIONS for Schwarzberggletscher using 1961-1990 climate norms
=====

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
0	opt_season_td	-0.673903	1.617824e-10	True
1	opt_season_pd	0.241944	4.360289e-02	True

Number of observations: 70

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.484
Model:	OLS	Adj. R-squared:	0.469
Method:	Least Squares	F-statistic:	31.45
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	2.34e-10
Time:	10:30:26	Log-Likelihood:	-550.54
No. Observations:	70	AIC:	1107.
Df Residuals:	67	BIC:	1114.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	37.4196	96.002	0.390	0.698	-154.201	229.040
opt_season_td	-452.9618	60.918	-7.436	0.000	-574.554	-331.370
opt_season_pd	1.8855	0.954	1.975	0.052	-0.020	3.791

Omnibus:	0.847	Durbin-Watson:	1.175
Prob(Omnibus):	0.655	Jarque-Bera (JB):	0.312
Skew:	-0.020	Prob(JB):	0.856
Kurtosis:	3.325	Cond. No.	111.

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

Regression: Seasonal 1961-1990

=====
SUMMER/WINTER SEASONAL DEVIATIONS for Schwarzberggletscher using 1961-1990 climate norms
=====

Correlation Analysis with Significance Testing:

Skipping constant column: const

Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
0 summer_td	-0.704085	1.048873e-11	True
1 winter_pd	0.245330	4.065650e-02	True

Number of observations: 70

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.537
Model:	OLS	Adj. R-squared:	0.523
Method:	Least Squares	F-statistic:	38.87
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	6.23e-12
Time:	10:30:26	Log-Likelihood:	-546.76
No. Observations:	70	AIC:	1100.
Df Residuals:	67	BIC:	1106.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	83.7591	92.237	0.908	0.367	-100.347	267.865
summer_td	-518.3643	62.394	-8.308	0.000	-642.904	-393.825
winter_pd	1.9387	0.793	2.446	0.017	0.357	3.521

Omnibus:	1.179	Durbin-Watson:	1.253
Prob(Omnibus):	0.555	Jarque-Bera (JB):	0.579
Skew:	-0.128	Prob(JB):	0.748
Kurtosis:	3.364	Cond. No.	132.

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

Regression: Monthly 1991-2020

=====
MONTHLY DEVIATIONS for Schwarzberggletscher using 1991-2020 climate norms
=====

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
2	july_td	-0.570124	2.579128e-07	True
1	june_td	-0.544123	1.123852e-06	True
3	august_td	-0.517207	4.552076e-06	True
4	september_td	-0.453572	8.035801e-05	True
0	may_td	-0.437913	1.499031e-04	True
5	october_pd	0.136419	2.601277e-01	False
10	march_pd	0.125403	3.009506e-01	False
6	november_pd	0.122187	3.136170e-01	False
9	february_pd	0.101011	4.053910e-01	False
7	december_pd	0.070149	5.639044e-01	False
8	january_pd	0.060120	6.210324e-01	False
11	april_pd	-0.053554	6.597125e-01	False

Number of observations: 70

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.582
Model:	OLS	Adj. R-squared:	0.494
Method:	Least Squares	F-statistic:	6.623
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	3.05e-07
Time:	10:30:26	Log-Likelihood:	-543.16
No. Observations:	70	AIC:	1112.
Df Residuals:	57	BIC:	1142.
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-843.0152	91.842	-9.179	0.000	-1026.926	-659.104
may_td	-93.5242	60.040	-1.558	0.125	-213.752	26.704
june_td	-87.6040	56.599	-1.548	0.127	-200.941	25.733
july_td	-161.3010	60.725	-2.656	0.010	-282.901	-39.701
august_td	-83.2476	71.653	-1.162	0.250	-226.730	60.234
september_td	-141.9432	57.014	-2.490	0.016	-256.111	-27.775
october_pd	2.2736	2.793	0.814	0.419	-3.319	7.866
november_pd	3.1229	2.075	1.505	0.138	-1.033	7.278
december_pd	3.7424	1.734	2.158	0.035	0.269	7.215
january_pd	2.0974	2.111	0.994	0.325	-2.129	6.324
february_pd	-0.6711	1.639	-0.409	0.684	-3.953	2.611
march_pd	1.7394	2.413	0.721	0.474	-3.092	6.571
april_pd	2.0444	3.685	0.555	0.581	-5.335	9.424

Omnibus:	0.273	Durbin-Watson:	1.180
Prob(Omnibus):	0.872	Jarque-Bera (JB):	0.042
Skew:	-0.051	Prob(JB):	0.979
Kurtosis:	3.063	Cond. No.	65.8

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

Regression: Optimal 1991-2020

```
=====
OPTIMAL SEASONAL DEVIATIONS for Schwarzberggletscher using 1991-2020 climate norms
=====
```

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
0	opt_season_td	-0.676153	1.334027e-10	True
1	opt_season_pd	0.241944	4.360289e-02	True

Number of observations: 70

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.485
Model:	OLS	Adj. R-squared:	0.470
Method:	Least Squares	F-statistic:	31.59
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	2.17e-10
Time:	10:30:26	Log-Likelihood:	-550.47
No. Observations:	70	AIC:	1107.
Df Residuals:	67	BIC:	1114.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-822.2518	92.603	-8.879	0.000	-1007.088	-637.415
opt_season_td	-457.0050	61.315	-7.453	0.000	-579.390	-334.620
opt_season_pd	1.8258	0.954	1.913	0.060	-0.079	3.731

Omnibus:	0.687	Durbin-Watson:	1.161
Prob(Omnibus):	0.709	Jarque-Bera (JB):	0.208
Skew:	-0.004	Prob(JB):	0.901
Kurtosis:	3.267	Cond. No.	107.

Notes:

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

Regression: Seasonal 1991-2020

```
=====
SUMMER/WINTER SEASONAL DEVIATIONS for Schwarzberggletscher using 1991-2020 climate norms
=====
```

Correlation Analysis with Significance Testing:

Skipping constant column: const

Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
0 summer_td	-0.702701	1.198032e-11	True
1 winter_pd	0.245330	4.065650e-02	True

Number of observations: 70

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.534
Model:	OLS	Adj. R-squared:	0.520
Method:	Least Squares	F-statistic:	38.40
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	7.75e-12
Time:	10:30:26	Log-Likelihood:	-546.99
No. Observations:	70	AIC:	1100.
Df Residuals:	67	BIC:	1107.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-842.3214	88.023	-9.569	0.000	-1018.016	-666.627
summer_td	-516.2801	62.546	-8.254	0.000	-641.122	-391.439
winter_pd	1.9136	0.795	2.406	0.019	0.326	3.501

Omnibus:	1.147	Durbin-Watson:	1.229
Prob(Omnibus):	0.564	Jarque-Bera (JB):	0.548
Skew:	-0.105	Prob(JB):	0.760
Kurtosis:	3.379	Cond. No.	124.

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