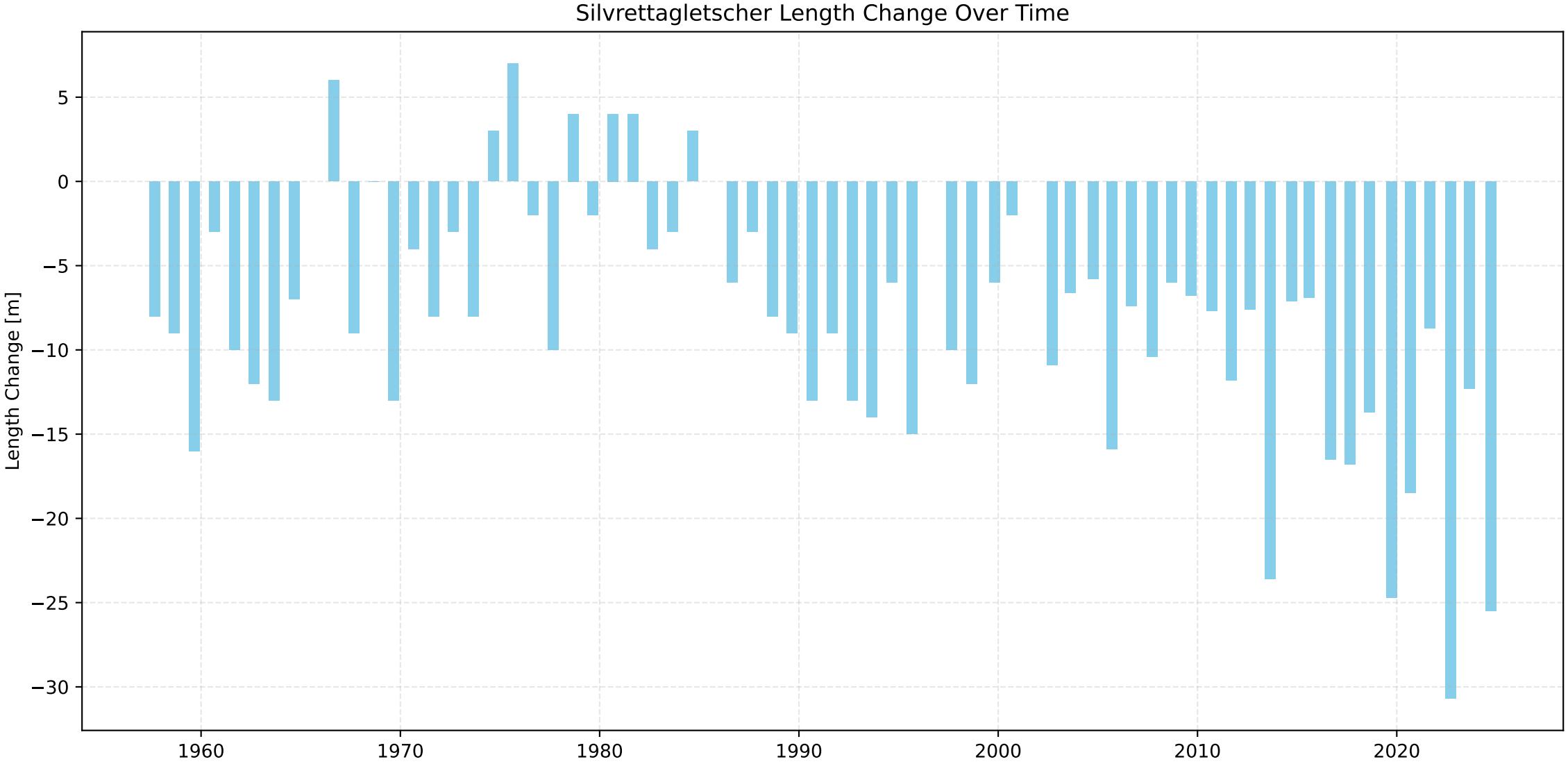
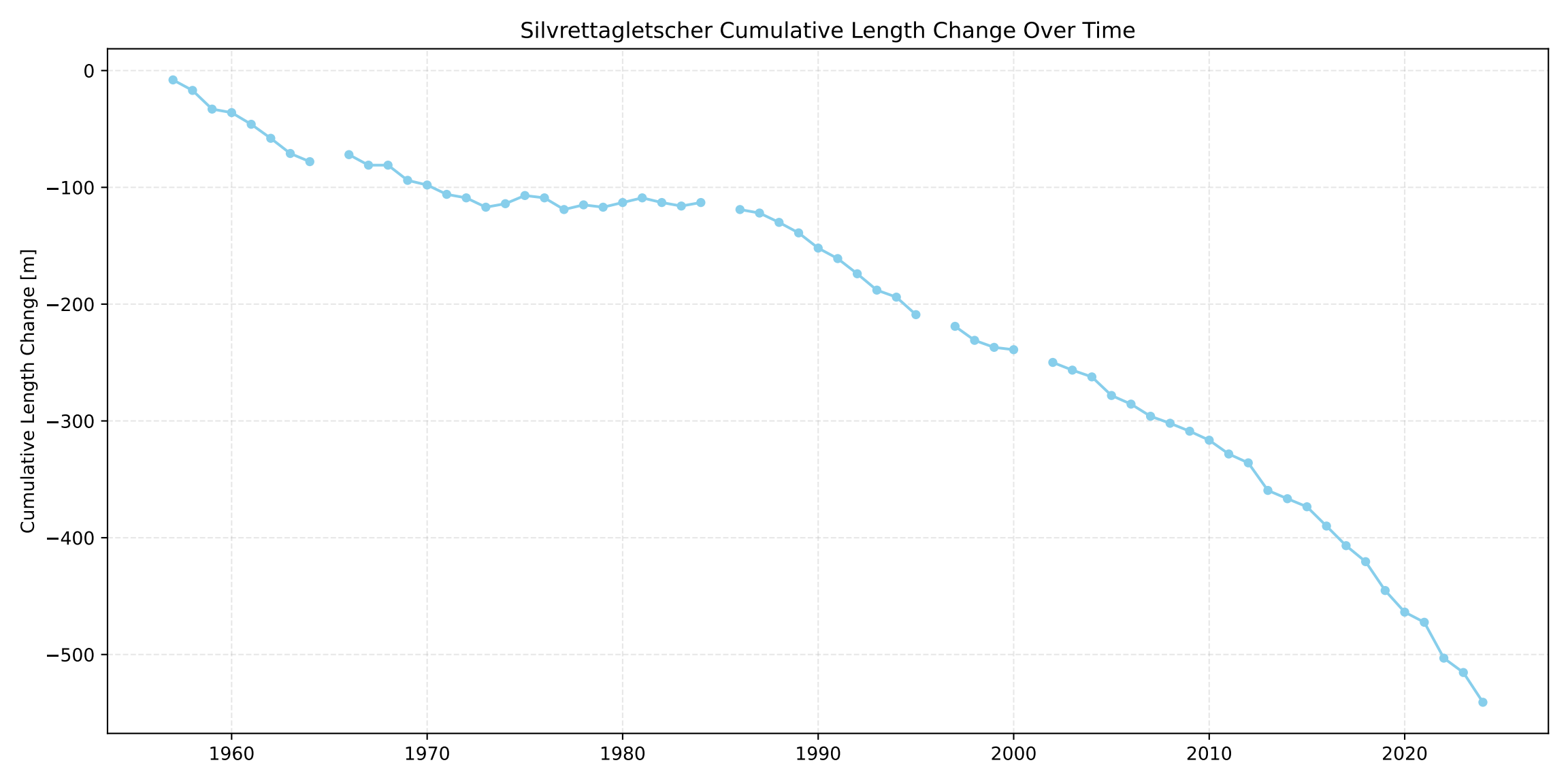
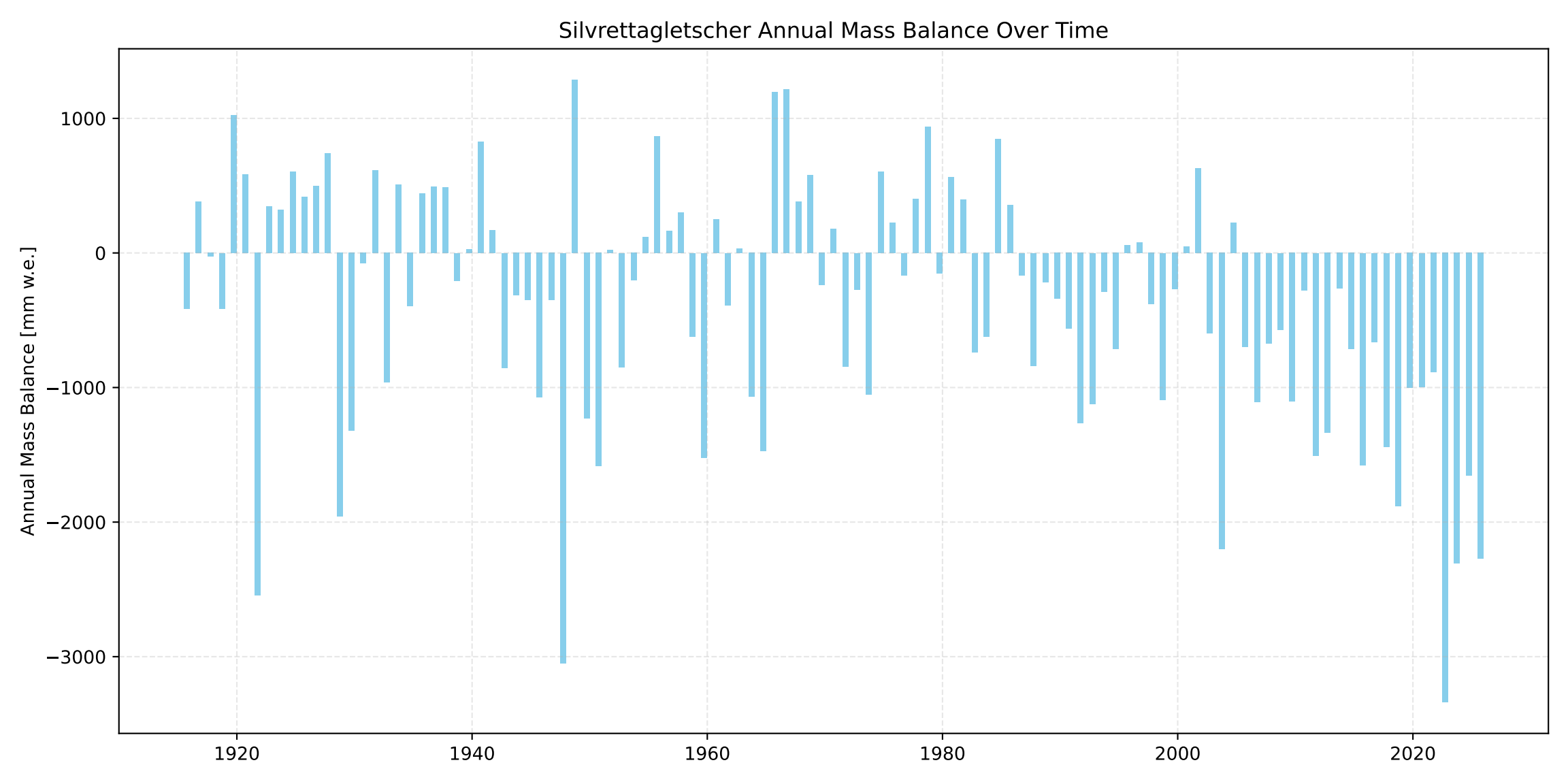
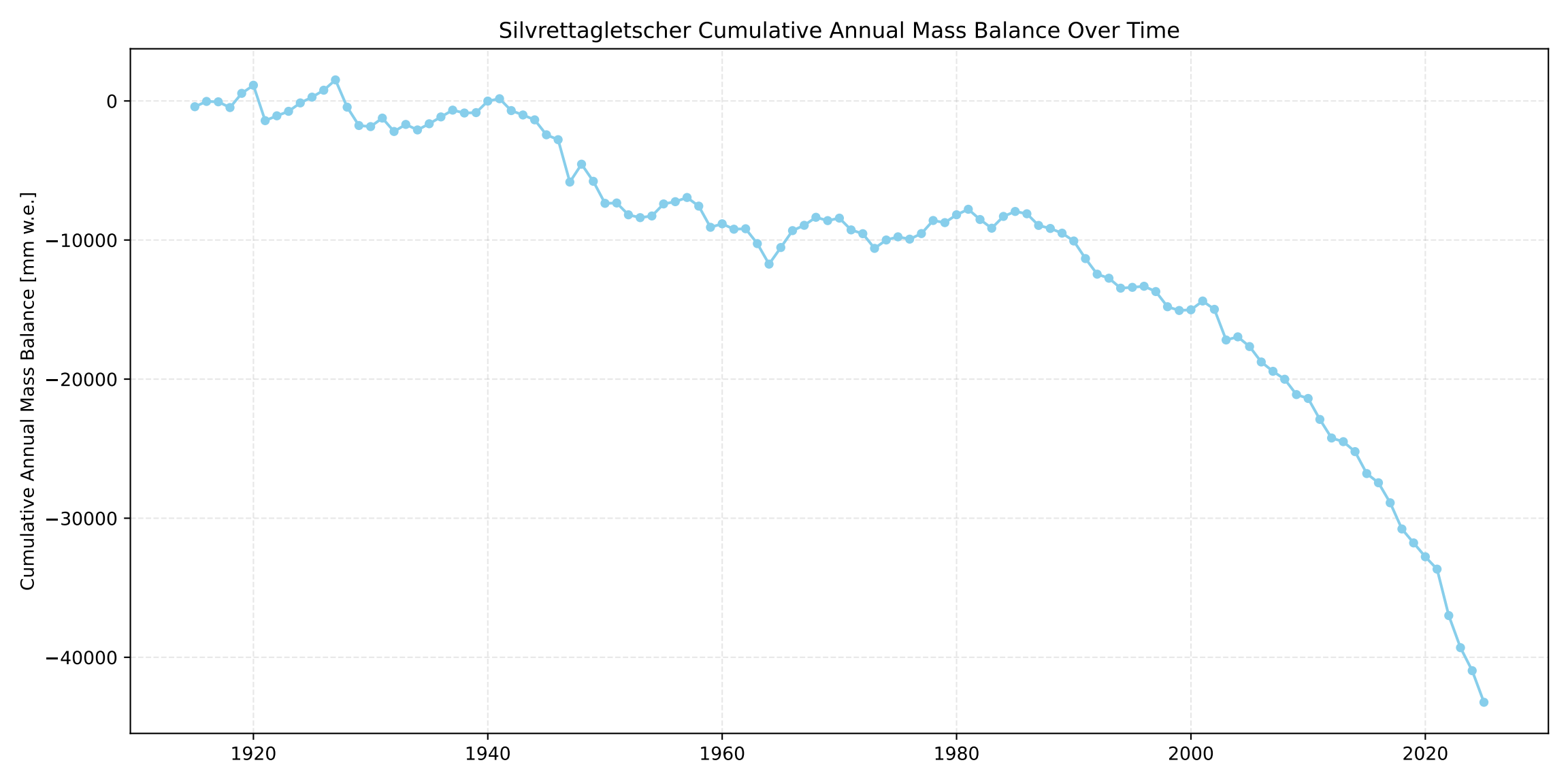
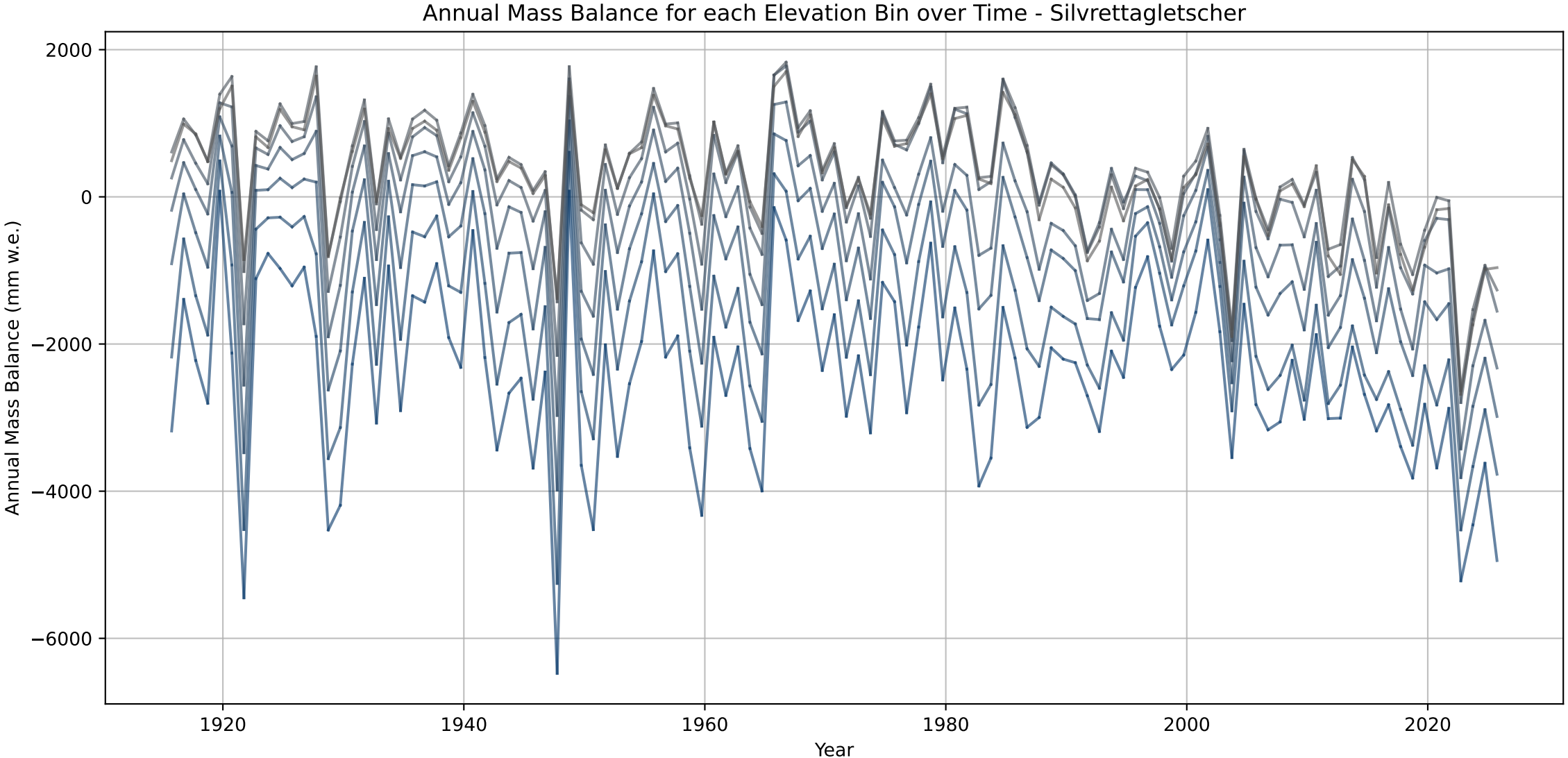
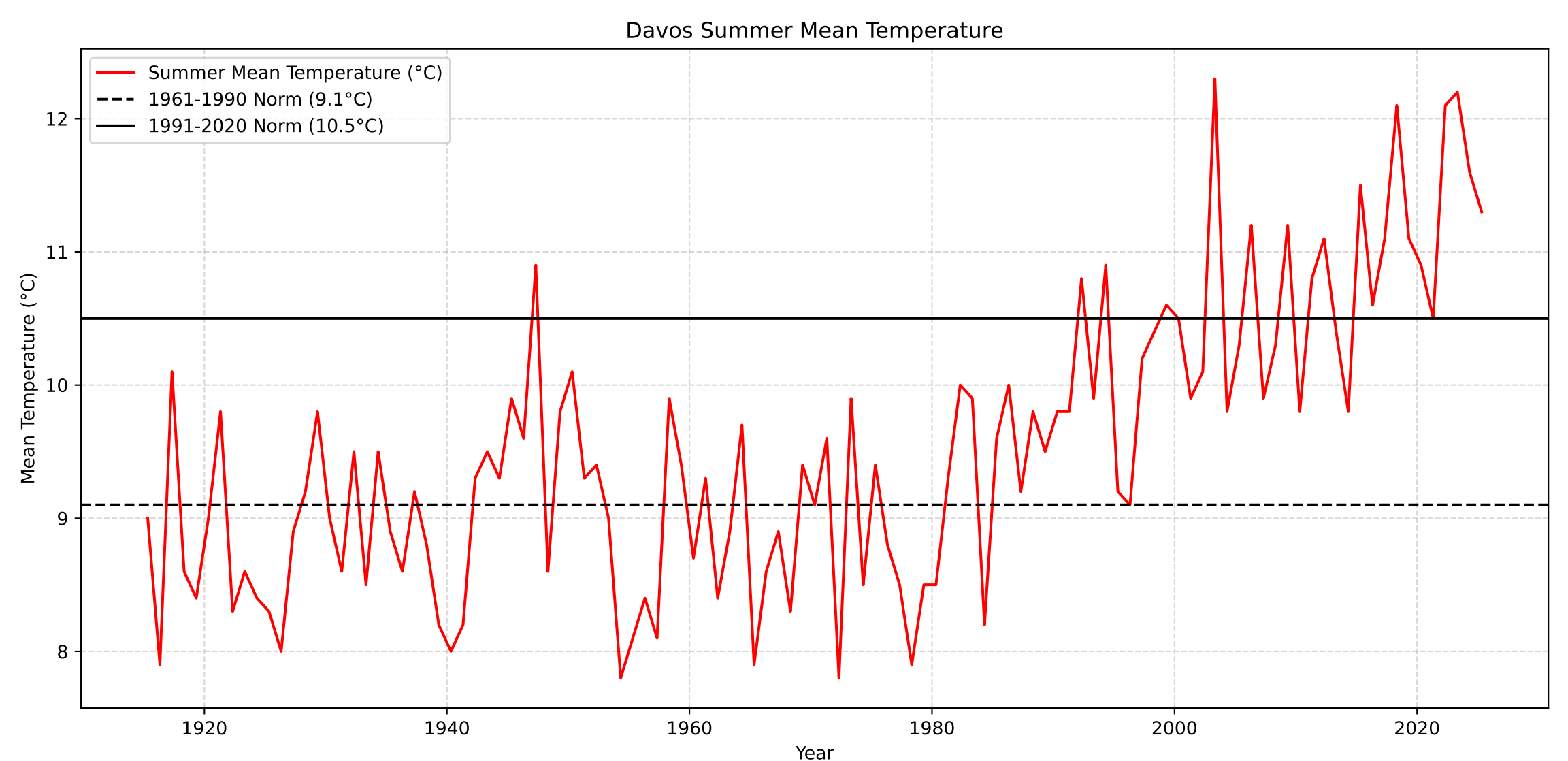

Silvrettagletscher Length Change Over Time
Length Change [m]
5
0
−5
−10
−15
−20
−25
−30
1960
1970
1980
1990
2000
2010
2020

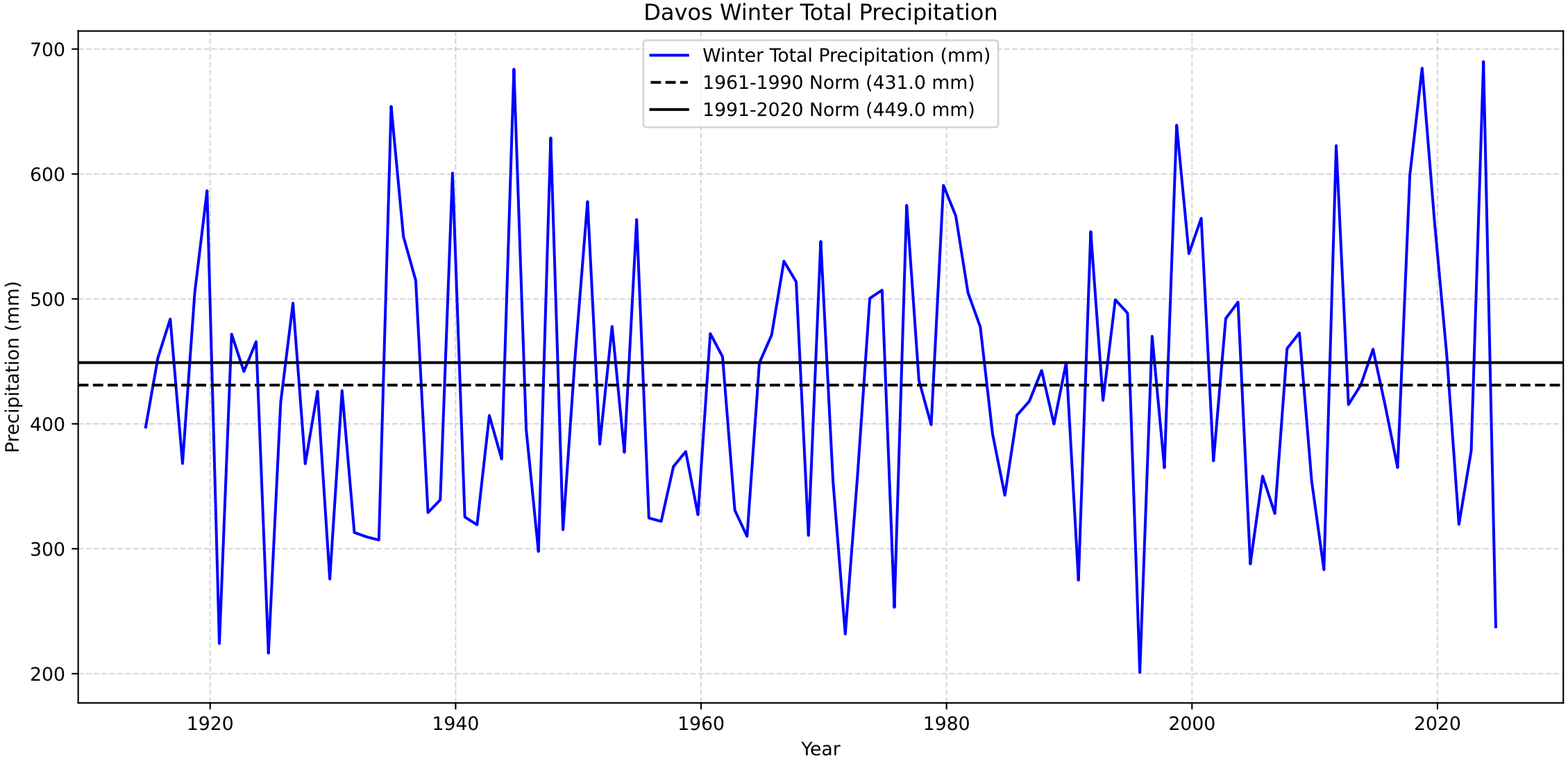

Silvrettagletscher Cumulative Length Change Over Time
Cumulative Length Change [m]
0
−100
−200
−300
−400
−500
1960
1970
1980
1990
2000
2010
2020

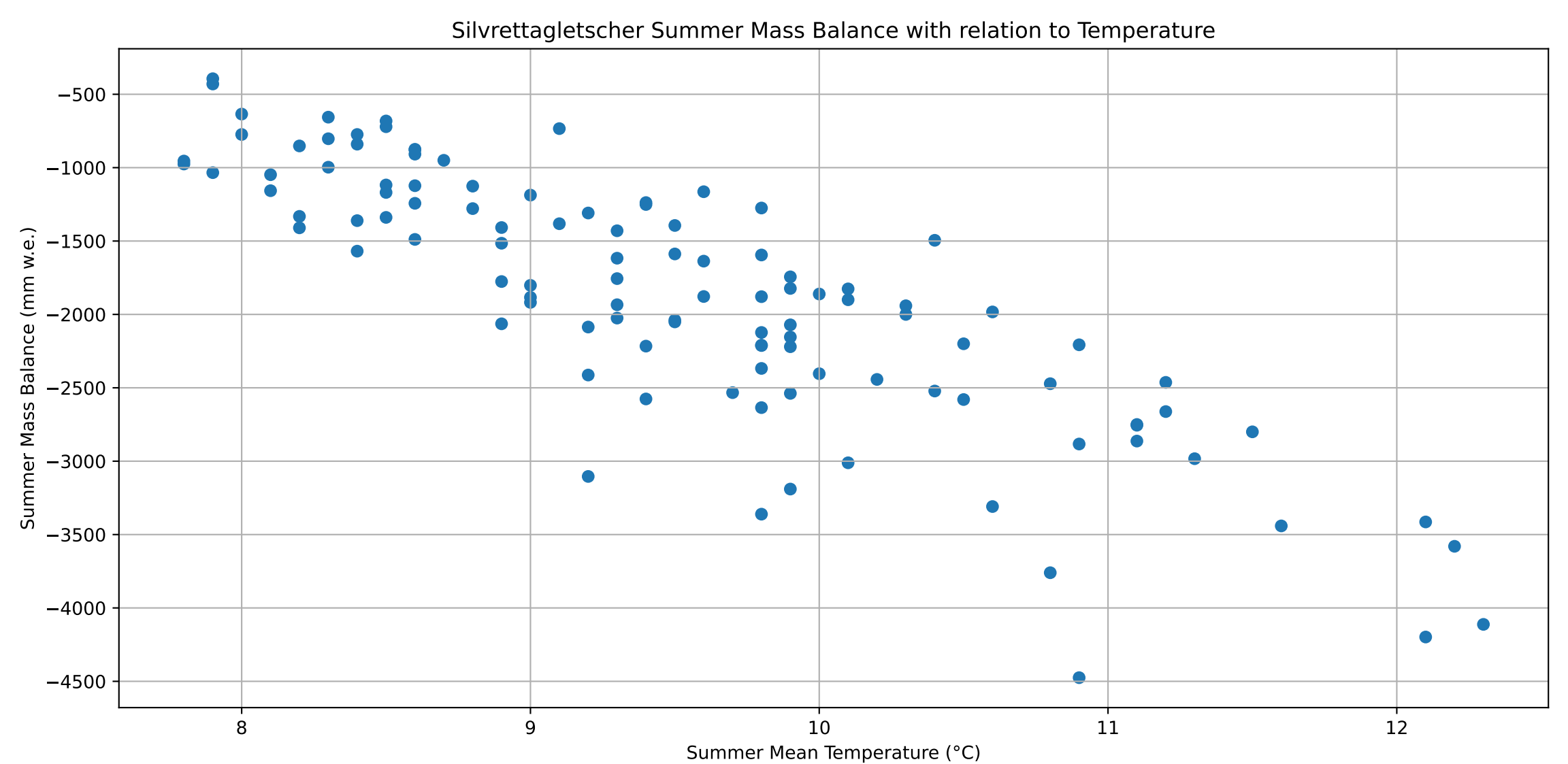

Silvrettagletscher Annual Mass Balance Over Time
Annual Mass Balance [mm w.e.]
1000
0
−1000
−2000
−3000
1920
1940
1960
1980
2000
2020


Silvrettagletscher Cumulative Annual Mass Balance Over Time
Cumulative Annual Mass Balance [mm w.e.]
0
−10000
−20000
−30000
−40000
1920
1940
1960
1980
2000
2020


Annual Mass Balance for each Elevation Bin over Time - Silvrettagletscher
Annual Mass Balance (mm w.e.)
2000
0
−2000
−4000
−6000
1920
1940
1960
1980
2000
2020
Year


Davos Summer Mean Temperature
Summer Mean Temperature (°C)
1961-1990 Norm (9.1°C)
1991-2020 Norm (10.5°C)
Mean Temperature (°C)
8
9
10
11
12
1920
1940
1960
1980
2000
2020
Year


Davos Winter Total Precipitation
Winter Total Precipitation (mm)
1961-1990 Norm (431.0 mm)
1991-2020 Norm (449.0 mm)
Precipitation (mm)
700
600
500
400
300
200
1920
1940
1960
1980
2000
2020
Year


Silvrettagletscher Summer Mass Balance with relation to Temperature
Summer Mass Balance (mm w.e.)
−500
−1000
−1500
−2000
−2500
−3000
−3500
−4000
−4500
8
9
10
11
12
Summer Mean Temperature (°C)

Regression: Monthly 1961-1990

```
================================================================================
MONTHLY DEVIATIONS ANALYSIS USING 1961-1990 CLIMATE NORMS
================================================================================

================================================================================
MONTHLY DEVIATIONS for Silvrettagletscher (1961-1990 norms)
================================================================================

Correlation Analysis with Significance Testing:
        Variable  Correlation Coefficient       P-value  Significant (p < 0.05)
10   february_pd                 0.229137  1.556087e-02                    True
8    december_pd                 0.162994  8.740341e-02                   False
12     april_pd                  0.107554  2.611870e-01                   False
11     march_pd                  0.104035  2.772043e-01                   False
9     january_pd                 0.039006  6.844079e-01                   False
7    november_pd                 0.024012  8.024705e-01                   False
6     october_pd                 0.023914  8.032595e-01                   False
1        may_td                 -0.378461  4.210489e-05                    True
5   september_td                -0.389909  2.335653e-05                    True
2       june_td                 -0.526089  3.034294e-09                    True
4     august_td                 -0.557269  2.119905e-10                    True
3       july_td                 -0.623656  2.646363e-13                    True
0         const                       NaN           NaN                   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:                           Mon, 08 Dec 2025   Prob (F-statistic):           8.96e-23
Time:                                   12:08:24   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
```

Regression: Optimal 1961-1990

```
================================================================================
OPTIMAL SEASONAL DEVIATIONS ANALYSIS USING 1961-1990 CLIMATE NORMS
================================================================================

================================================================================
OPTIMAL SEASONAL DEVIATIONS for Silvrettagletscher (1961-1990 norms)
================================================================================

Correlation Analysis with Significance Testing:
        Variable  Correlation Coefficient       P-value  Significant (p < 0.05)
2  opt_season_pd                 0.230968  1.473111e-02                    True
1  opt_season_td                -0.736032  3.487469e-20                    True
0          const                      NaN           NaN                   False

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:                           Mon, 08 Dec 2025   Prob (F-statistic):           6.41e-24
Time:                                   12:08:24   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.

Coefficient Interpretation:
Intercept (normal mass balance): -79.33 (p=0.1821)
opt_season_td: -586.70 (p=0.0000)
opt_season_pd: 2.66 (p=0.0000)

Variance Inflation Factors (VIF):
        Variable       VIF
0          const  1.223947
1  opt_season_td  1.007088
2  opt_season_pd  1.007088

R-squared: 0.6280
Adjusted R-squared: 0.6211
```

Regression: Seasonal 1961-1990

```
================================================================================
SUMMER/WINTER SEASONAL DEVIATIONS ANALYSIS USING 1961-1990 CLIMATE NORMS
================================================================================

================================================================================
SUMMER/WINTER SEASONAL DEVIATIONS for Silvrettagletscher (1961-1990 norms)
================================================================================

Correlation Analysis with Significance Testing:
    Variable  Correlation Coefficient       P-value  Significant (p < 0.05)
2  winter_pd                 0.267049  4.606567e-03                    True
1  summer_td                -0.774308  2.135179e-23                    True
0      const                      NaN           NaN                   False

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:                           Mon, 08 Dec 2025   Prob (F-statistic):           2.38e-30
Time:                                   12:08:24   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.

Coefficient Interpretation:
Intercept (normal mass balance): -70.26 (p=0.1692)
summer_td: -693.93 (p=0.0000)
winter_pd: 2.84 (p=0.0000)

Variance Inflation Factors (VIF):
    Variable       VIF
0      const  1.189057
1  summer_td  1.009322
2  winter_pd  1.009322

R-squared: 0.7172
Adjusted R-squared: 0.7120
```

Regression: Monthly 1991-2020

```
================================================================================
MONTHLY DEVIATIONS ANALYSIS USING 1991-2020 CLIMATE NORMS
================================================================================

================================================================================
MONTHLY DEVIATIONS for Silvrettagletscher (1991-2020 norms)
================================================================================

Correlation Analysis with Significance Testing:
        Variable  Correlation Coefficient       P-value  Significant (p < 0.05)
10   february_pd                 0.229137  1.556087e-02                    True
8    december_pd                 0.162994  8.740341e-02                   False
12     april_pd                  0.107554  2.611870e-01                   False
11     march_pd                  0.104035  2.772043e-01                   False
9     january_pd                 0.039006  6.844079e-01                   False
7    november_pd                 0.024012  8.024705e-01                   False
6     october_pd                 0.023914  8.032595e-01                   False
1        may_td                 -0.378461  4.210489e-05                    True
5   september_td                -0.389909  2.335653e-05                    True
2       june_td                 -0.526089  3.034294e-09                    True
4     august_td                 -0.557269  2.119905e-10                    True
3       july_td                 -0.623656  2.646363e-13                    True
0         const                       NaN           NaN                   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:                           Mon, 08 Dec 2025   Prob (F-statistic):           8.96e-23
Time:                                   12:08:24   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
```

Regression: Optimal 1991-2020

```
================================================================================
OPTIMAL SEASONAL DEVIATIONS ANALYSIS USING 1991-2020 CLIMATE NORMS
================================================================================

================================================================================
OPTIMAL SEASONAL DEVIATIONS for Silvrettagletscher (1991-2020 norms)
================================================================================

Correlation Analysis with Significance Testing:
        Variable  Correlation Coefficient       P-value  Significant (p < 0.05)
2  opt_season_pd                 0.230968  1.473111e-02                    True
1  opt_season_td                -0.737299  2.787494e-20                    True
0          const                      NaN           NaN                   False

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:                           Mon, 08 Dec 2025   Prob (F-statistic):           5.34e-24
Time:                                   12:08:24   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.

Coefficient Interpretation:
Intercept (normal mass balance): -1018.00 (p=0.0000)
opt_season_td: -587.39 (p=0.0000)
opt_season_pd: 2.65 (p=0.0000)

Variance Inflation Factors (VIF):
        Variable       VIF
0          const  1.940502
1  opt_season_td  1.006837
2  opt_season_pd  1.006837

R-squared: 0.6293
Adjusted R-squared: 0.6224
```

Regression: Seasonal 1991-2020

```
================================================================================
SUMMER/WINTER SEASONAL DEVIATIONS ANALYSIS USING 1991-2020 CLIMATE NORMS
================================================================================

================================================================================
SUMMER/WINTER SEASONAL DEVIATIONS for Silvrettagletscher (1991-2020 norms)
================================================================================

Correlation Analysis with Significance Testing:
    Variable  Correlation Coefficient       P-value  Significant (p < 0.05)
2  winter_pd                 0.267049  4.606567e-03                    True
1  summer_td                -0.770585  4.666698e-23                    True
0      const                      NaN           NaN                   False

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:                           Mon, 08 Dec 2025   Prob (F-statistic):           7.26e-30
Time:                                   12:08:24   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.

Coefficient Interpretation:
Intercept (normal mass balance): -1013.84 (p=0.0000)
summer_td: -688.81 (p=0.0000)
winter_pd: 2.83 (p=0.0000)

Variance Inflation Factors (VIF):
    Variable       VIF
0      const  1.863214
1  summer_td  1.009356
2  winter_pd  1.009356

R-squared: 0.7113
Adjusted R-squared: 0.7060
```