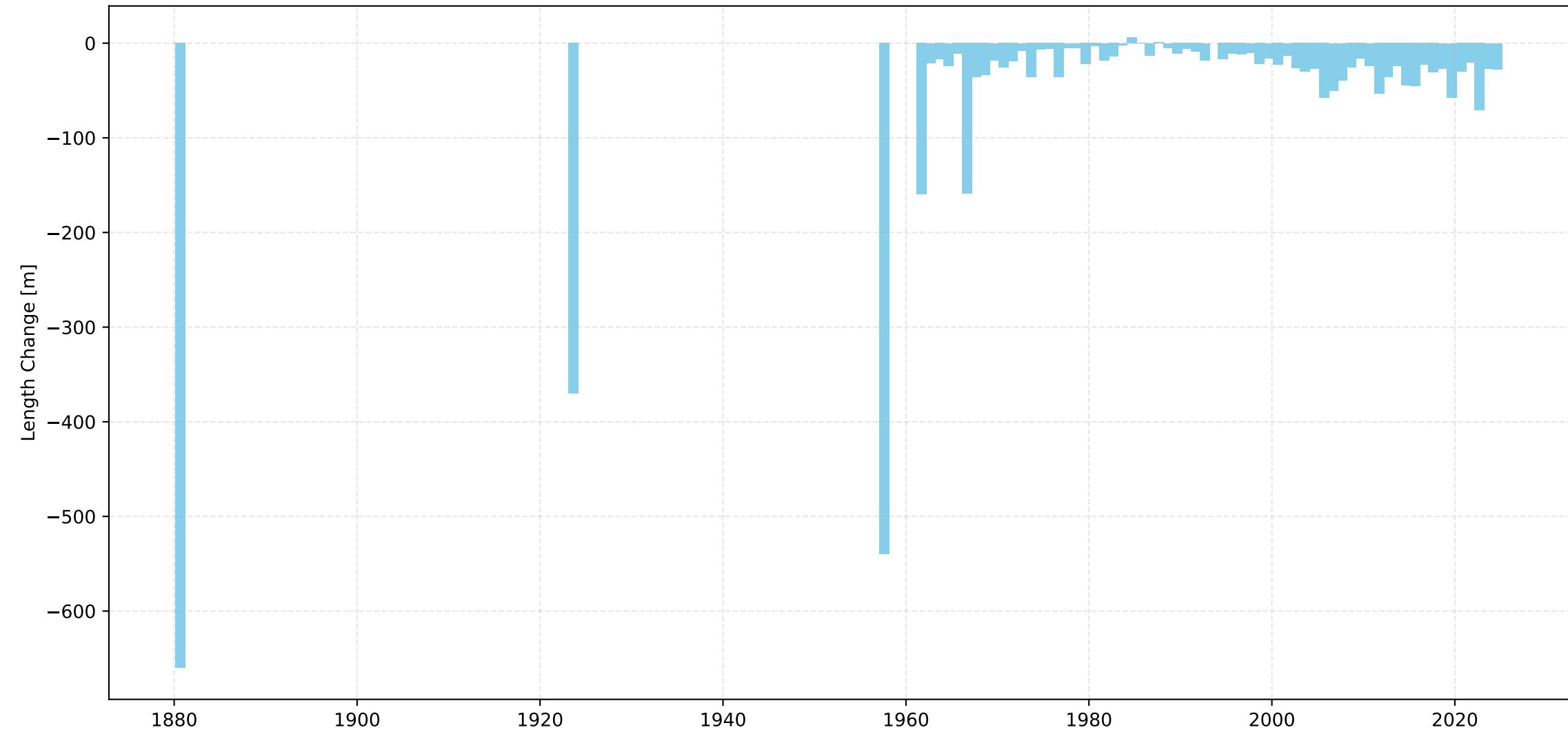
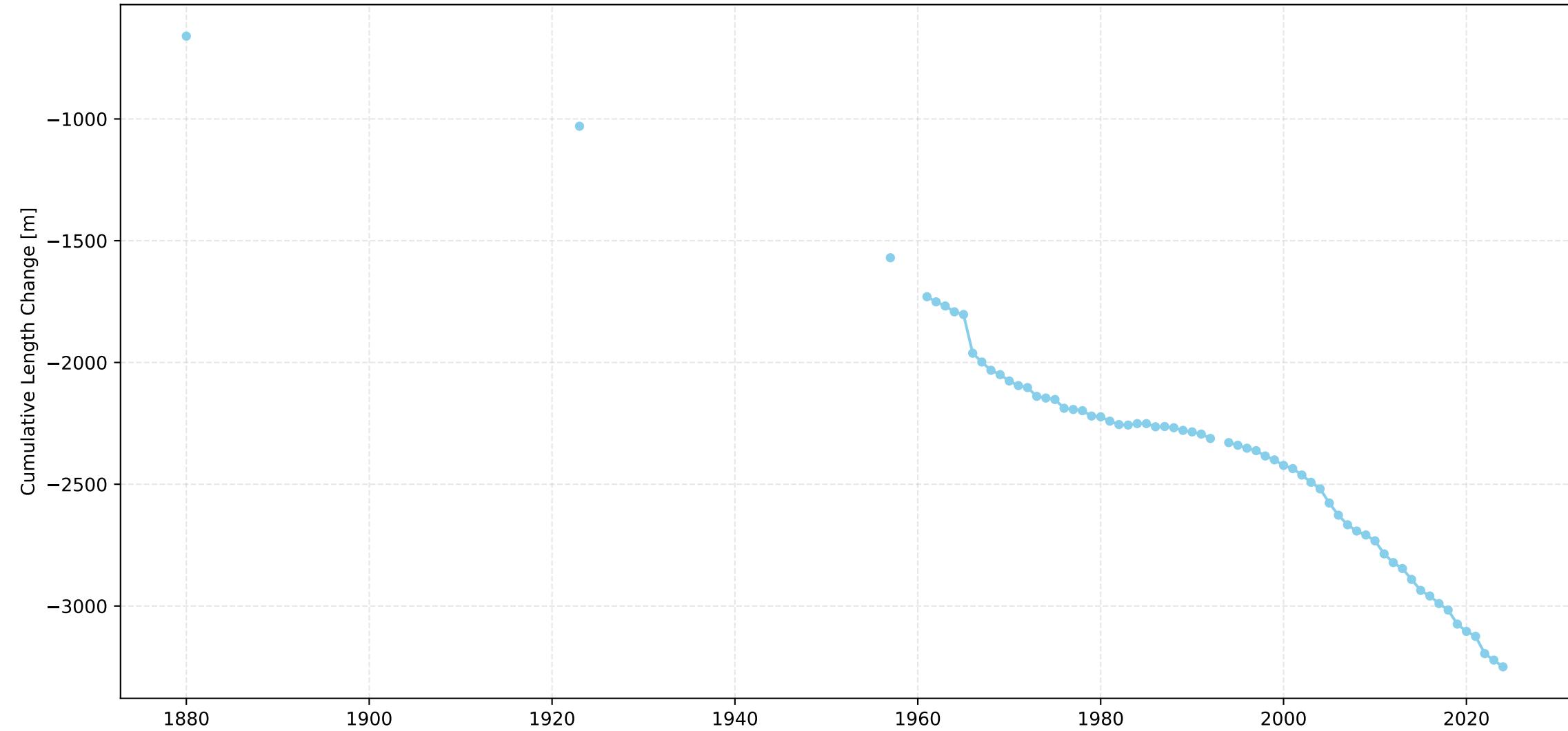


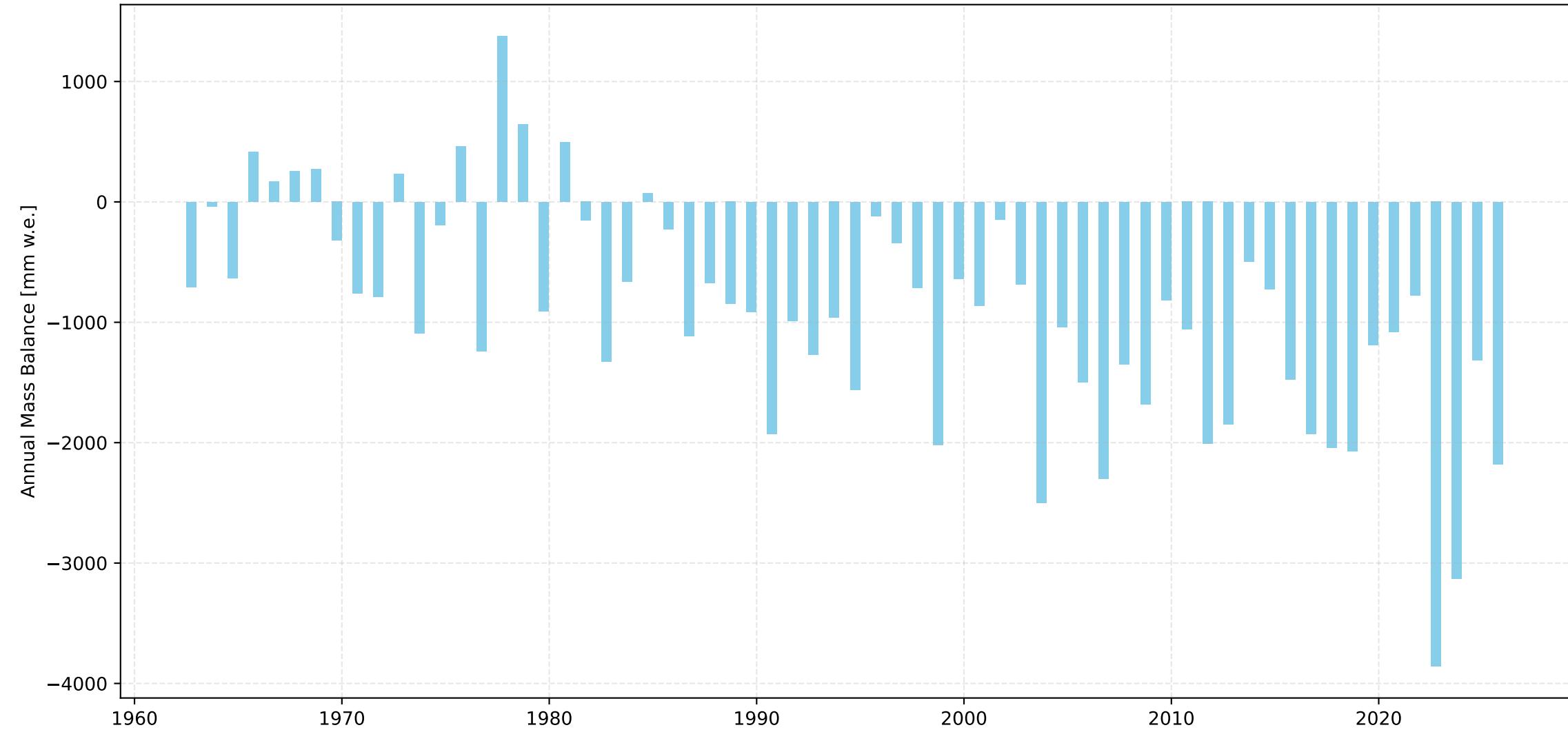
Griesgletscher Length Change Over Time



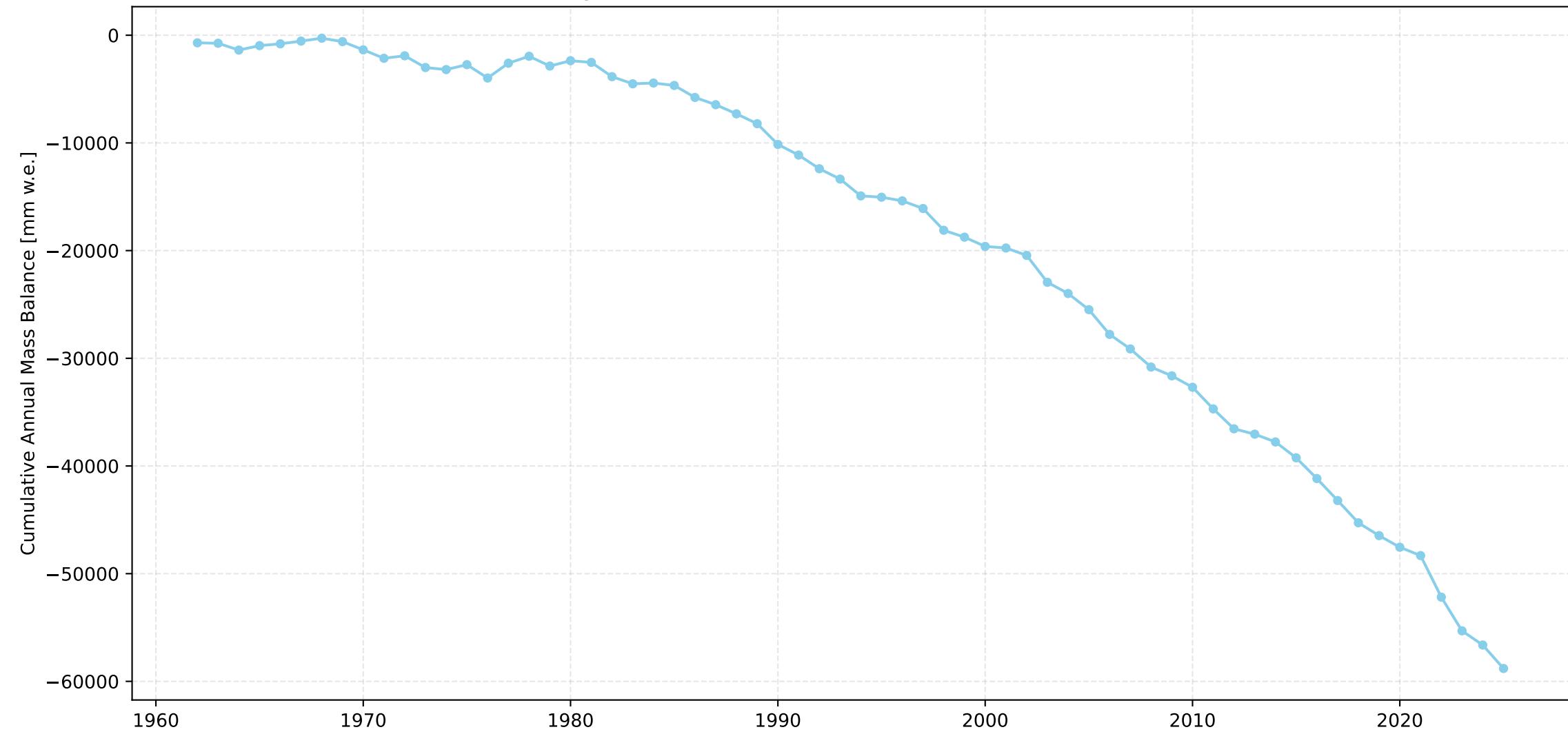
Griesgletscher Cumulative Length Change Over Time



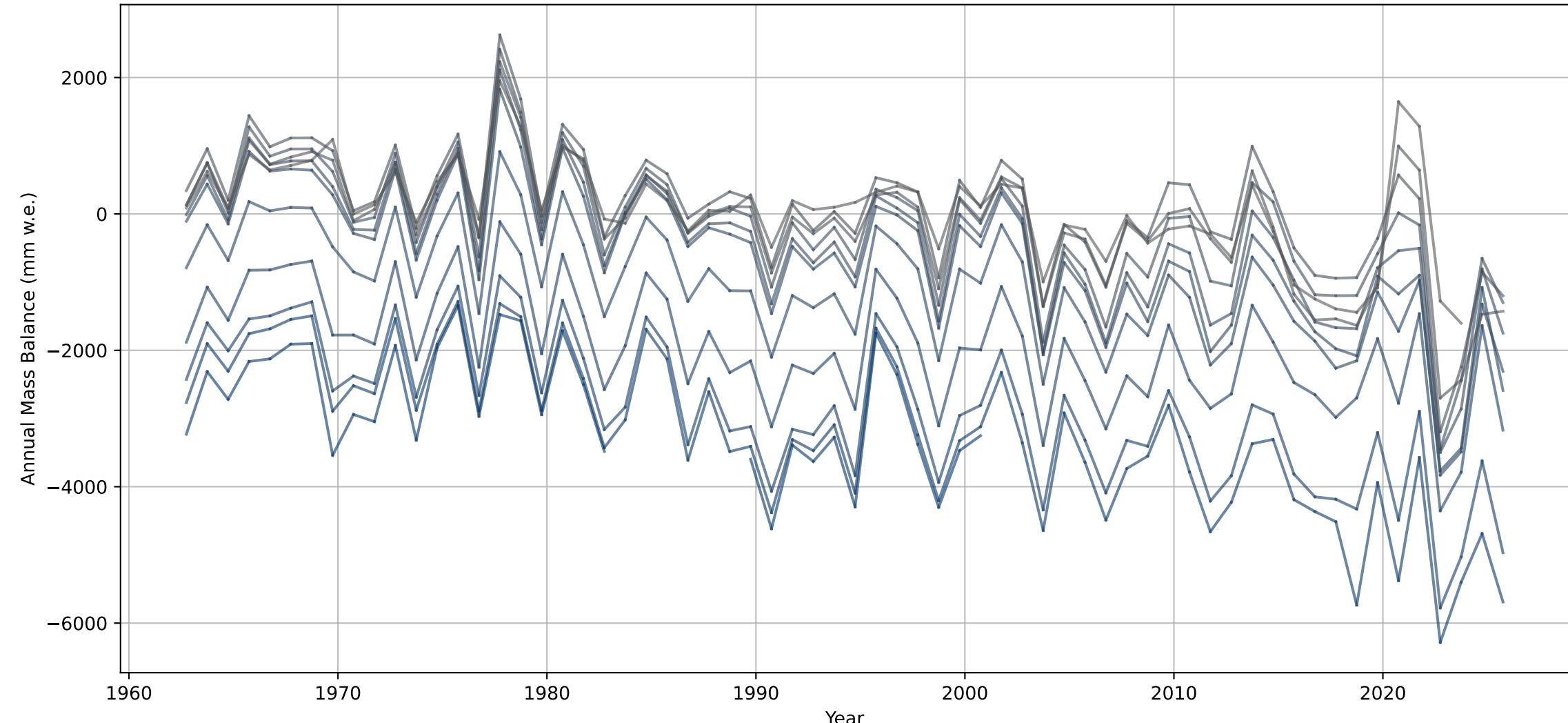
Griesgletscher Annual Mass Balance Over Time



Griesgletscher Cumulative Annual Mass Balance Over Time



Annual Mass Balance for each Elevation Bin over Time - Griesgletscher



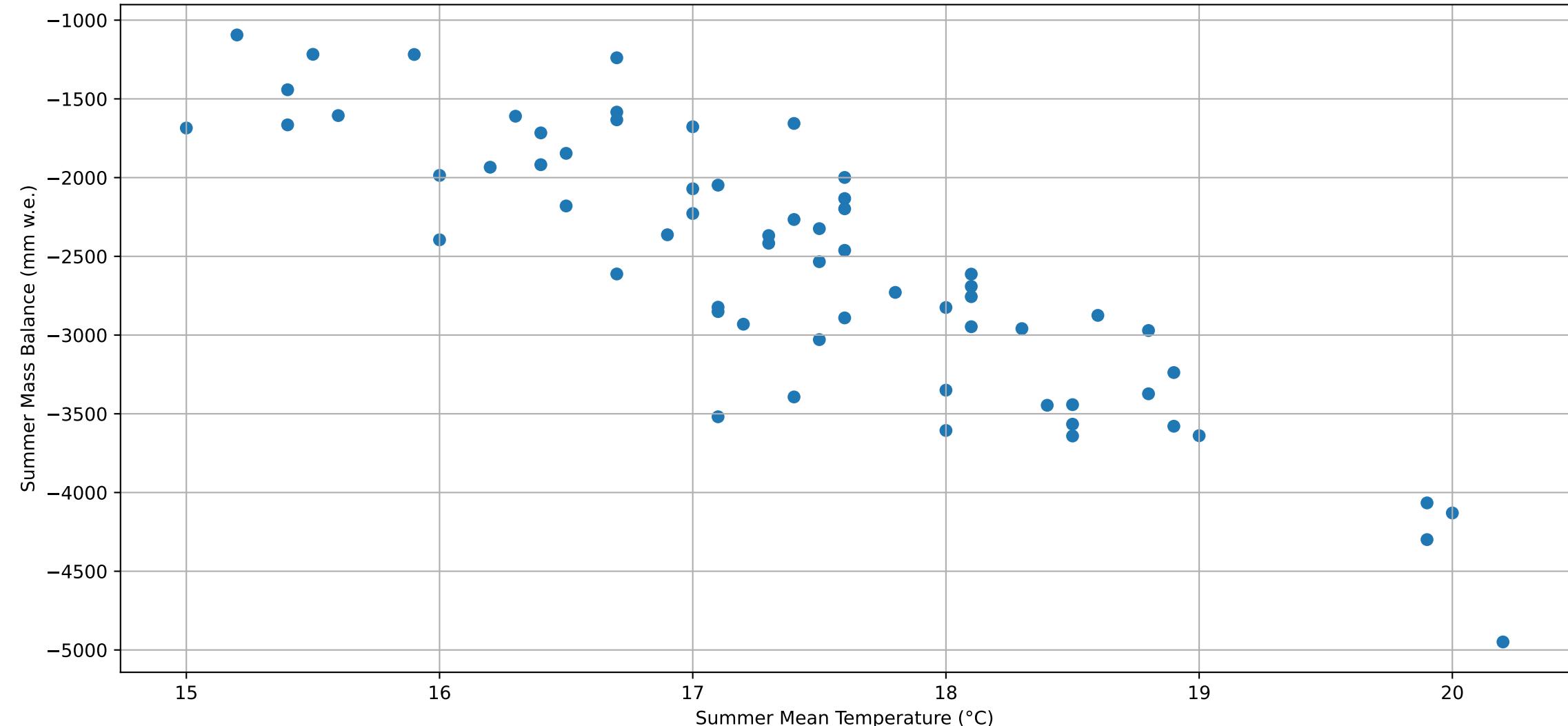
Sion Summer Mean Temperature



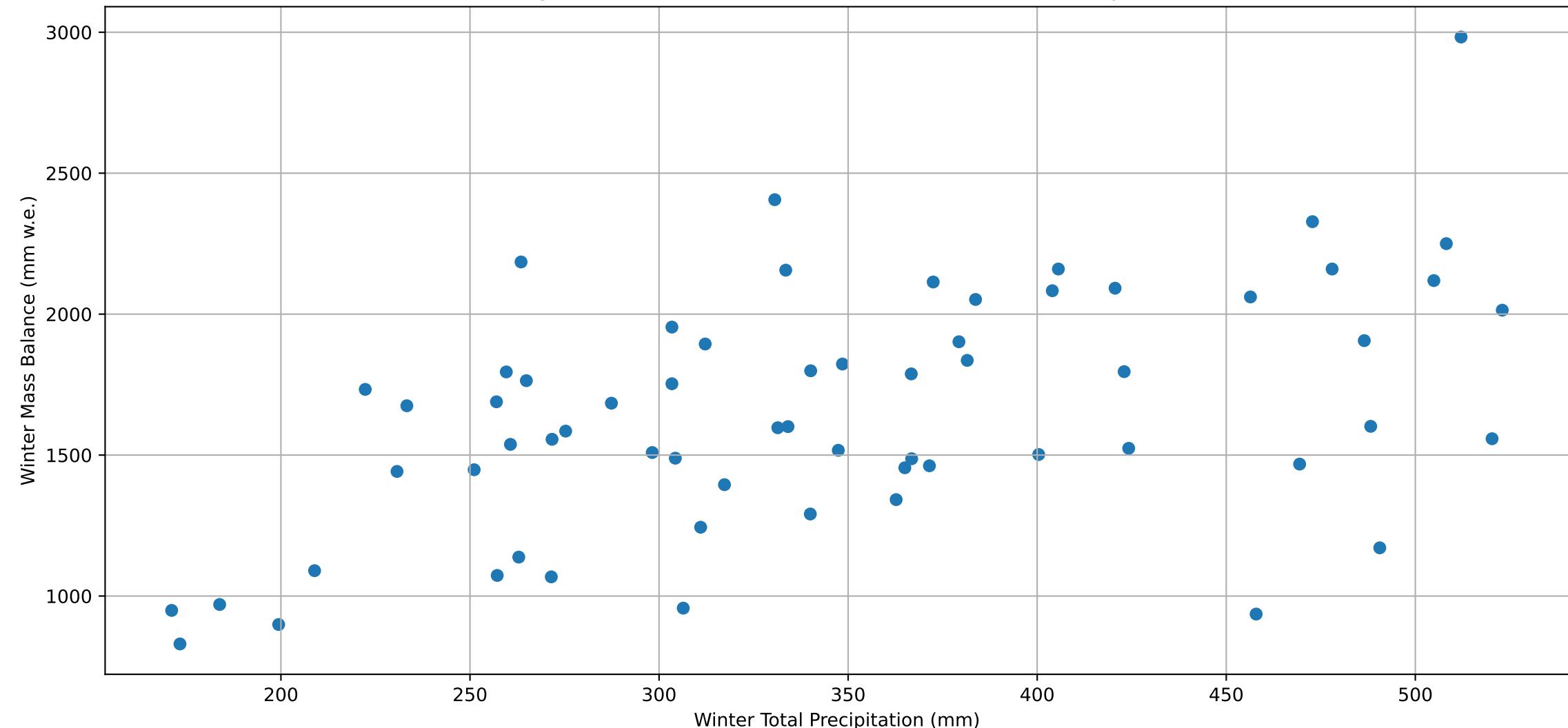
Sion Winter Total Precipitation



Griesgletscher Summer Mass Balance with relation to Temperature



Griesgletscher Winter Mass Balance with relation to Precipitation



Regression: Monthly 1961-1990

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

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
1	june_td	-0.698060	1.443175e-10	True
3	august_td	-0.655278	4.221977e-09	True
0	may_td	-0.625149	3.351914e-08	True
2	july_td	-0.616048	6.005828e-08	True
4	september_td	-0.508344	1.799456e-05	True
9	february_pd	0.192294	1.279396e-01	False
6	november_pd	0.156378	2.172118e-01	False
5	october_pd	0.140020	2.697968e-01	False
10	march_pd	0.131427	3.005778e-01	False
8	january_pd	0.085564	5.014223e-01	False
11	april_pd	-0.075242	5.545815e-01	False
7	december_pd	-0.068362	5.914439e-01	False

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:	Wed, 17 Dec 2025	Prob (F-statistic):	1.74e-12
Time:	14:27:27	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	-253.5128	80.999	-3.130	0.003	-416.125	-90.901
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.	65.0

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

Regression: Optimal 1961-1990

=====
OPTIMAL SEASONAL DEVIATIONS for Griesgletscher 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	-0.842259	2.741200e-18	True
1	opt_season_pd	0.237420	5.888798e-02	False

Number of observations: 64

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.726
Model:	OLS	Adj. R-squared:	0.717
Method:	Least Squares	F-statistic:	80.84
Date:	Wed, 17 Dec 2025	Prob (F-statistic):	7.04e-18
Time:	14:27:27	Log-Likelihood:	-486.43
No. Observations:	64	AIC:	978.9
Df Residuals:	61	BIC:	985.3
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-274.3677	80.189	-3.422	0.001	-434.715	-114.020
opt_season_td	-602.0175	49.297	-12.212	0.000	-700.593	-503.442
opt_season_pd	1.4376	0.746	1.927	0.059	-0.054	2.930

Omnibus:	0.547	Durbin-Watson:	1.614
Prob(Omnibus):	0.761	Jarque-Bera (JB):	0.597
Skew:	-0.208	Prob(JB):	0.742
Kurtosis:	2.773	Cond. No.	119.

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

Regression: Seasonal 1961-1990

```
=====
SUMMER/WINTER SEASONAL DEVIATIONS for Griesgletscher 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	-0.855394	2.273303e-19	True
1 winter_pd	0.240352	5.574003e-02	False

Number of observations: 64

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.753
Model:	OLS	Adj. R-squared:	0.745
Method:	Least Squares	F-statistic:	93.11
Date:	Wed, 17 Dec 2025	Prob (F-statistic):	2.91e-19
Time:	14:27:27	Log-Likelihood:	-483.09
No. Observations:	64	AIC:	972.2
Df Residuals:	61	BIC:	978.6
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-262.7624	75.959	-3.459	0.001	-414.651	-110.874
summer_td	-659.9391	50.330	-13.112	0.000	-760.580	-559.298
winter_pd	1.4463	0.627	2.308	0.024	0.193	2.699

Omnibus:	0.715	Durbin-Watson:	1.725
Prob(Omnibus):	0.699	Jarque-Bera (JB):	0.563
Skew:	-0.227	Prob(JB):	0.755
Kurtosis:	2.934	Cond. No.	137.

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

Regression: Monthly 1991-2020

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

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
1	june_td	-0.698060	1.443175e-10	True
3	august_td	-0.655278	4.221977e-09	True
0	may_td	-0.625149	3.351914e-08	True
2	july_td	-0.616048	6.005828e-08	True
4	september_td	-0.508344	1.799456e-05	True
9	february_pd	0.192294	1.279396e-01	False
6	november_pd	0.156378	2.172118e-01	False
5	october_pd	0.140020	2.697968e-01	False
10	march_pd	0.131427	3.005778e-01	False
8	january_pd	0.085564	5.014223e-01	False
11	april_pd	-0.075242	5.545815e-01	False
7	december_pd	-0.068362	5.914439e-01	False

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:	Wed, 17 Dec 2025	Prob (F-statistic):	1.74e-12
Time:	14:27:27	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.

Regression: Optimal 1991-2020

```
=====
OPTIMAL SEASONAL DEVIATIONS for Griesgletscher 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	-0.844729	1.747008e-18	True
1	opt_season_pd	0.237420	5.888798e-02	False

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:	Wed, 17 Dec 2025	Prob (F-statistic):	5.53e-18
Time:	14:27:27	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.

Regression: Seasonal 1991-2020

```
=====
SUMMER/WINTER SEASONAL DEVIATIONS for Griesgletscher 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	-0.860874	7.474647e-20	True
1 winter_pd	0.240352	5.574003e-02	False

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: Wed, 17 Dec 2025 Prob (F-statistic): 1.07e-19
Time: 14:27:27 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.