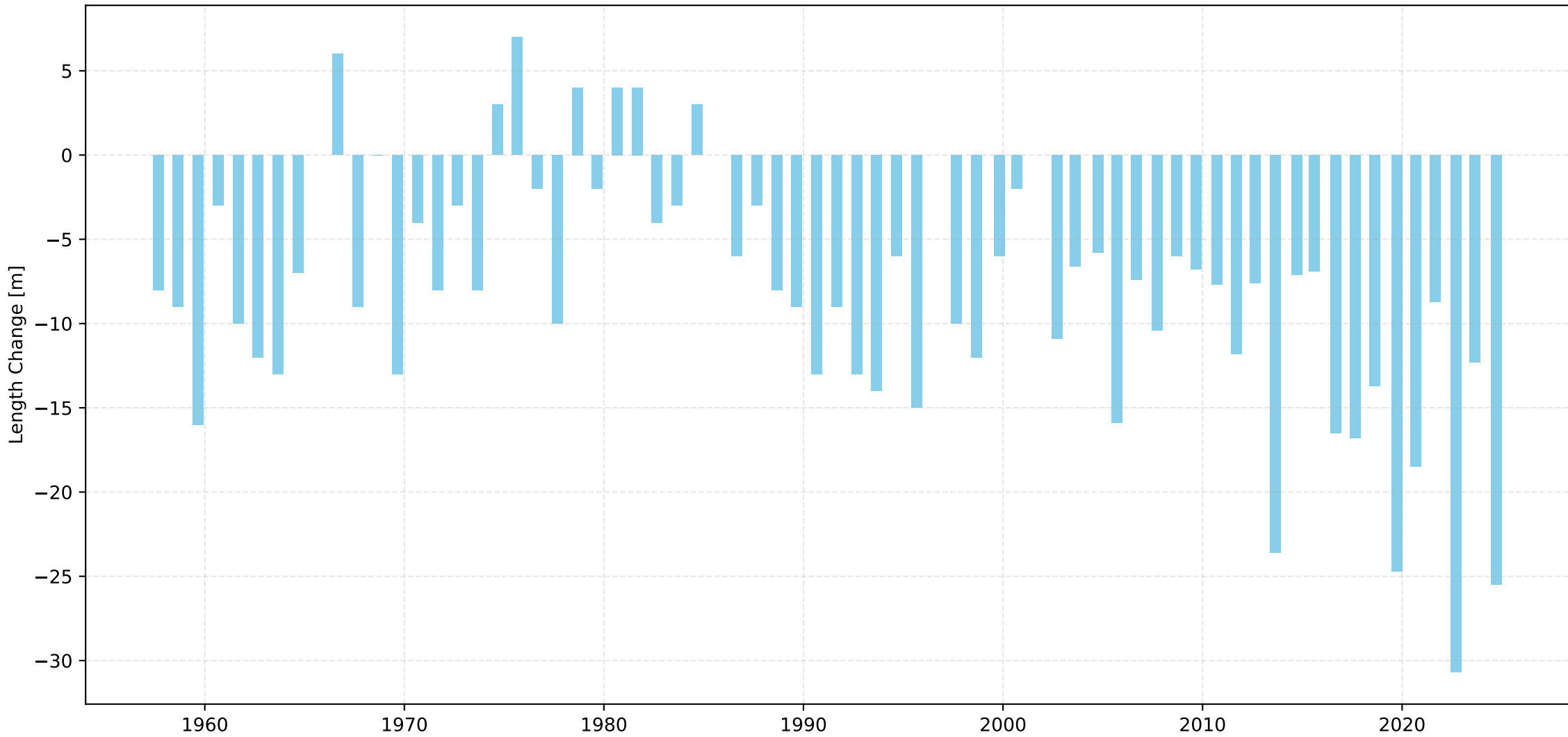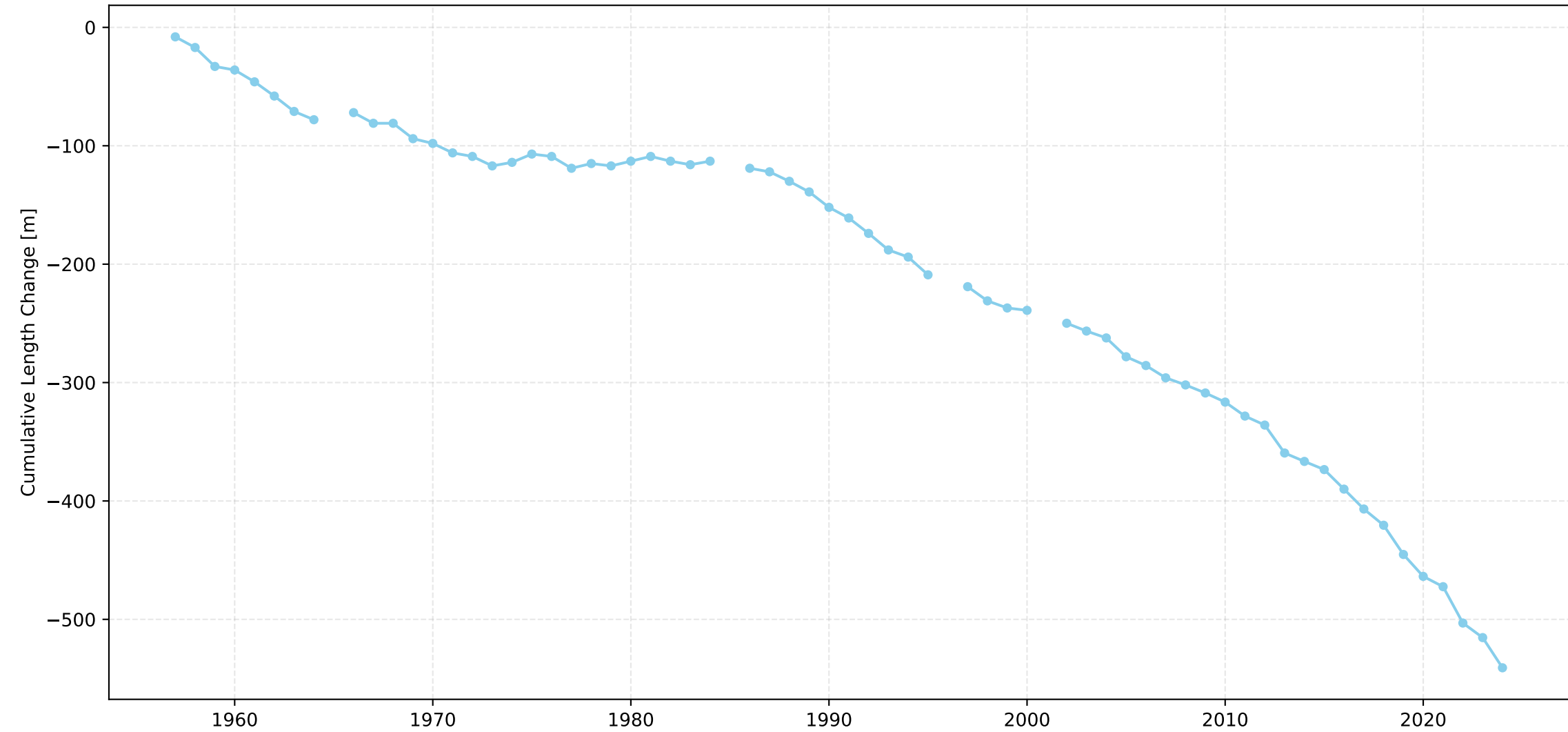Silvrettagletscher Length Change Over Time

Silvrettagletscher Cumulative Length Change Over Time
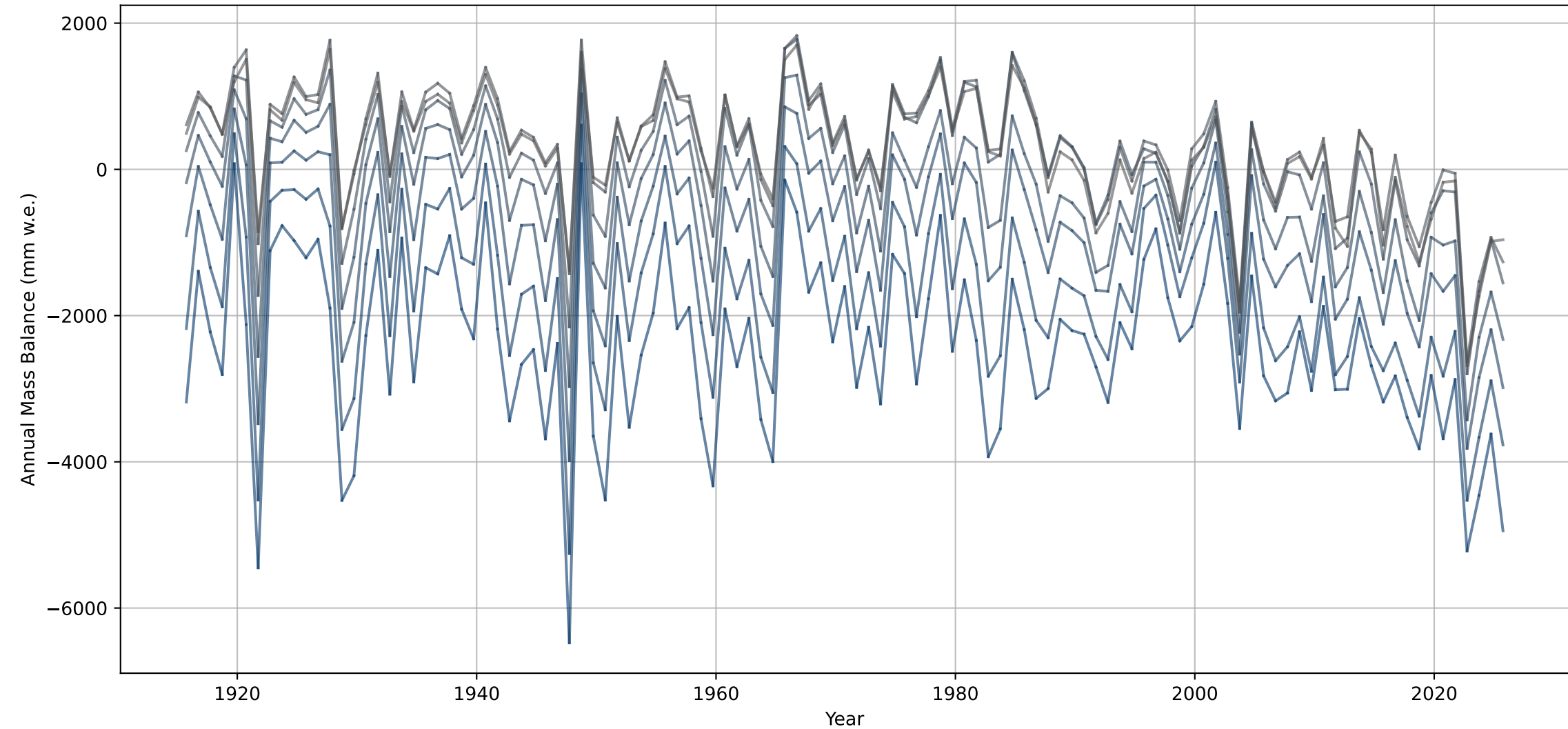
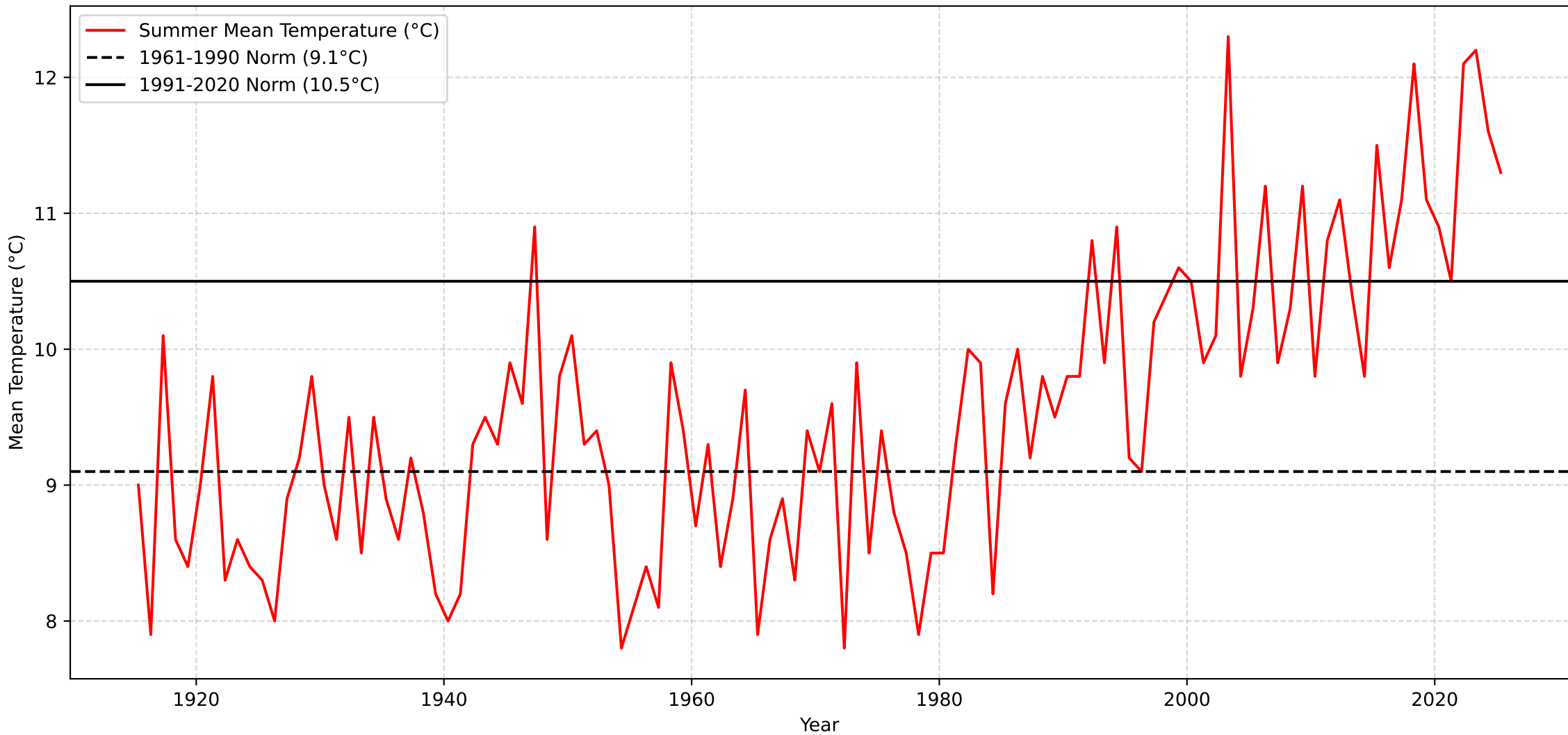Silvrettagletscher Annual Mass Balance Over Time
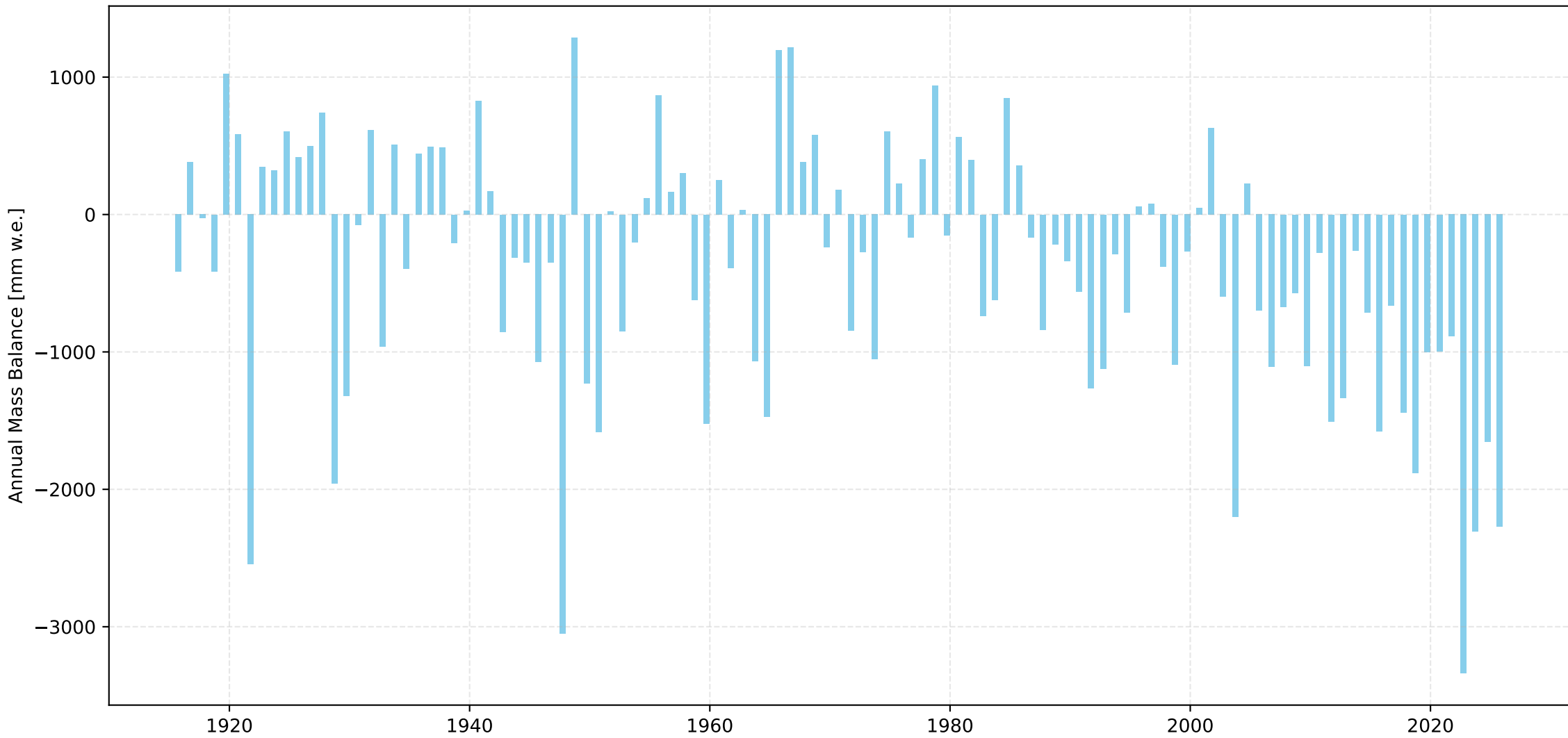
Silvrettagletscher Cumulative Annual Mass Balance Over Time
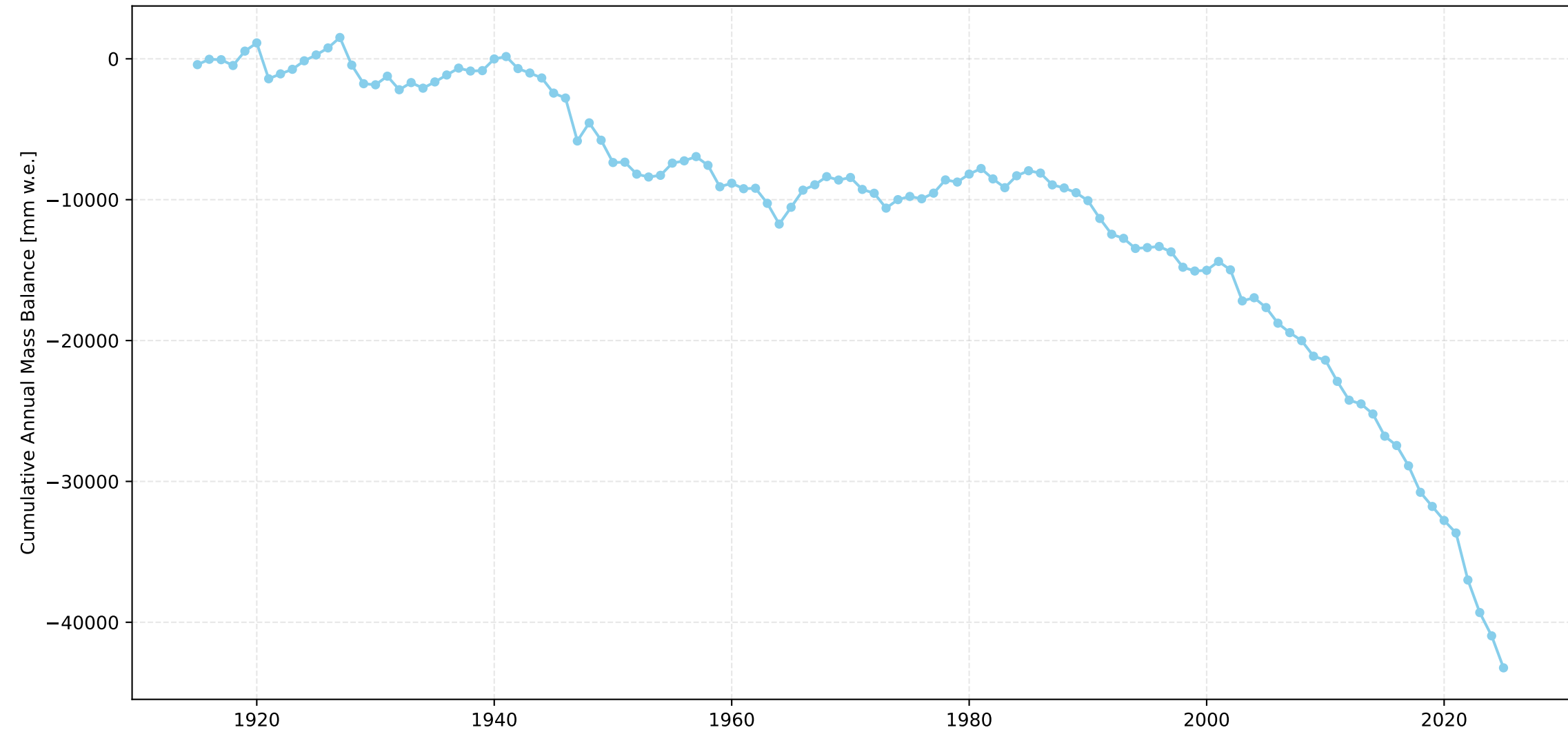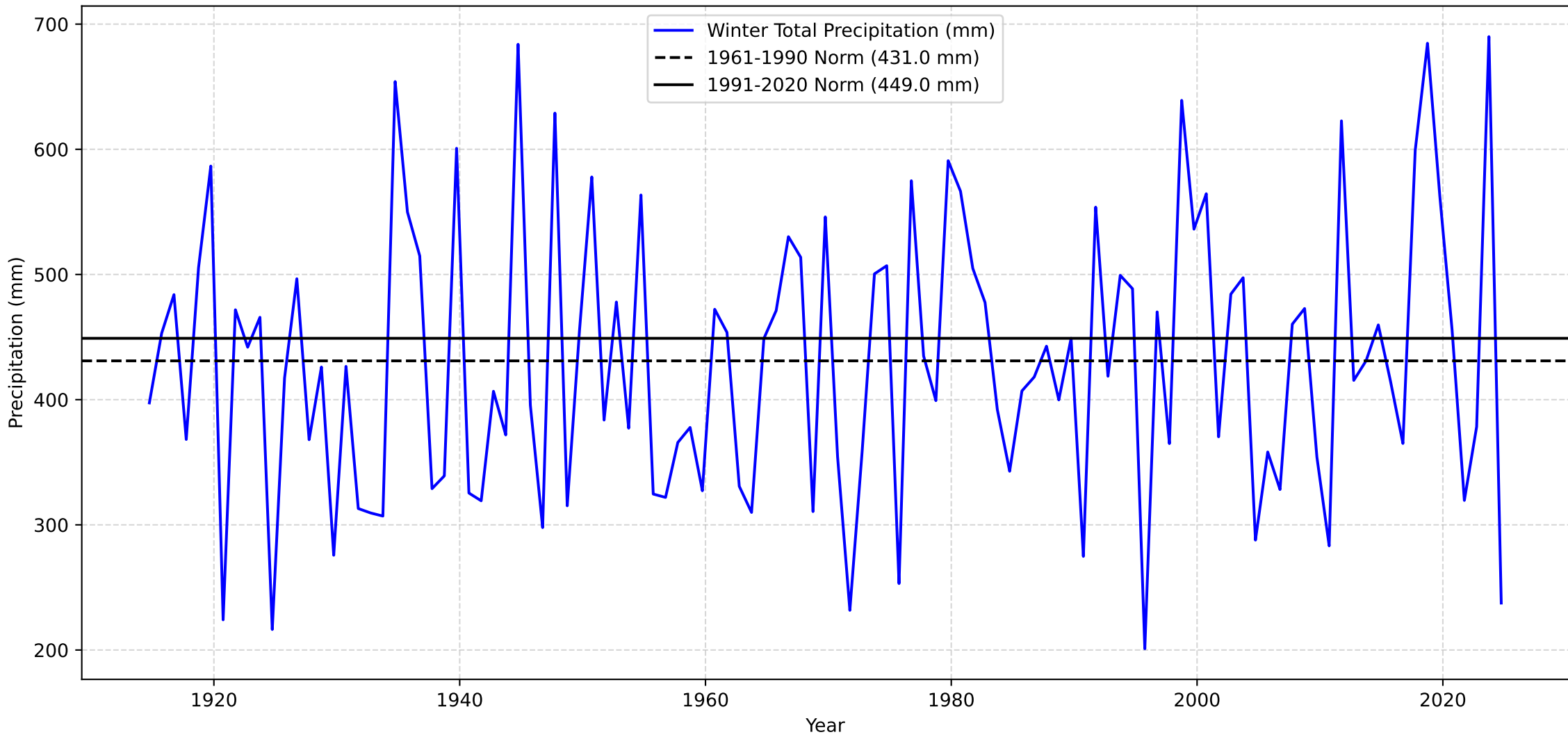
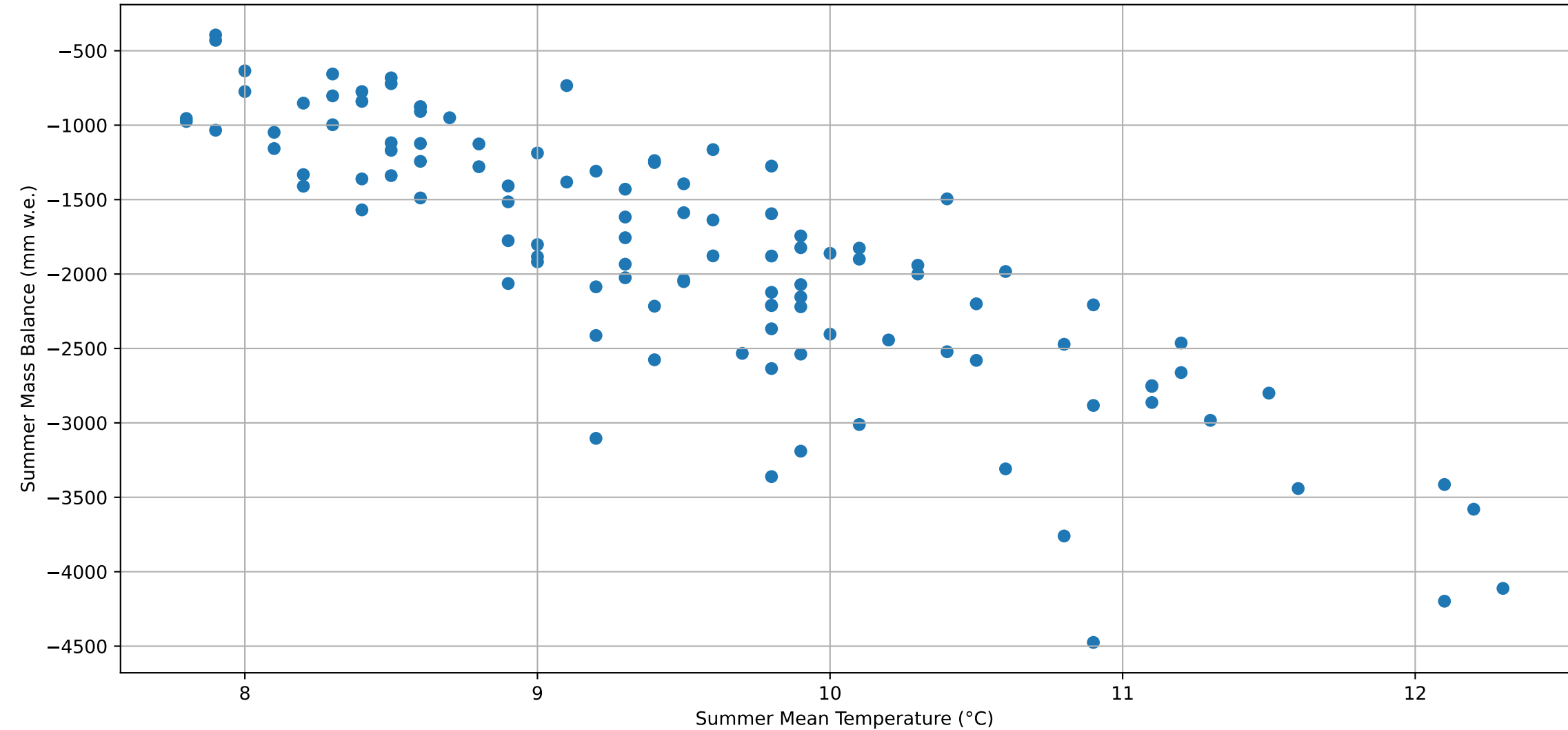Annual Mass Balance for each Elevation Bin over Time - Silvrettagletscher
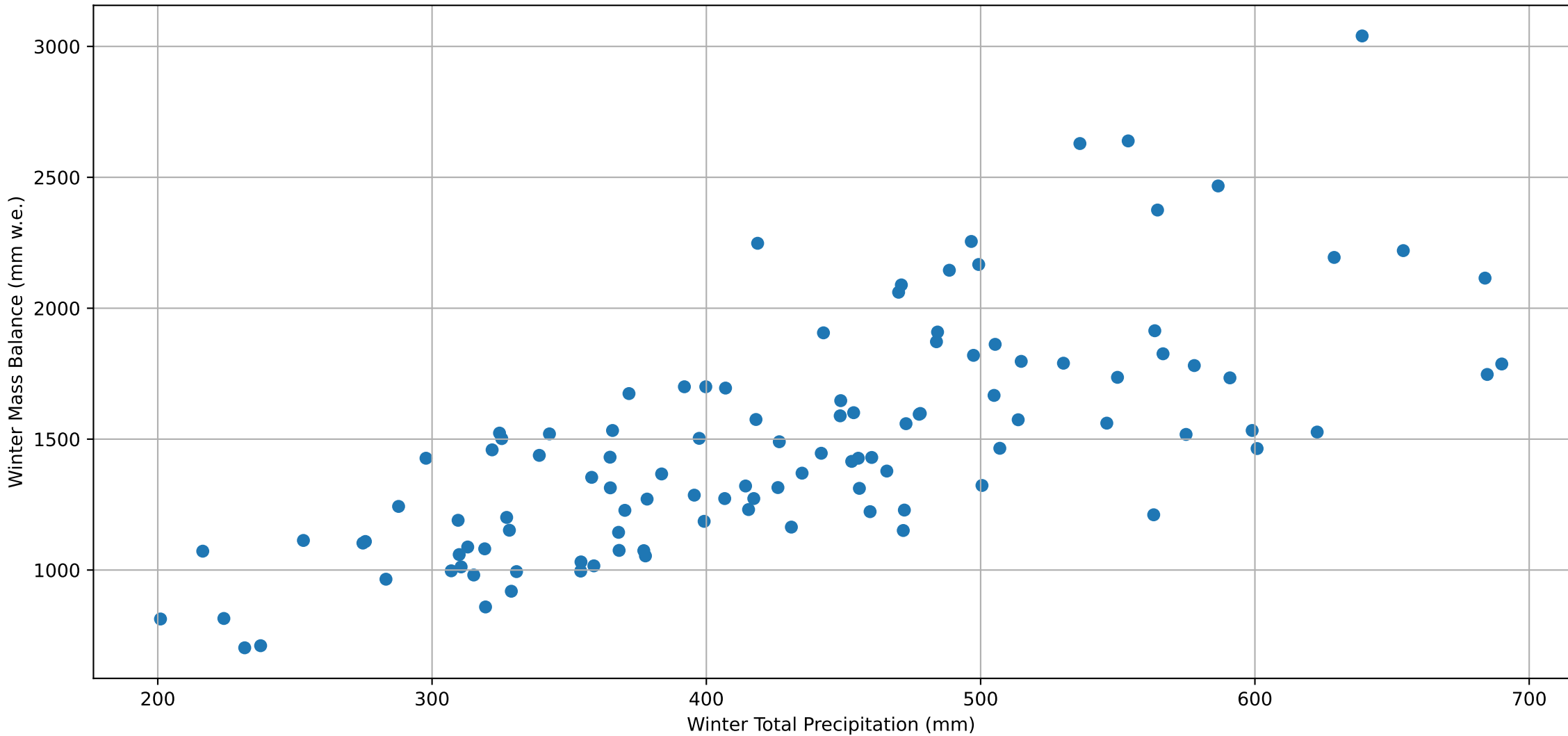
Davos Summer Mean Temperature

Davos Winter Total Precipitation

Silvrettagletscher Summer Mass Balance with relation to Temperature

Silvrettagletscher Winter Mass Balance with relation to Precipitation

```
================================================================================
MONTHLY DEVIATIONS for Silvrettagletscher 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                -0.623656  2.646363e-13                  True
3        august_td                -0.557269  2.119905e-10                  True
1          june_td                -0.526089  3.034294e-09                  True
4     september_td                -0.389909  2.335653e-05                  True
0           may_td                -0.378461  4.210489e-05                  True
9      february_pd                 0.229137  1.556087e-02                  True
7      december_pd                 0.162994  8.740341e-02                 False
11         april_pd                0.107554  2.611870e-01                 False
10         march_pd                0.104035  2.772043e-01                 False
8        january_pd                0.039006  6.844079e-01                 False
6       november_pd                0.024012  8.024705e-01                 False
5        october_pd                0.023914  8.032595e-01                 False

Number of observations: 111

Regression Summary:
                            OLS Regression Results
==============================================================================
Dep. Variable:     annual mass balance (mm w.e.)   R-squared:            0.730
Model:                                      OLS    Adj. R-squared:       0.697
Method:                           Least Squares    F-statistic:          22.11
Date:                          Thu, 11 Dec 2025    Prob (F-statistic): 8.96e-23
Time:                                 23:54:00     Log-Likelihood:      -841.07
No. Observations:                          111     AIC:                   1708.
Df Residuals:                               98     BIC:                   1743.
Df Model:                                   12
Covariance Type:                      nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          -97.6019     55.476     -1.759      0.082    -207.692      12.488
may_td         -82.7007     32.167     -2.571      0.012    -146.535     -18.867
june_td       -129.4217     30.488     -4.245      0.000    -189.924     -68.919
july_td       -186.8879     34.816     -5.368      0.000    -255.979    -117.797
august_td     -138.3572     36.665     -3.774      0.000    -211.118     -65.596
september_td  -144.9407     32.587     -4.448      0.000    -209.608     -80.273
october_pd       3.2888      1.205      2.729      0.008       0.897       5.680
november_pd      1.9937      1.141      1.747      0.084      -0.271       4.258
december_pd      3.3502      1.027      3.262      0.002       1.312       5.388
january_pd       2.1727      0.953      2.279      0.025       0.281       4.065
february_pd      2.8034      0.989      2.834      0.006       0.840       4.766
march_pd         3.0489      1.374      2.219      0.029       0.322       5.776
april_pd         3.1920      2.086      1.530      0.129      -0.948       7.332
==============================================================================
Omnibus:                        9.671   Durbin-Watson:                   1.744
Prob(Omnibus):                  0.008   Jarque-Bera (JB):                9.749
Skew:                          -0.621   Prob(JB):                      0.00764
Kurtosis:                       3.752   Cond. No.                         65.3
==============================================================================

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

```
================================================================================
OPTIMAL SEASONAL DEVIATIONS for Silvrettagletscher 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                -0.736032  3.487469e-20                    True
1  opt_season_pd                 0.230968  1.473111e-02                    True

Number of observations: 111

Regression Summary:
                            OLS Regression Results
===============================================================================
Dep. Variable:    annual mass balance (mm w.e.)   R-squared:               0.628
Model:                                      OLS   Adj. R-squared:          0.621
Method:                           Least Squares   F-statistic:             91.17
Date:                          Thu, 11 Dec 2025   Prob (F-statistic):   6.41e-24
Time:                                  23:54:00   Log-Likelihood:         -858.90
No. Observations:                           111   AIC:                     1724.
Df Residuals:                               108   BIC:                     1732.
Df Model:                                     2
Covariance Type:                      nonrobust
===============================================================================
                   coef    std err          t      P>|t|      [0.025      0.975]
-------------------------------------------------------------------------------
const           -79.3339     59.079     -1.343      0.182    -196.439      37.771
opt_season_td  -586.6998     45.419    -12.917      0.000    -676.729    -496.671
opt_season_pd     2.6641      0.532      5.005      0.000       1.609       3.719
===============================================================================
Omnibus:                        6.003   Durbin-Watson:                   1.809
Prob(Omnibus):                  0.050   Jarque-Bera (JB):                5.486
Skew:                          -0.459   Prob(JB):                       0.0644
Kurtosis:                       3.585   Cond. No.                        121.
===============================================================================

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

```
================================================================================
SUMMER/WINTER SEASONAL DEVIATIONS for Silvrettagletscher 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                  -0.774308  2.135179e-23                    True
1   winter_pd                   0.267049  4.606567e-03                    True

Number of observations: 111

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:                     137.0
Date:                           Thu, 11 Dec 2025   Prob (F-statistic):           2.38e-30
Time:                                   23:54:00   Log-Likelihood:                 -843.68
No. Observations:                            111   AIC:                             1693.
Df Residuals:                                108   BIC:                             1701.
Df Model:                                      2
Covariance Type:                       nonrobust
==========================================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const         -70.2623     50.771     -1.384      0.169    -170.899      30.374
summer_td    -693.9275     44.180    -15.707      0.000    -781.500    -606.355
winter_pd       2.8365      0.423      6.704      0.000       1.998       3.675
==========================================================================================
Omnibus:                       11.362   Durbin-Watson:                   1.809
Prob(Omnibus):                  0.003   Jarque-Bera (JB):               12.083
Skew:                          -0.670   Prob(JB):                      0.00238
Kurtosis:                       3.904   Cond. No.                         135.
==========================================================================================

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

```
================================================================================
MONTHLY DEVIATIONS for Silvrettagletscher 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                  -0.623656  2.646363e-13                   True
3       august_td                  -0.557269  2.119905e-10                   True
1         june_td                  -0.526089  3.034294e-09                   True
4    september_td                  -0.389909  2.335653e-05                   True
0          may_td                  -0.378461  4.210489e-05                   True
9     february_pd                   0.229137  1.556087e-02                   True
7     december_pd                   0.162994  8.740341e-02                  False
11       april_pd                   0.107554  2.611870e-01                  False
10       march_pd                   0.104035  2.772043e-01                  False
8      january_pd                   0.039006  6.844079e-01                  False
6     november_pd                   0.024012  8.024705e-01                  False
5      october_pd                   0.023914  8.032595e-01                  False

Number of observations: 111

Regression Summary:
                            OLS Regression Results
==============================================================================
Dep. Variable:    annual mass balance (mm w.e.)   R-squared:           0.730
Model:                                      OLS   Adj. R-squared:      0.697
Method:                           Least Squares   F-statistic:         22.11
Date:                          Thu, 11 Dec 2025   Prob (F-statistic):  8.96e-23
Time:                                  23:54:00   Log-Likelihood:      -841.07
No. Observations:                           111   AIC:                 1708.
Df Residuals:                                98   BIC:                 1743.
Df Model:                                    12
Covariance Type:                      nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const       -1012.9579     67.730    -14.956      0.000   -1147.366    -878.550
may_td         -82.7007     32.167     -2.571      0.012    -146.535     -18.867
june_td       -129.4217     30.488     -4.245      0.000    -189.924     -68.919
july_td       -186.8879     34.816     -5.368      0.000    -255.979    -117.797
august_td     -138.3572     36.665     -3.774      0.000    -211.118     -65.596
september_td  -144.9407     32.587     -4.448      0.000    -209.608     -80.273
october_pd       3.2888      1.205      2.729      0.008       0.897       5.680
november_pd      1.9937      1.141      1.747      0.084      -0.271       4.258
december_pd      3.3502      1.027      3.262      0.002       1.312       5.388
january_pd       2.1727      0.953      2.279      0.025       0.281       4.065
february_pd      2.8034      0.989      2.834      0.006       0.840       4.766
march_pd         3.0489      1.374      2.219      0.029       0.322       5.776
april_pd         3.1920      2.086      1.530      0.129      -0.948       7.332
==============================================================================
Omnibus:                        9.671   Durbin-Watson:                   1.744
Prob(Omnibus):                  0.008   Jarque-Bera (JB):                9.749
Skew:                          -0.621   Prob(JB):                     0.00764
Kurtosis:                       3.752   Cond. No.                        80.0
==============================================================================

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

```
================================================================================
OPTIMAL SEASONAL DEVIATIONS for Silvrettagletscher 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               -0.737299  2.787494e-20                    True
1  opt_season_pd                0.230968  1.473111e-02                    True

Number of observations: 111

Regression Summary:
                          OLS Regression Results
==============================================================================
Dep. Variable:     annual mass balance (mm w.e.)   R-squared:                   0.629
Model:                                       OLS   Adj. R-squared:              0.622
Method:                            Least Squares   F-statistic:                 91.67
Date:                           Thu, 11 Dec 2025   Prob (F-statistic):       5.34e-24
Time:                                   23:54:00   Log-Likelihood:            -858.71
No. Observations:                            111   AIC:                         1723.
Df Residuals:                                108   BIC:                         1732.
Df Model:                                      2
Covariance Type:                       nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const       -1017.9957     74.263    -13.708      0.000   -1165.197    -870.794
opt_season_td -587.3911     45.346    -12.954      0.000    -677.274    -497.508
opt_season_pd    2.6544      0.531      4.996      0.000       1.601       3.708
==============================================================================
Omnibus:                        5.737   Durbin-Watson:                   1.807
Prob(Omnibus):                  0.057   Jarque-Bera (JB):                5.187
Skew:                          -0.449   Prob(JB):                       0.0747
Kurtosis:                       3.560   Cond. No.                         156.
==============================================================================

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

```
================================================================================
SUMMER/WINTER SEASONAL DEVIATIONS for Silvrettagletscher 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                 -0.770585  4.666698e-23                    True
1   winter_pd                  0.267049  4.606567e-03                    True

Number of observations: 111

Regression Summary:
                          OLS Regression Results
==============================================================================
Dep. Variable:     annual mass balance (mm w.e.)   R-squared:                       0.711
Model:                                       OLS   Adj. R-squared:                  0.706
Method:                            Least Squares   F-statistic:                     133.1
Date:                           Thu, 11 Dec 2025   Prob (F-statistic):           7.26e-30
Time:                                   23:54:00   Log-Likelihood:                -844.83
No. Observations:                            111   AIC:                             1696.
Df Residuals:                                108   BIC:                             1704.
Df Model:                                      2
Covariance Type:                       nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const       -1013.8381     64.214    -15.788      0.000   -1141.121    -886.555
summer_td    -688.8103     44.513    -15.474      0.000    -777.043    -600.578
winter_pd       2.8348      0.427      6.631      0.000       1.987       3.682
==============================================================================
Omnibus:                       11.257   Durbin-Watson:                   1.803
Prob(Omnibus):                  0.004   Jarque-Bera (JB):               11.758
Skew:                          -0.684   Prob(JB):                      0.00280
Kurtosis:                       3.820   Cond. No.                         173.
==============================================================================

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