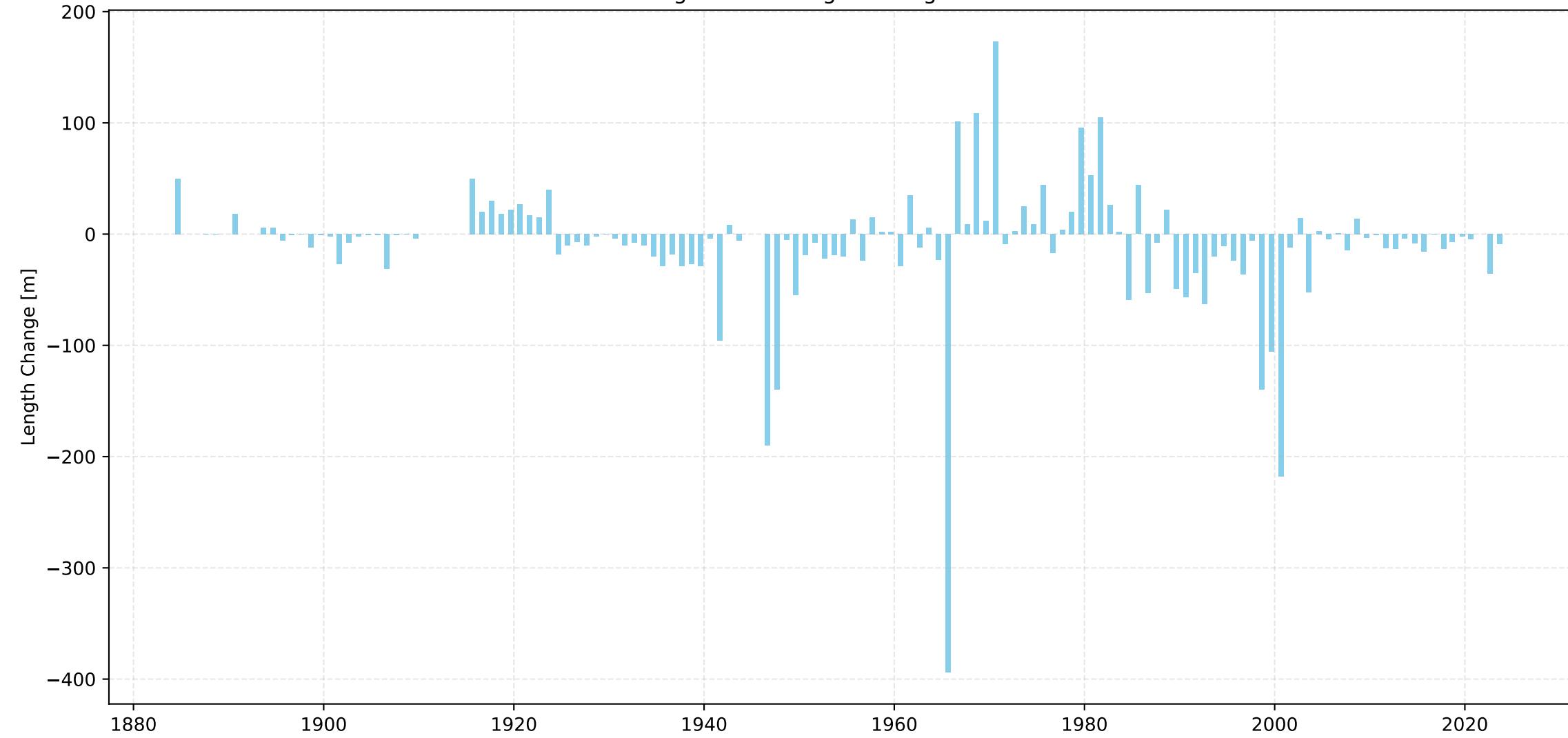
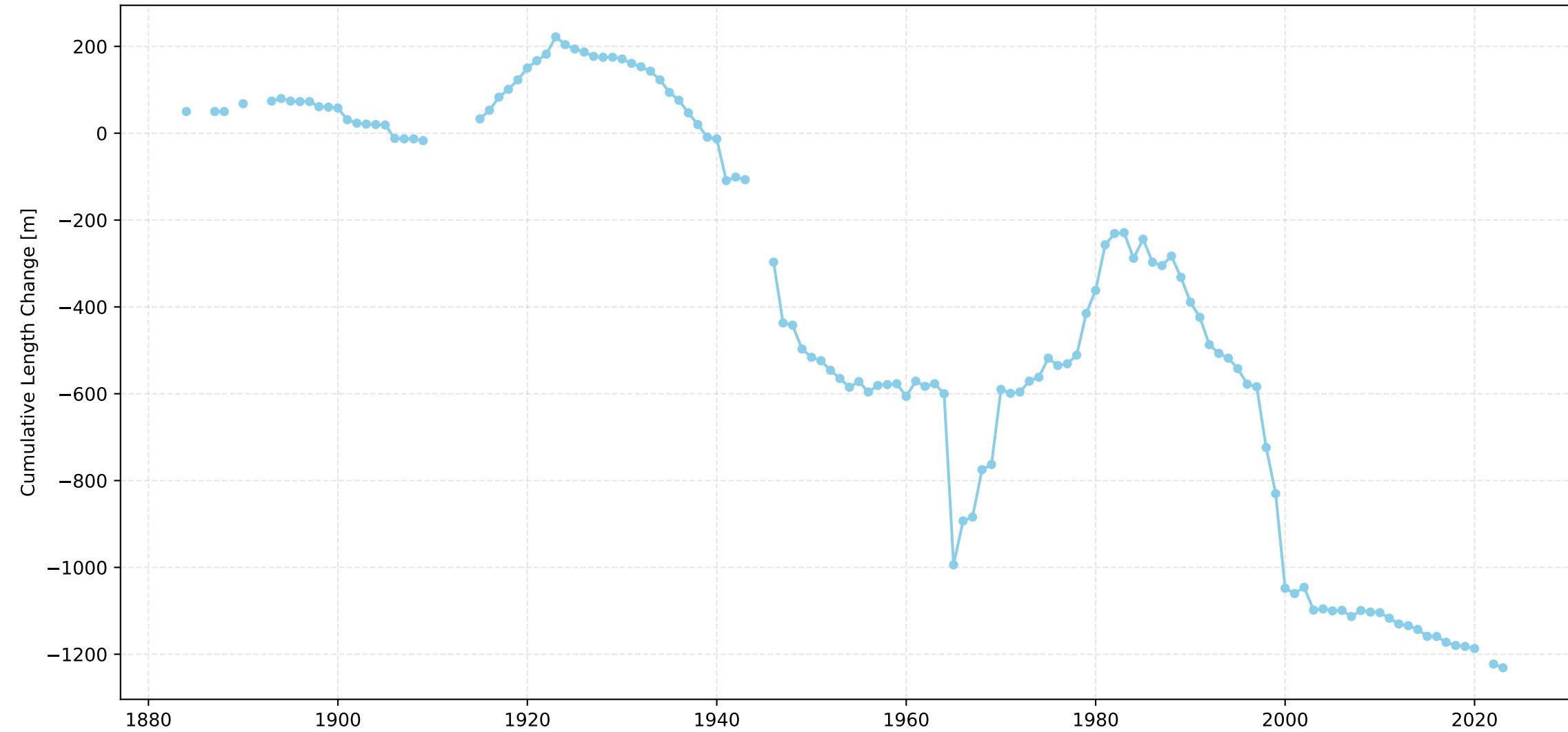


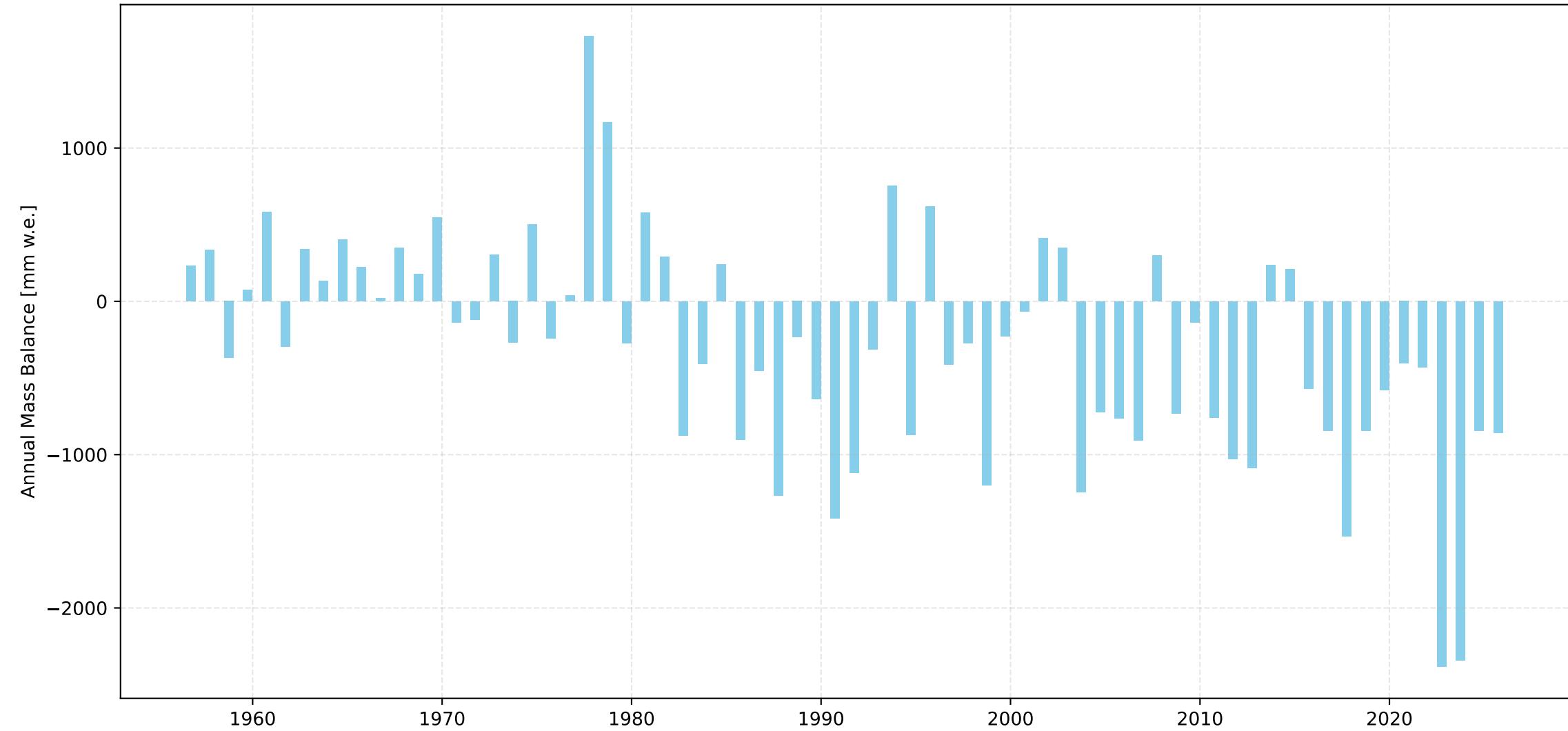
## Allalingletscher Length Change Over Time



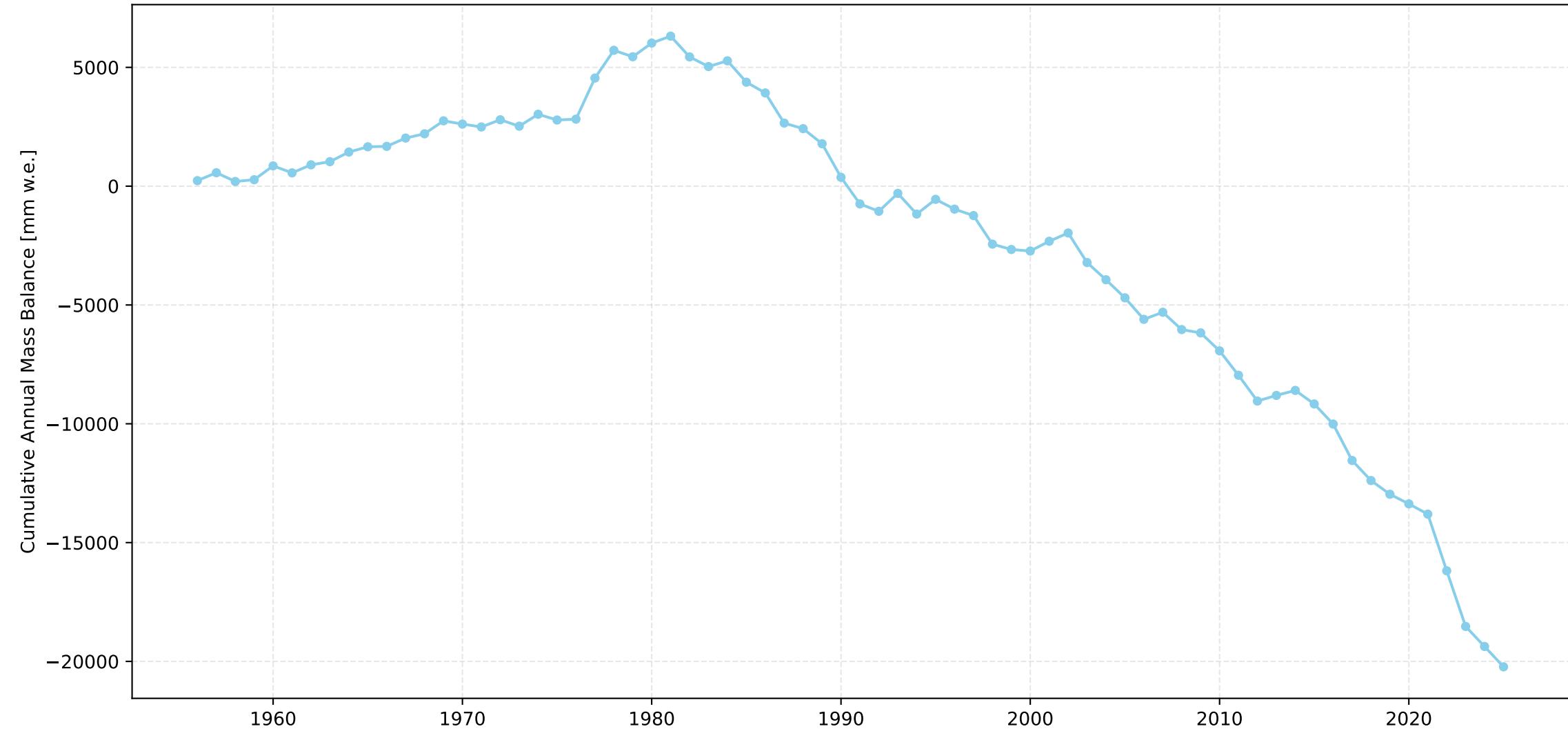
## Allalingletscher Cumulative Length Change Over Time



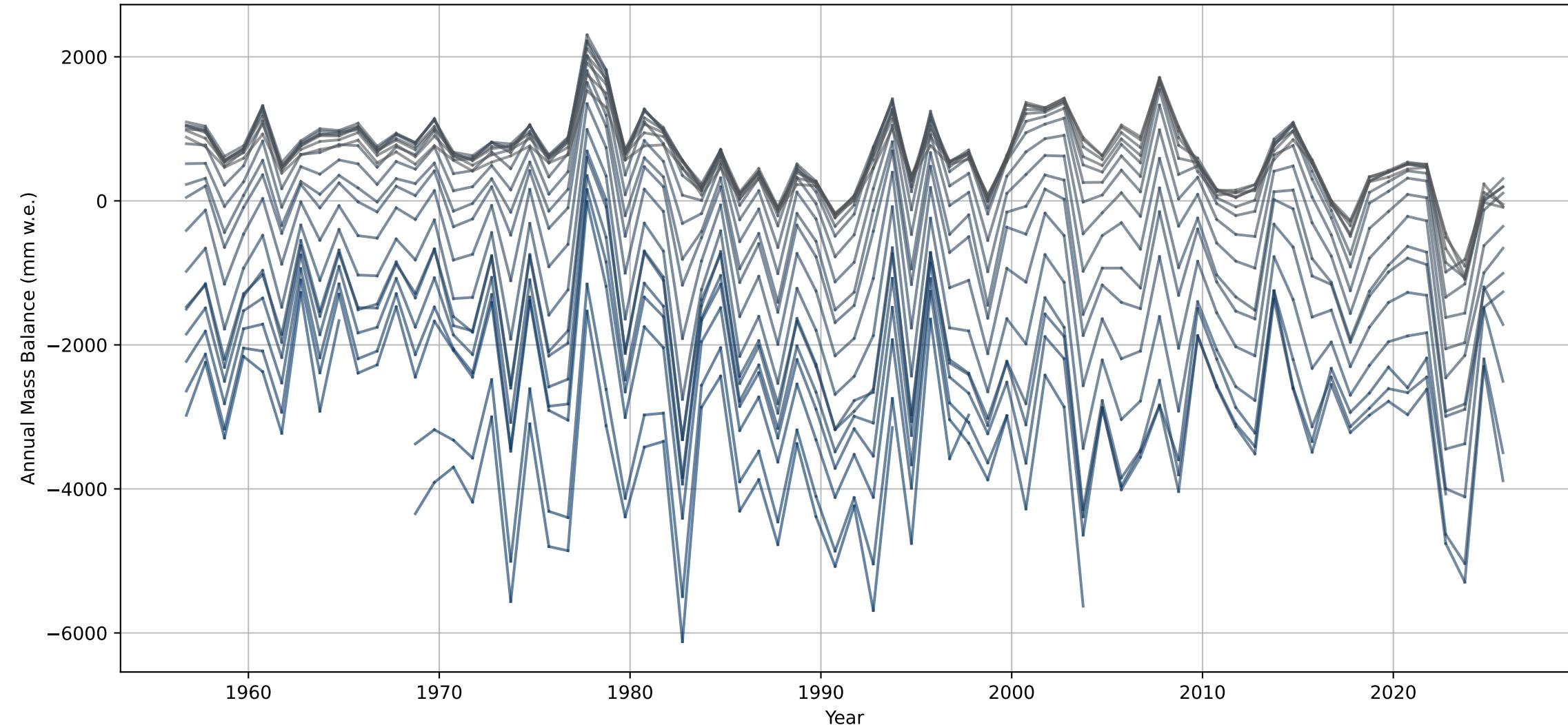
## Allalingletscher Annual Mass Balance Over Time



## Allalingletscher Cumulative Annual Mass Balance Over Time



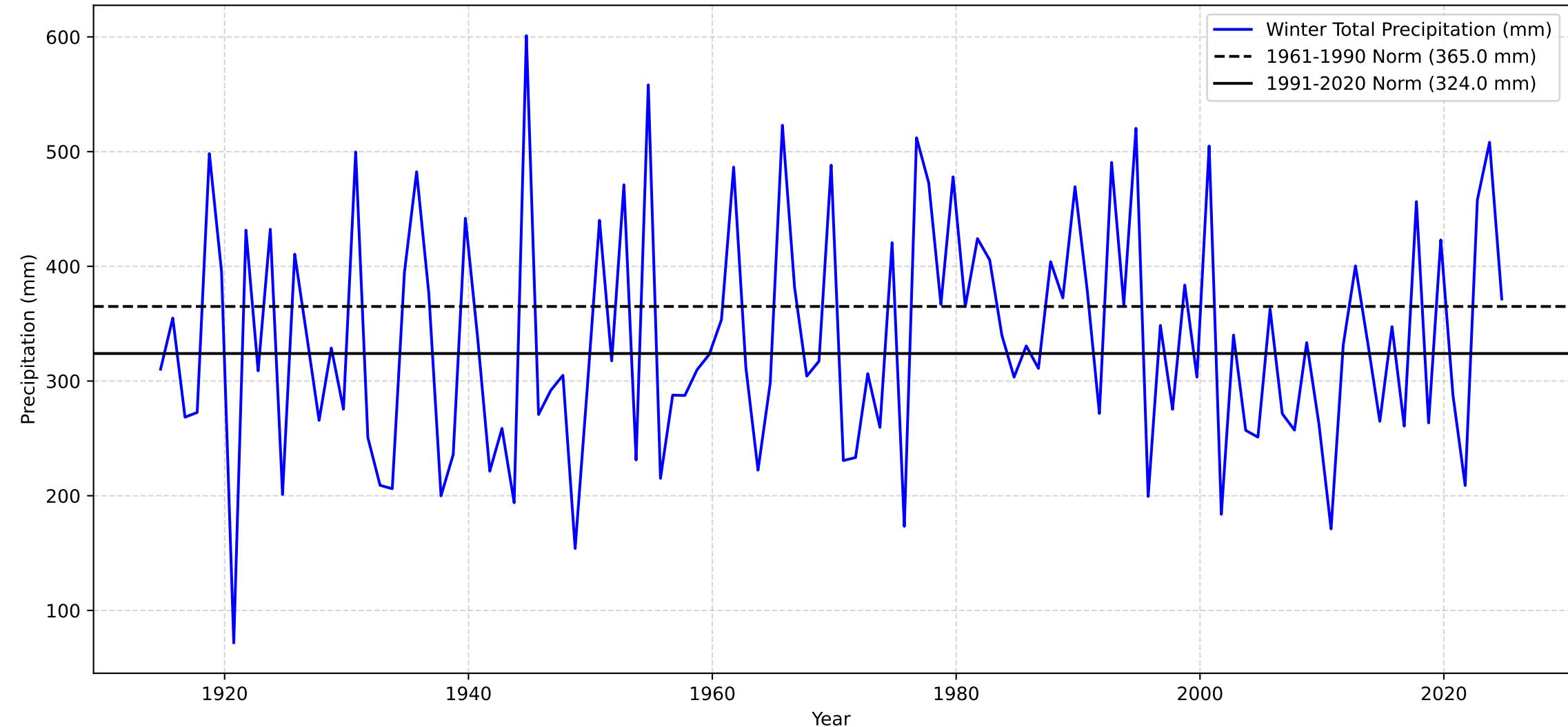
# Annual Mass Balance for each Elevation Bin over Time - Allalingletscher



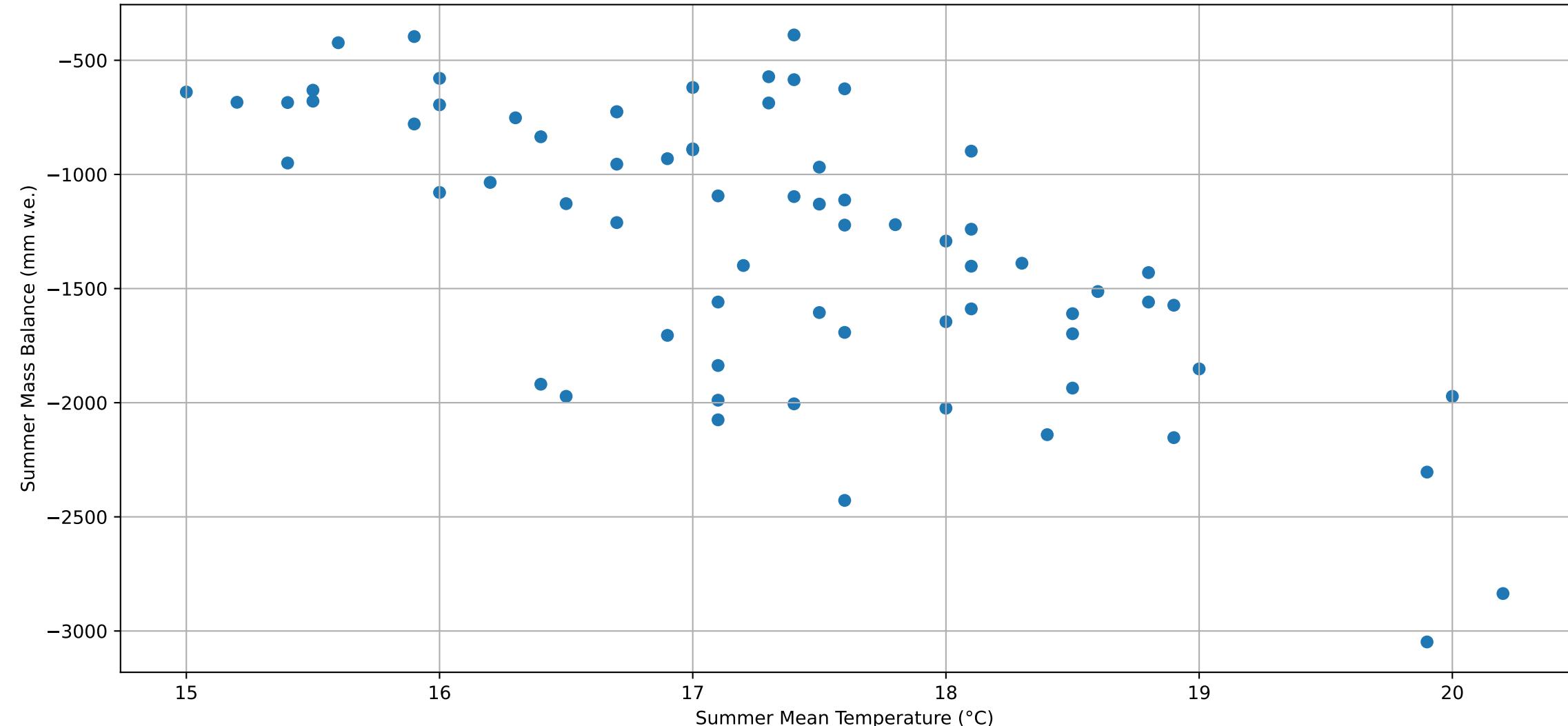
## Sion Summer Mean Temperature



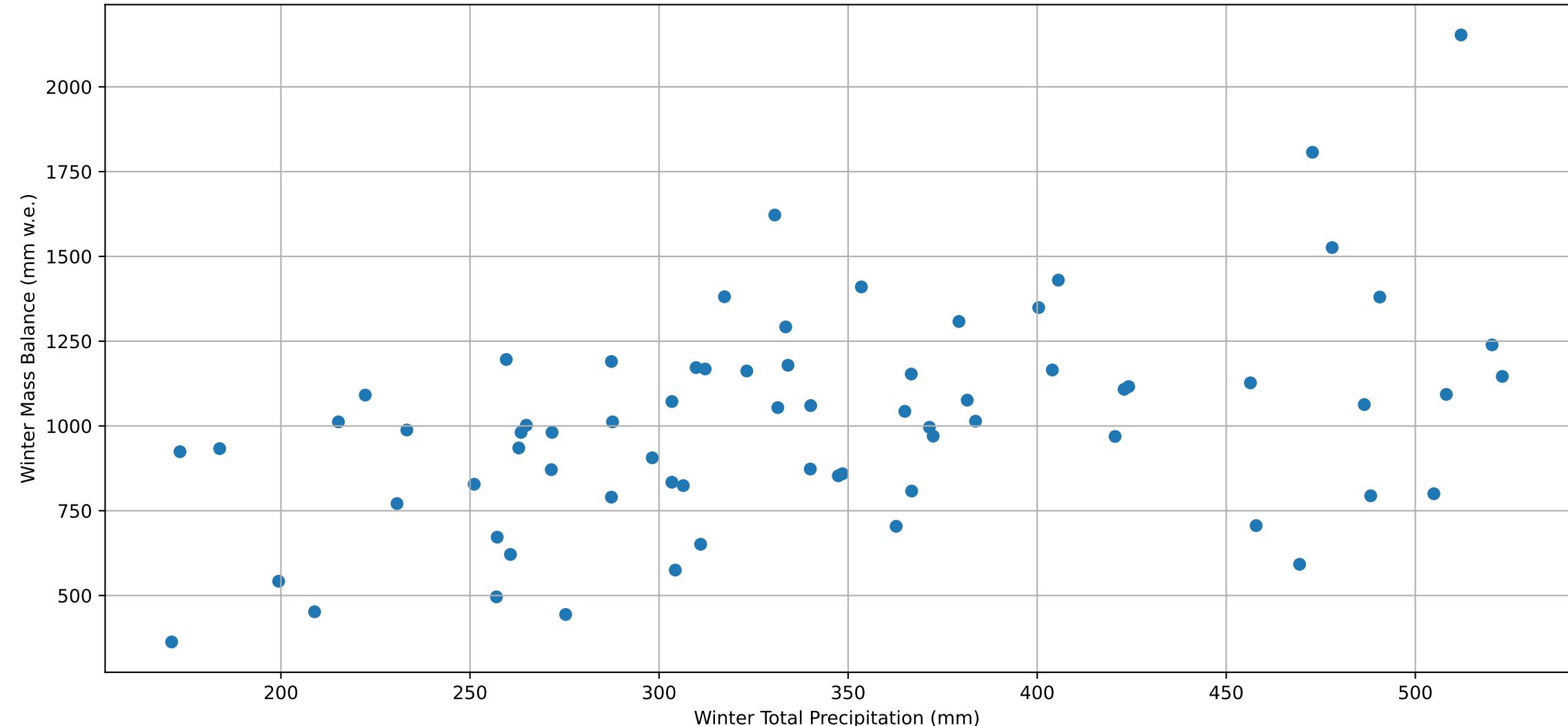
## Sion Winter Total Precipitation



### Allalingletscher Summer Mass Balance with relation to Temperature



### Allalingletscher Winter Mass Balance with relation to Precipitation



# Regression: Monthly 1961-1990

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

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
3	august_td	-0.575838	1.834509e-07	True
2	july_td	-0.569002	2.755457e-07	True
4	september_td	-0.524591	3.138374e-06	True
1	june_td	-0.507660	7.269171e-06	True
0	may_td	-0.383095	1.062868e-03	True
9	february_pd	0.191023	1.131806e-01	False
6	november_pd	0.139067	2.509042e-01	False
10	march_pd	0.078152	5.201751e-01	False
7	december_pd	-0.056406	6.427920e-01	False
5	october_pd	0.049693	6.828859e-01	False
11	april_pd	-0.033442	7.834401e-01	False
8	january_pd	0.026701	8.263267e-01	False

Number of observations: 70

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.577
Model:	OLS	Adj. R-squared:	0.488
Method:	Least Squares	F-statistic:	6.472
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	4.26e-07
Time:	10:30:20	Log-Likelihood:	-530.10
No. Observations:	70	AIC:	1086.
Df Residuals:	57	BIC:	1115.
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	115.7522	81.059	1.428	0.159	-46.565	278.069
may_td	-35.6575	49.823	-0.716	0.477	-135.427	64.112
june_td	-43.8331	46.968	-0.933	0.355	-137.885	50.218
july_td	-107.0402	50.392	-2.124	0.038	-207.949	-6.132
august_td	-116.1017	59.460	-1.953	0.056	-235.168	2.965
september_td	-150.8187	47.312	-3.188	0.002	-245.560	-56.078
october_pd	1.3714	2.318	0.592	0.556	-3.269	6.012
november_pd	2.9680	1.722	1.723	0.090	-0.480	6.416
december_pd	1.1423	1.439	0.794	0.431	-1.740	4.024
january_pd	1.9309	1.751	1.102	0.275	-1.576	5.438
february_pd	0.8317	1.360	0.611	0.543	-1.892	3.555
march_pd	0.5088	2.002	0.254	0.800	-3.500	4.518
april_pd	2.4437	3.058	0.799	0.428	-3.680	8.568

Omnibus:	1.054	Durbin-Watson:	1.687
Prob(Omnibus):	0.590	Jarque-Bera (JB):	1.056
Skew:	-0.164	Prob(JB):	0.590
Kurtosis:	2.496	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 Allalingletscher 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	-0.663145	3.977237e-10	True
1	opt_season_pd	0.186076	1.230024e-01	False

Number of observations: 70

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.454
Model:	OLS	Adj. R-squared:	0.437
Method:	Least Squares	F-statistic:	27.83
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	1.59e-09
Time:	10:30:20	Log-Likelihood:	-539.03
No. Observations:	70	AIC:	1084.
Df Residuals:	67	BIC:	1091.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	73.5746	81.436	0.903	0.370	-88.972	236.122
opt_season_td	-370.5059	51.675	-7.170	0.000	-473.650	-267.362
opt_season_pd	1.0606	0.810	1.310	0.195	-0.556	2.677

Omnibus:	2.669	Durbin-Watson:	1.541
Prob(Omnibus):	0.263	Jarque-Bera (JB):	1.882
Skew:	-0.338	Prob(JB):	0.390
Kurtosis:	3.433	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 Allalingletscher 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	-0.712312	4.685311e-12	True
1 winter_pd	0.183920	1.274798e-01	False

Number of observations: 70

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.527
Model:	OLS	Adj. R-squared:	0.513
Method:	Least Squares	F-statistic:	37.38
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	1.25e-11
Time:	10:30:20	Log-Likelihood:	-533.96
No. Observations:	70	AIC:	1074.
Df Residuals:	67	BIC:	1081.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	116.6081	76.826	1.518	0.134	-36.737	269.953
summer_td	-434.6813	51.969	-8.364	0.000	-538.412	-330.950
winter_pd	1.1106	0.660	1.682	0.097	-0.207	2.428

Omnibus:	2.272	Durbin-Watson:	1.565
Prob(Omnibus):	0.321	Jarque-Bera (JB):	1.650
Skew:	-0.360	Prob(JB):	0.438
Kurtosis:	3.219	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 Allalingletscher using 1991-2020 climate norms  
=====

Correlation Analysis with Significance Testing:

Skipping constant column: const

	Variable	Correlation Coefficient	P-value	Significant (p < 0.05)
3	august_td	-0.575838	1.834509e-07	True
2	july_td	-0.569002	2.755457e-07	True
4	september_td	-0.524591	3.138374e-06	True
1	june_td	-0.507660	7.269171e-06	True
0	may_td	-0.383095	1.062868e-03	True
9	february_pd	0.191023	1.131806e-01	False
6	november_pd	0.139067	2.509042e-01	False
10	march_pd	0.078152	5.201751e-01	False
7	december_pd	-0.056406	6.427920e-01	False
5	october_pd	0.049693	6.828859e-01	False
11	april_pd	-0.033442	7.834401e-01	False
8	january_pd	0.026701	8.263267e-01	False

Number of observations: 70

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.577
Model:	OLS	Adj. R-squared:	0.488
Method:	Least Squares	F-statistic:	6.472
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	4.26e-07
Time:	10:30:20	Log-Likelihood:	-530.10
No. Observations:	70	AIC:	1086.
Df Residuals:	57	BIC:	1115.
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-645.4679	76.214	-8.469	0.000	-798.084	-492.852
may_td	-35.6575	49.823	-0.716	0.477	-135.427	64.112
june_td	-43.8331	46.968	-0.933	0.355	-137.885	50.218
july_td	-107.0402	50.392	-2.124	0.038	-207.949	-6.132
august_td	-116.1017	59.460	-1.953	0.056	-235.168	2.965
september_td	-150.8187	47.312	-3.188	0.002	-245.560	-56.078
october_pd	1.3714	2.318	0.592	0.556	-3.269	6.012
november_pd	2.9680	1.722	1.723	0.090	-0.480	6.416
december_pd	1.1423	1.439	0.794	0.431	-1.740	4.024
january_pd	1.9309	1.751	1.102	0.275	-1.576	5.438
february_pd	0.8317	1.360	0.611	0.543	-1.892	3.555
march_pd	0.5088	2.002	0.254	0.800	-3.500	4.518
april_pd	2.4437	3.058	0.799	0.428	-3.680	8.568

Omnibus:	1.054	Durbin-Watson:	1.687
Prob(Omnibus):	0.590	Jarque-Bera (JB):	1.056
Skew:	-0.164	Prob(JB):	0.590
Kurtosis:	2.496	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 Allalingletscher 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	-0.665403	3.303086e-10	True
1	opt_season_pd	0.186076	1.230024e-01	False

Number of observations: 70

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.455
Model:	OLS	Adj. R-squared:	0.439
Method:	Least Squares	F-statistic:	28.02
Date:	Mon, 15 Dec 2025	Prob (F-statistic):	1.44e-09
Time:	10:30:20	Log-Likelihood:	-538.92
No. Observations:	70	AIC:	1084.
Df Residuals:	67	BIC:	1091.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-616.3370	78.515	-7.850	0.000	-773.054	-459.620
opt_season_td	-374.0837	51.987	-7.196	0.000	-477.850	-270.318
opt_season_pd	1.0113	0.809	1.250	0.216	-0.604	2.626

Omnibus:	2.208	Durbin-Watson:	1.529
Prob(Omnibus):	0.332	Jarque-Bera (JB):	1.476
Skew:	-0.299	Prob(JB):	0.478
Kurtosis:	3.386	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 Allalingletscher 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	-0.711854	4.903874e-12	True
1 winter_pd	0.183920	1.274798e-01	False

Number of observations: 70

Regression Summary:

## OLS Regression Results

```
=====
Dep. Variable: annual mass balance (mm w.e.) R-squared: 0.526
Model: OLS Adj. R-squared: 0.512
Method: Least Squares F-statistic: 37.16
Date: Mon, 15 Dec 2025 Prob (F-statistic): 1.38e-11
Time: 10:30:20 Log-Likelihood: -534.07
No. Observations: 70 AIC: 1074.
Df Residuals: 67 BIC: 1081.
Df Model: 2
Covariance Type: nonrobust
=====
```

	coef	std err	t	P> t	[0.025	0.975]
const	-639.4128	73.187	-8.737	0.000	-785.495	-493.330
summer_td	-433.6850	52.004	-8.339	0.000	-537.485	-329.885
winter_pd	1.0890	0.661	1.647	0.104	-0.231	2.409

```
=====
Omnibus: 2.028 Durbin-Watson: 1.553
Prob(Omnibus): 0.363 Jarque-Bera (JB): 1.428
Skew: -0.333 Prob(JB): 0.490
Kurtosis: 3.217 Cond. No. 124.
=====
```

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