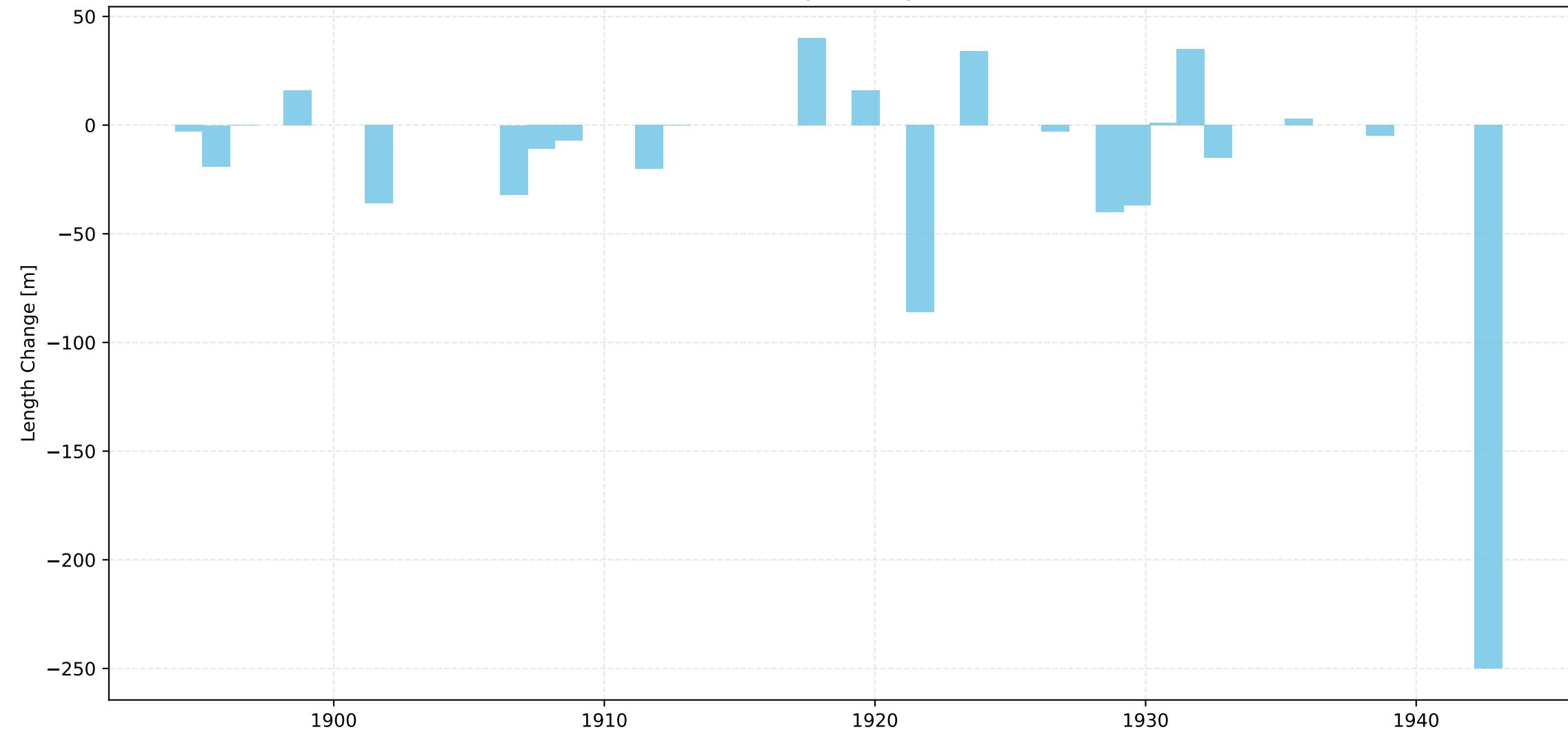
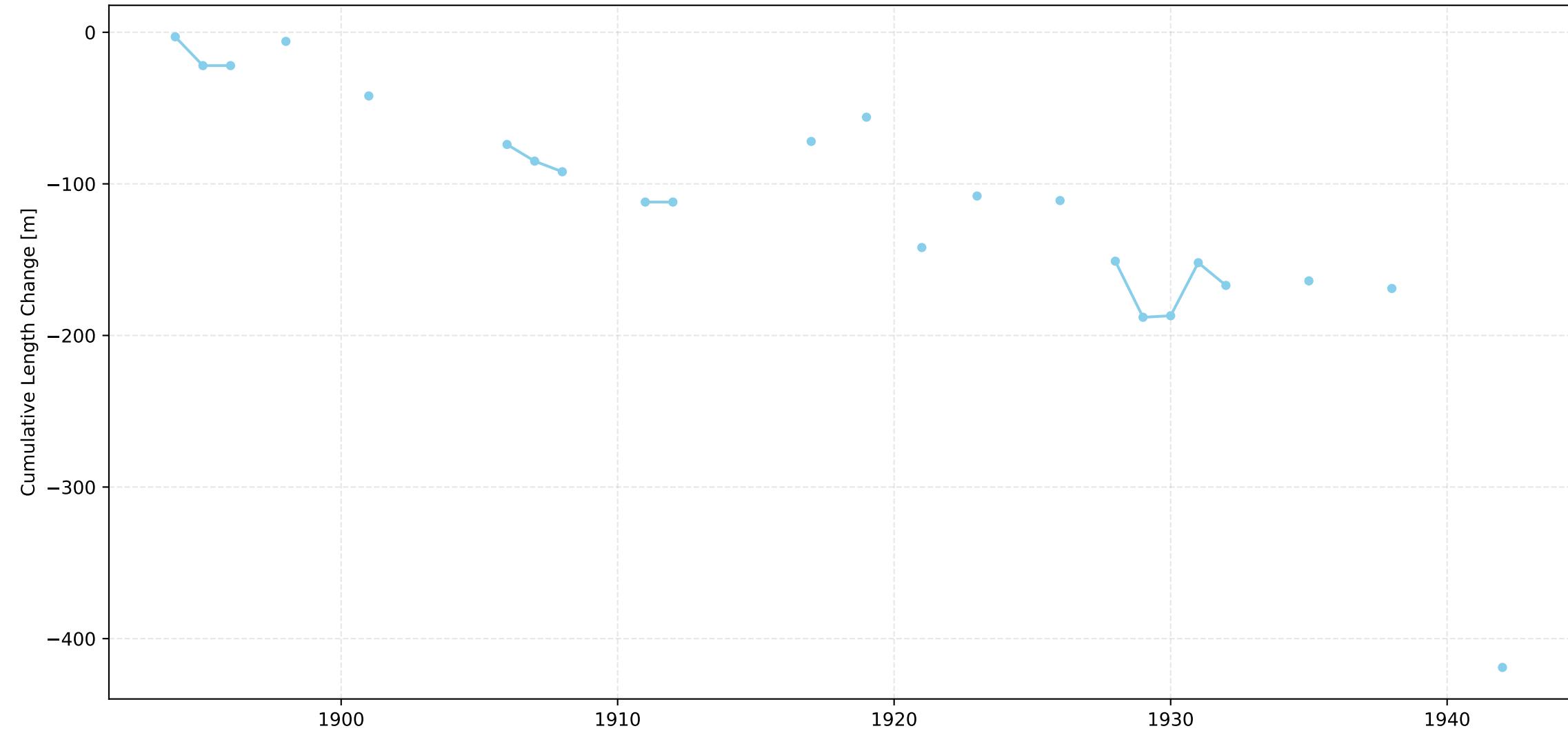


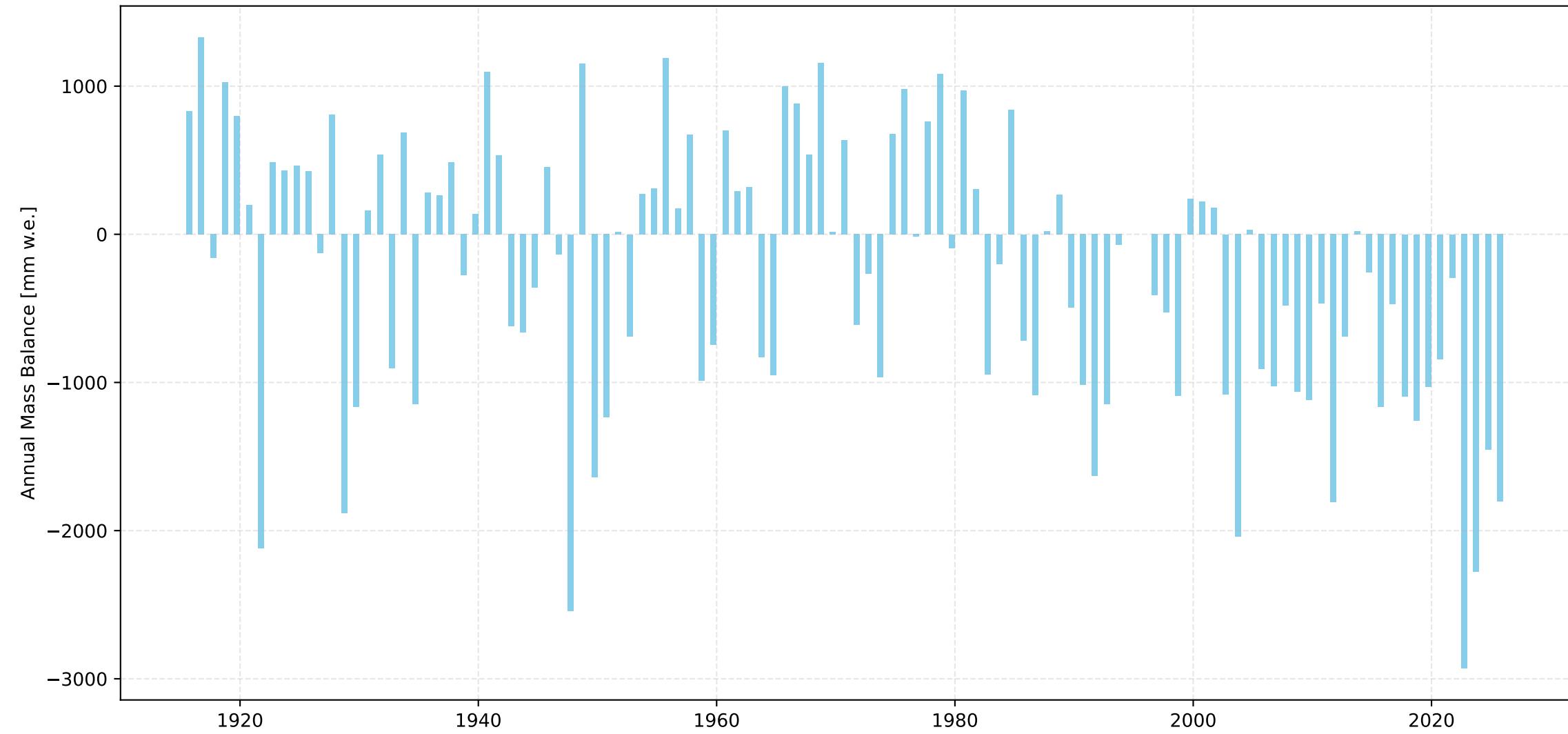
## Claridenfирn Length Change Over Time



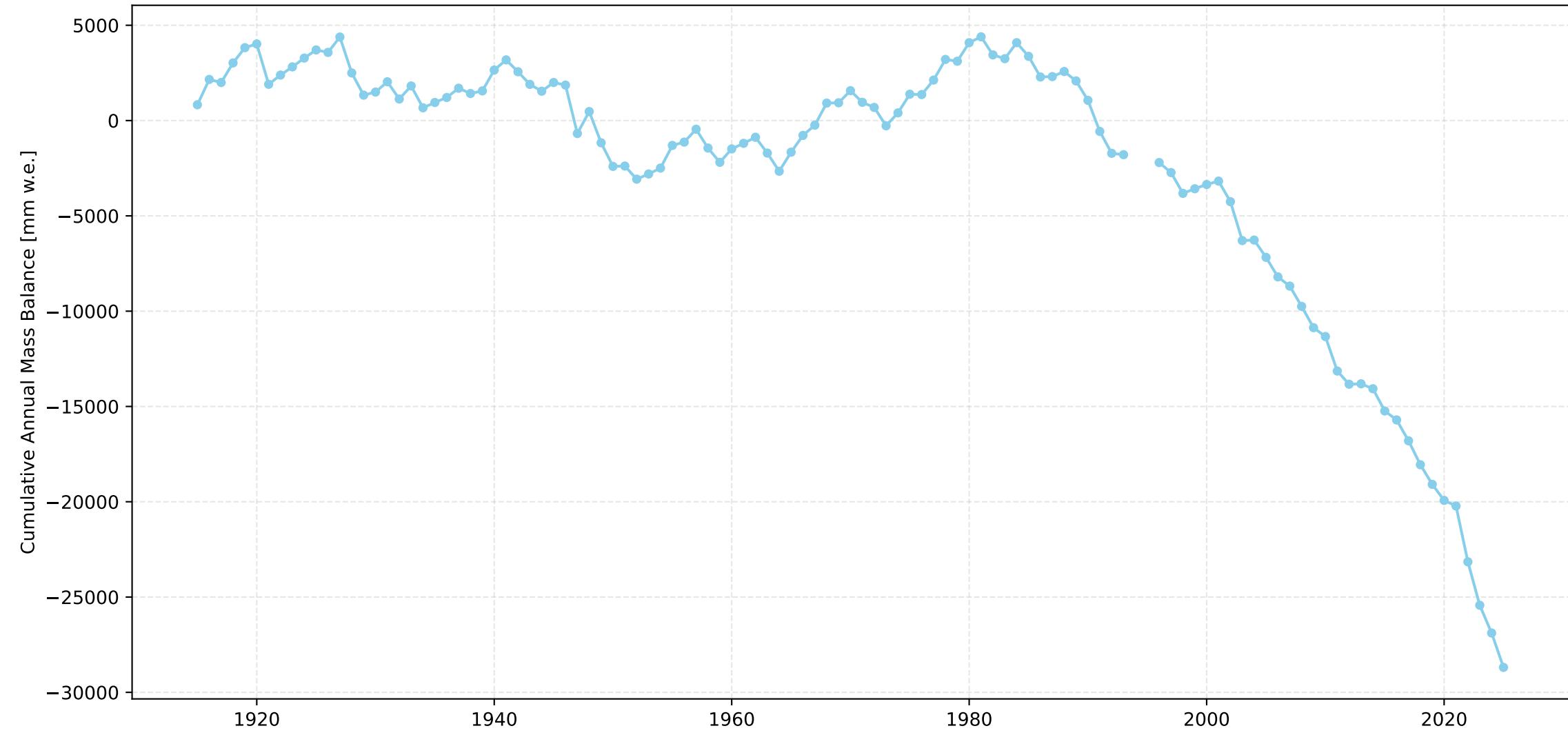
## Claridenfirn Cumulative Length Change Over Time



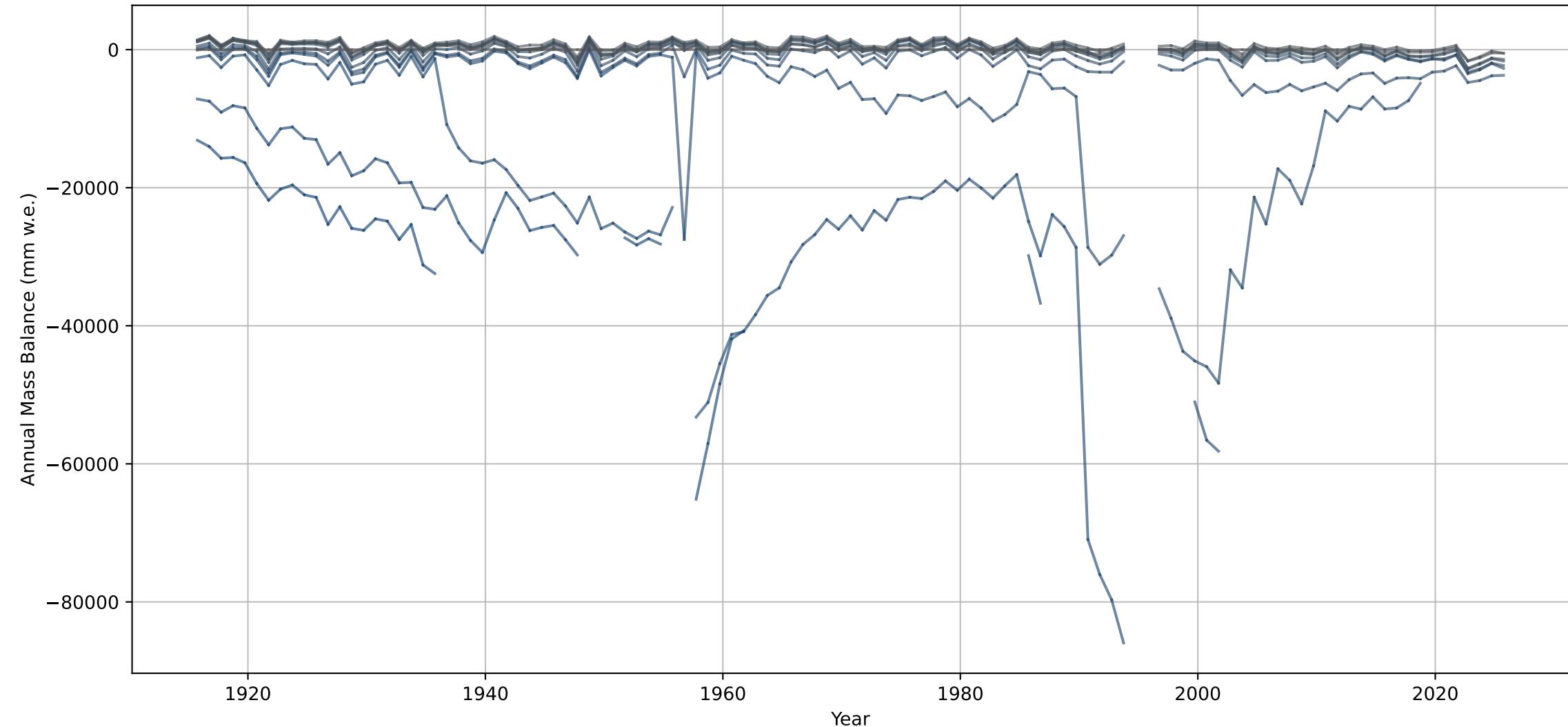
## Claridenfirn Annual Mass Balance Over Time



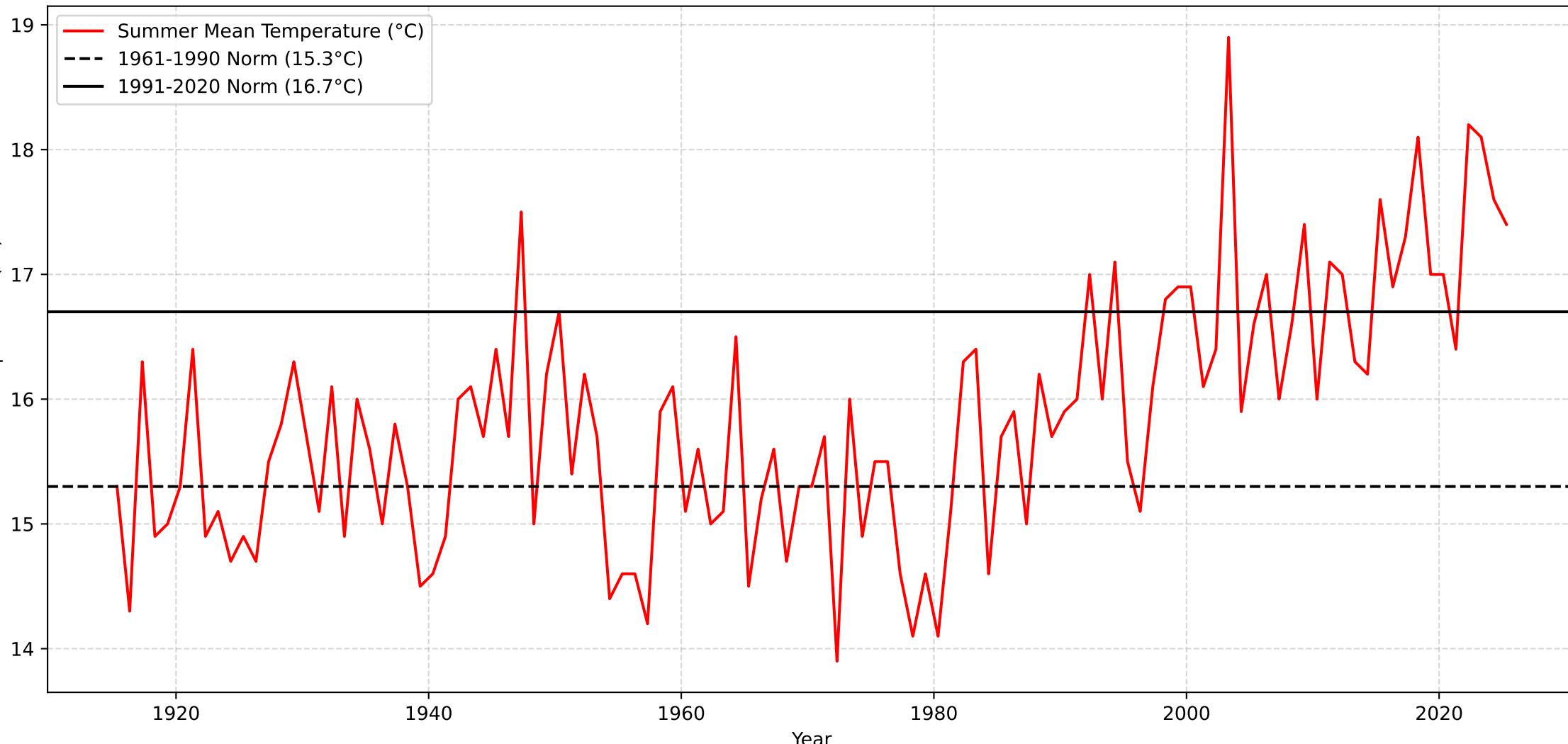
## Claridenfirn Cumulative Annual Mass Balance Over Time



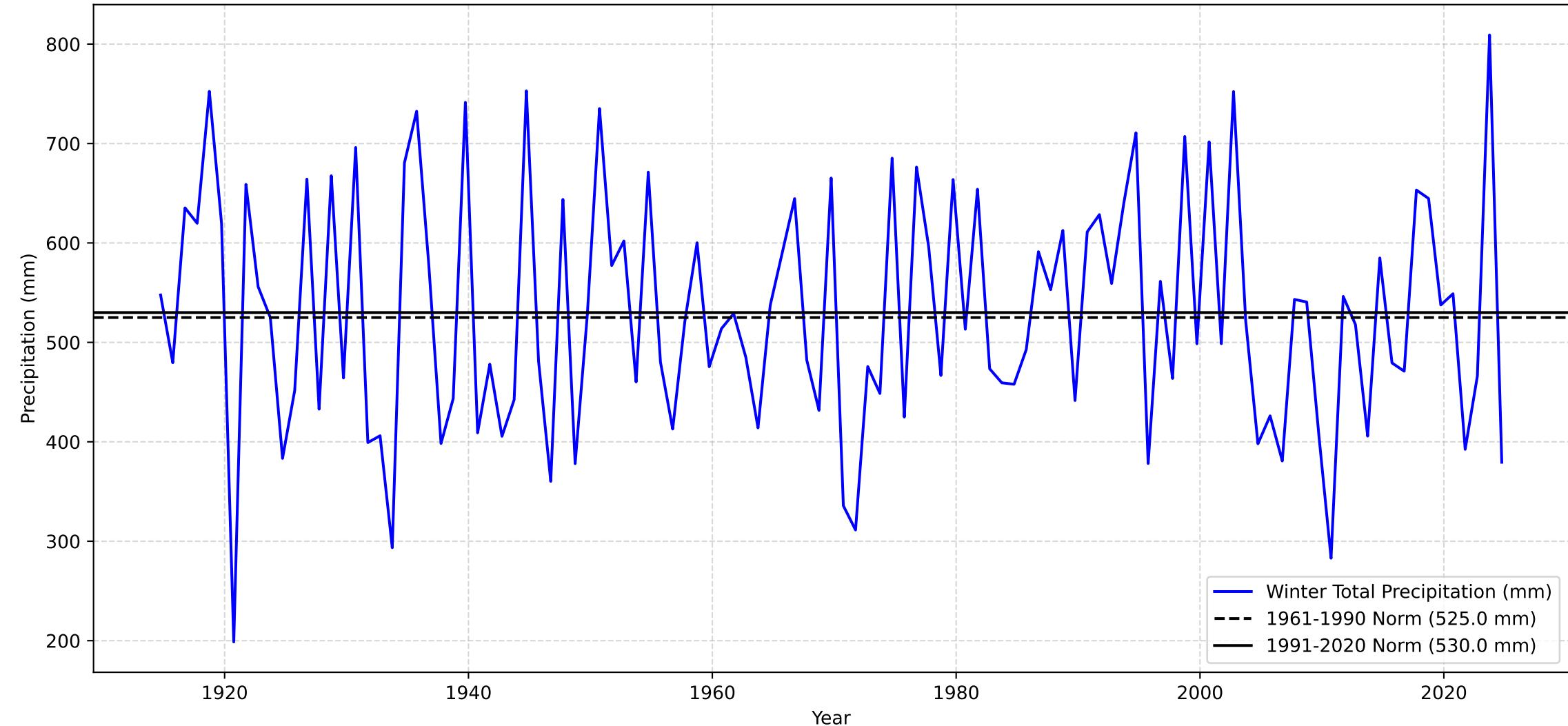
### Annual Mass Balance for each Elevation Bin over Time - Claridenfirn



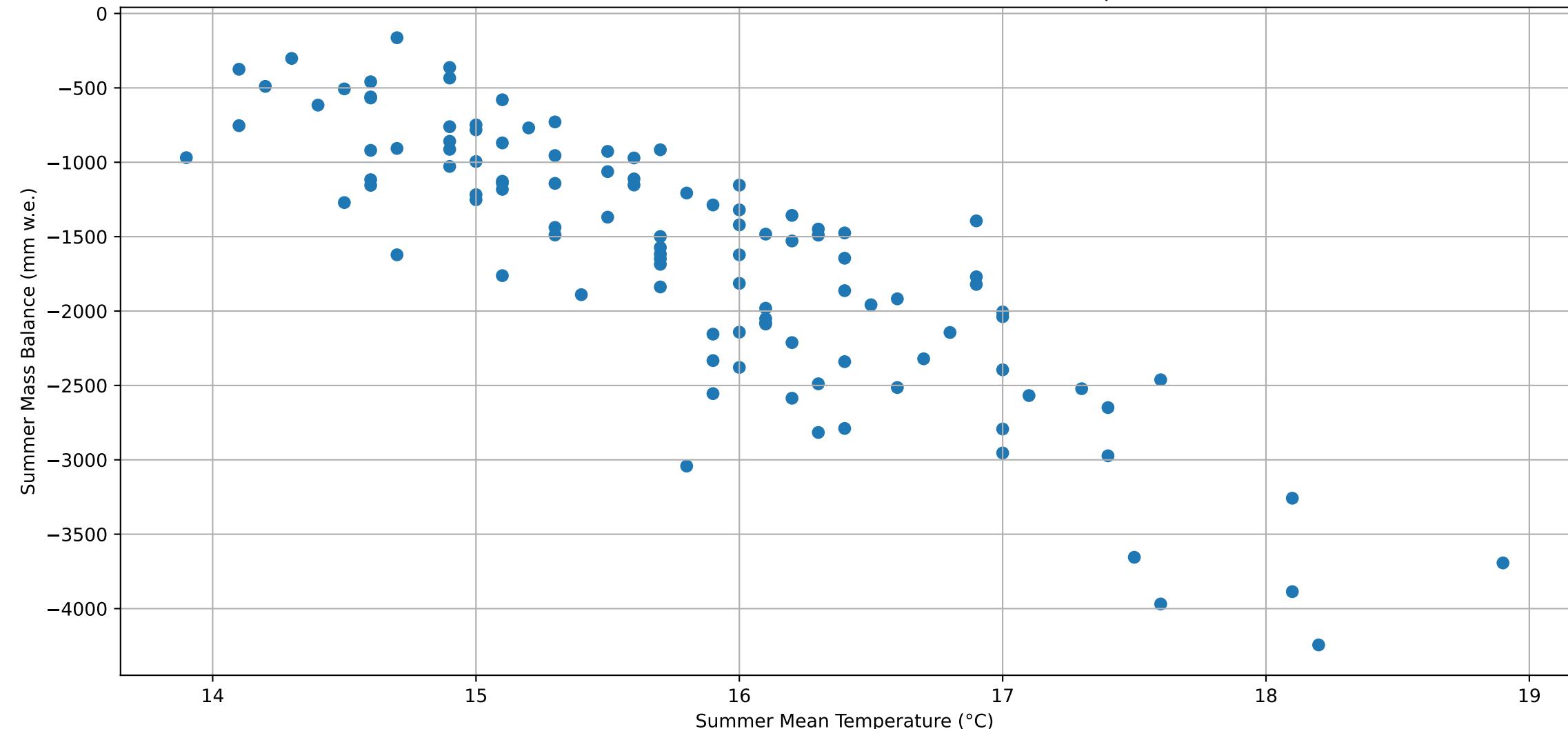
## Altdorf Summer Mean Temperature



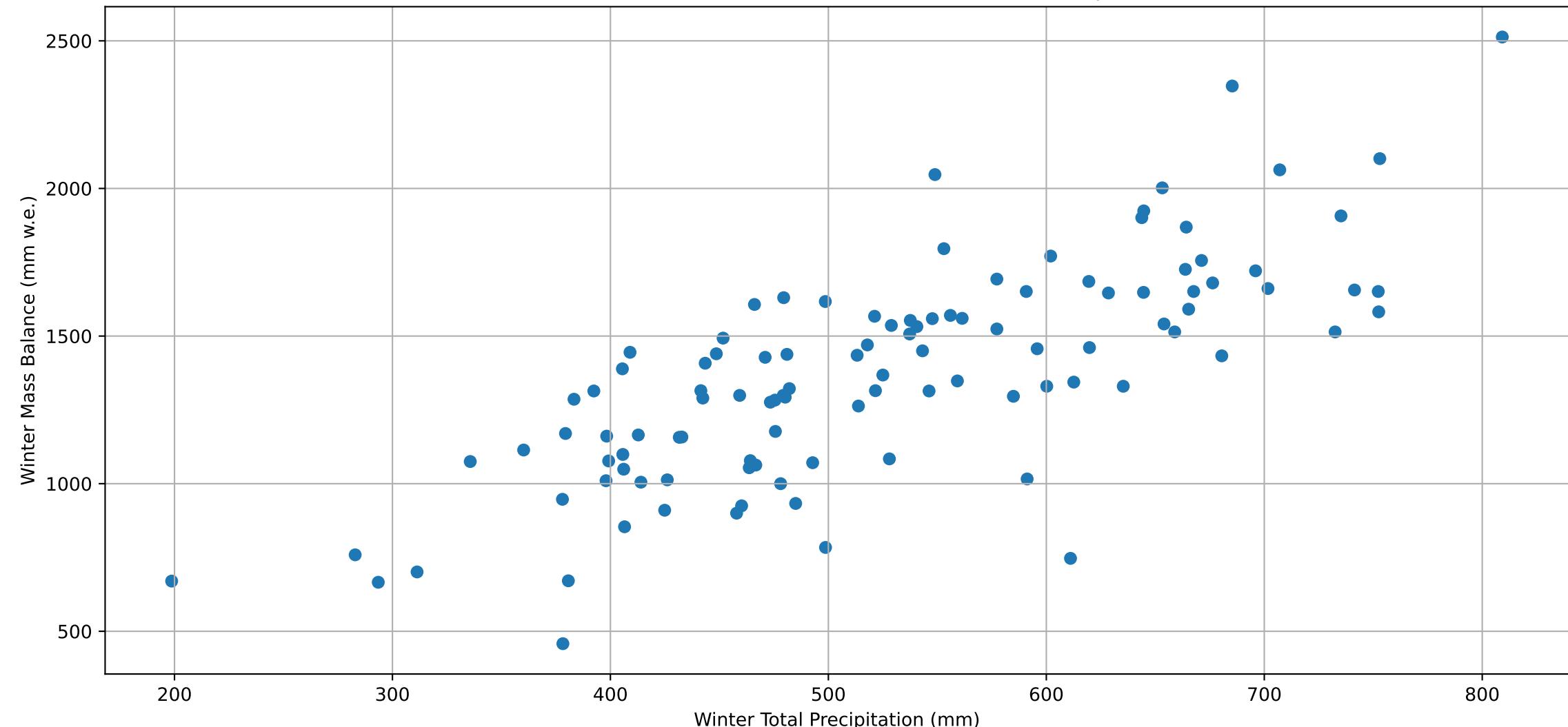
## Altdorf Winter Total Precipitation



### Claridenfirn Summer Mass Balance with relation to Temperature



### Claridenfирn Winter Mass Balance with relation to Precipitation



# Regression: Monthly 1961-1990

=====  
MONTHLY DEVIATIONS for Claridenfirn 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	-0.642742	4.899987e-14	True
3	august_td	-0.603902	3.614537e-12	True
1	june_td	-0.470638	2.414525e-07	True
4	september_td	-0.440927	1.597990e-06	True
0	may_td	-0.327747	5.033976e-04	True
9	february_pd	0.272898	4.091815e-03	True
5	october_pd	0.155127	1.072529e-01	False
8	january_pd	0.149151	1.216468e-01	False
7	december_pd	0.094737	3.271420e-01	False
10	march_pd	0.082160	3.957002e-01	False
11	april_pd	0.081340	4.004488e-01	False
6	november_pd	0.071166	4.621182e-01	False

Number of observations: 109

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.768
Model:	OLS	Adj. R-squared:	0.739
Method:	Least Squares	F-statistic:	26.54
Date:	Thu, 11 Dec 2025	Prob (F-statistic):	2.55e-25
Time:	23:54:04	Log-Likelihood:	-818.07
No. Observations:	109	AIC:	1662.
Df Residuals:	96	BIC:	1697.
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	59.2099	53.628	1.104	0.272	-47.241	165.661
may_td	-78.5856	30.615	-2.567	0.012	-139.356	-17.815
june_td	-98.5647	30.860	-3.194	0.002	-159.821	-37.309
july_td	-192.9518	34.689	-5.562	0.000	-261.808	-124.095
august_td	-189.5345	36.611	-5.177	0.000	-262.207	-116.862
september_td	-137.7202	34.027	-4.047	0.000	-205.263	-70.178
october_pd	3.7112	0.949	3.911	0.000	1.827	5.595
november_pd	2.0676	0.824	2.509	0.014	0.432	3.703
december_pd	2.2300	0.913	2.443	0.016	0.418	4.042
january_pd	3.4498	1.133	3.046	0.003	1.202	5.698
february_pd	4.5414	1.066	4.258	0.000	2.424	6.658
march_pd	2.7083	1.152	2.350	0.021	0.421	4.996
april_pd	-0.5163	1.286	-0.402	0.689	-3.069	2.036

Omnibus:	1.448	Durbin-Watson:	1.667
Prob(Omnibus):	0.485	Jarque-Bera (JB):	1.207
Skew:	-0.039	Prob(JB):	0.547
Kurtosis:	2.491	Cond. No.	72.2

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

# Regression: Optimal 1961-1990

```
=====
OPTIMAL SEASONAL DEVIATIONS for Claridenfirn 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	-0.729232	2.449264e-19	True
1	opt_season_pd	0.333928	3.873699e-04	True

Number of observations: 109

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.640
Model:	OLS	Adj. R-squared:	0.633
Method:	Least Squares	F-statistic:	94.27
Date:	Thu, 11 Dec 2025	Prob (F-statistic):	3.00e-24
Time:	23:54:04	Log-Likelihood:	-842.09
No. Observations:	109	AIC:	1690.
Df Residuals:	106	BIC:	1698.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	83.3856	60.955	1.368	0.174	-37.464	204.236
opt_season_td	-604.5066	48.447	-12.478	0.000	-700.557	-508.456
opt_season_pd	2.8935	0.512	5.649	0.000	1.878	3.909

Omnibus:	1.729	Durbin-Watson:	1.776
Prob(Omnibus):	0.421	Jarque-Bera (JB):	1.287
Skew:	-0.250	Prob(JB):	0.526
Kurtosis:	3.180	Cond. No.	133.

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

# Regression: Seasonal 1961-1990

```
=====
SUMMER/WINTER SEASONAL DEVIATIONS for Claridenfirn 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	-0.772507	7.814267e-23	True
1 winter_pd	0.344108	2.485777e-04	True

Number of observations: 109

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.717
Model:	OLS	Adj. R-squared:	0.712
Method:	Least Squares	F-statistic:	134.6
Date:	Thu, 11 Dec 2025	Prob (F-statistic):	8.03e-30
Time:	23:54:04	Log-Likelihood:	-828.90
No. Observations:	109	AIC:	1664.
Df Residuals:	106	BIC:	1672.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	113.6658	53.563	2.122	0.036	7.471	219.860
summer_td	-708.5002	47.257	-14.993	0.000	-802.191	-614.809
winter_pd	2.6683	0.396	6.730	0.000	1.882	3.454

Omnibus:	3.151	Durbin-Watson:	1.635
Prob(Omnibus):	0.207	Jarque-Bera (JB):	2.632
Skew:	-0.367	Prob(JB):	0.268
Kurtosis:	3.201	Cond. No.	155.

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

# Regression: Monthly 1991-2020

=====  
MONTHLY DEVIATIONS for Claridenfirn 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	-0.642742	4.899987e-14	True
3	august_td	-0.603902	3.614537e-12	True
1	june_td	-0.470638	2.414525e-07	True
4	september_td	-0.440927	1.597990e-06	True
0	may_td	-0.327747	5.033976e-04	True
9	february_pd	0.272898	4.091815e-03	True
5	october_pd	0.155127	1.072529e-01	False
8	january_pd	0.149151	1.216468e-01	False
7	december_pd	0.094737	3.271420e-01	False
10	march_pd	0.082160	3.957002e-01	False
11	april_pd	0.081340	4.004488e-01	False
6	november_pd	0.071166	4.621182e-01	False

Number of observations: 109

Regression Summary:

## OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.768
Model:	OLS	Adj. R-squared:	0.739
Method:	Least Squares	F-statistic:	26.54
Date:	Thu, 11 Dec 2025	Prob (F-statistic):	2.55e-25
Time:	23:54:04	Log-Likelihood:	-818.07
No. Observations:	109	AIC:	1662.
Df Residuals:	96	BIC:	1697.
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-885.9051	61.387	-14.432	0.000	-1007.757	-764.054
may_td	-78.5856	30.615	-2.567	0.012	-139.356	-17.815
june_td	-98.5647	30.860	-3.194	0.002	-159.821	-37.309
july_td	-192.9518	34.689	-5.562	0.000	-261.808	-124.095
august_td	-189.5345	36.611	-5.177	0.000	-262.207	-116.862
september_td	-137.7202	34.027	-4.047	0.000	-205.263	-70.178
october_pd	3.7112	0.949	3.911	0.000	1.827	5.595
november_pd	2.0676	0.824	2.509	0.014	0.432	3.703
december_pd	2.2300	0.913	2.443	0.016	0.418	4.042
january_pd	3.4498	1.133	3.046	0.003	1.202	5.698
february_pd	4.5414	1.066	4.258	0.000	2.424	6.658
march_pd	2.7083	1.152	2.350	0.021	0.421	4.996
april_pd	-0.5163	1.286	-0.402	0.689	-3.069	2.036

Omnibus:	1.448	Durbin-Watson:	1.667
Prob(Omnibus):	0.485	Jarque-Bera (JB):	1.207
Skew:	-0.039	Prob(JB):	0.547
Kurtosis:	2.491	Cond. No.	83.1

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

# Regression: Optimal 1991-2020

```
=====
OPTIMAL SEASONAL DEVIATIONS for Claridenfirn 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	-0.731612	1.638598e-19	True
1	opt_season_pd	0.333928	3.873699e-04	True

Number of observations: 109

Regression Summary:

OLS Regression Results

Dep. Variable:	annual mass balance (mm w.e.)	R-squared:	0.642
Model:	OLS	Adj. R-squared:	0.635
Method:	Least Squares	F-statistic:	94.89
Date:	Thu, 11 Dec 2025	Prob (F-statistic):	2.40e-24
Time:	23:54:04	Log-Likelihood:	-841.86
No. Observations:	109	AIC:	1690.
Df Residuals:	106	BIC:	1698.
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	-844.3329	70.849	-11.917	0.000	-984.798	-703.868
opt_season_td	-610.0771	48.721	-12.522	0.000	-706.672	-513.482
opt_season_pd	2.8672	0.511	5.609	0.000	1.854	3.881

Omnibus:	2.136	Durbin-Watson:	1.779
Prob(Omnibus):	0.344	Jarque-Bera (JB):	1.580
Skew:	-0.252	Prob(JB):	0.454
Kurtosis:	3.307	Cond. No.	156.

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

# Regression: Seasonal 1991-2020

```
=====
SUMMER/WINTER SEASONAL DEVIATIONS for Claridenfirn 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	-0.772507	7.814267e-23	True
1 winter_pd	0.344108	2.485777e-04	True

Number of observations: 109

Regression Summary:

## OLS Regression Results

```
=====
Dep. Variable: annual mass balance (mm w.e.) R-squared: 0.717
Model: OLS Adj. R-squared: 0.712
Method: Least Squares F-statistic: 134.6
Date: Thu, 11 Dec 2025 Prob (F-statistic): 8.03e-30
Time: 23:54:04 Log-Likelihood: -828.90
No. Observations: 109 AIC: 1664.
Df Residuals: 106 BIC: 1672.
Df Model: 2
Covariance Type: nonrobust
=====
```

	coef	std err	t	P> t	[0.025	0.975]
const	-864.8931	62.383	-13.864	0.000	-988.574	-741.212
summer_td	-708.5002	47.257	-14.993	0.000	-802.191	-614.809
winter_pd	2.6683	0.396	6.730	0.000	1.882	3.454

```
=====
Omnibus: 3.151 Durbin-Watson: 1.635
Prob(Omnibus): 0.207 Jarque-Bera (JB): 2.632
Skew: -0.367 Prob(JB): 0.268
Kurtosis: 3.201 Cond. No. 181.
=====
```

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