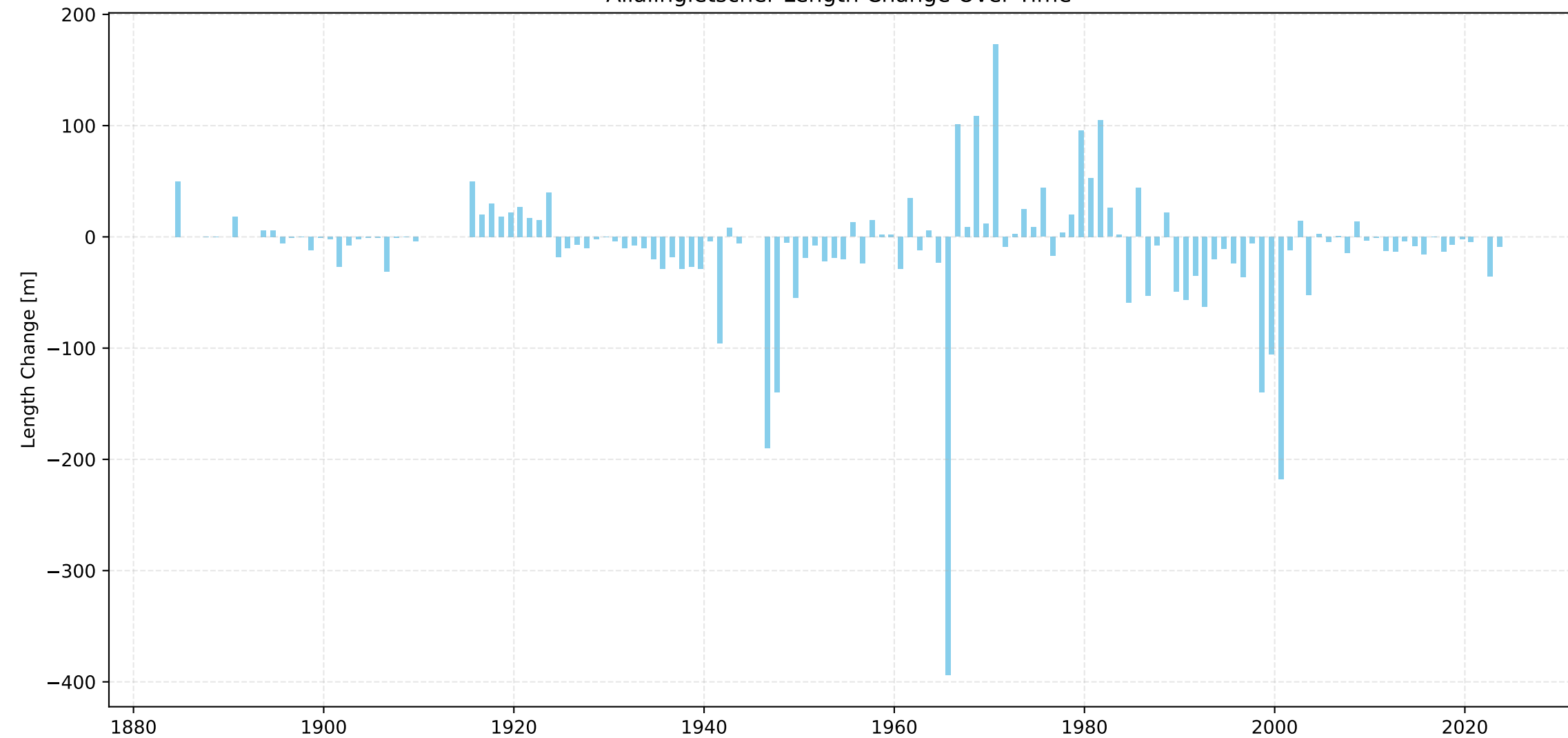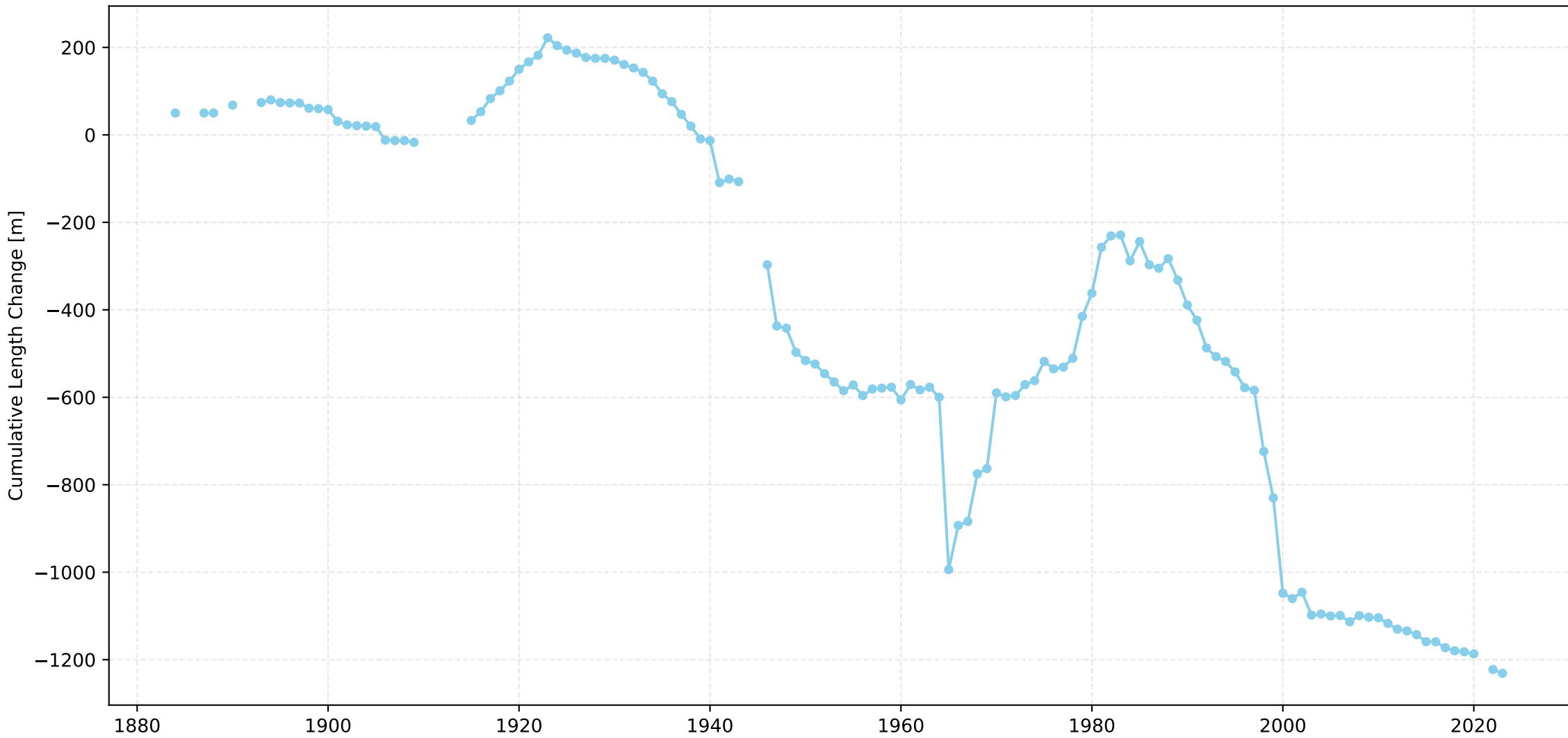Allalingletscher Length Change Over Time

Allalingletscher Cumulative Length Change Over Time
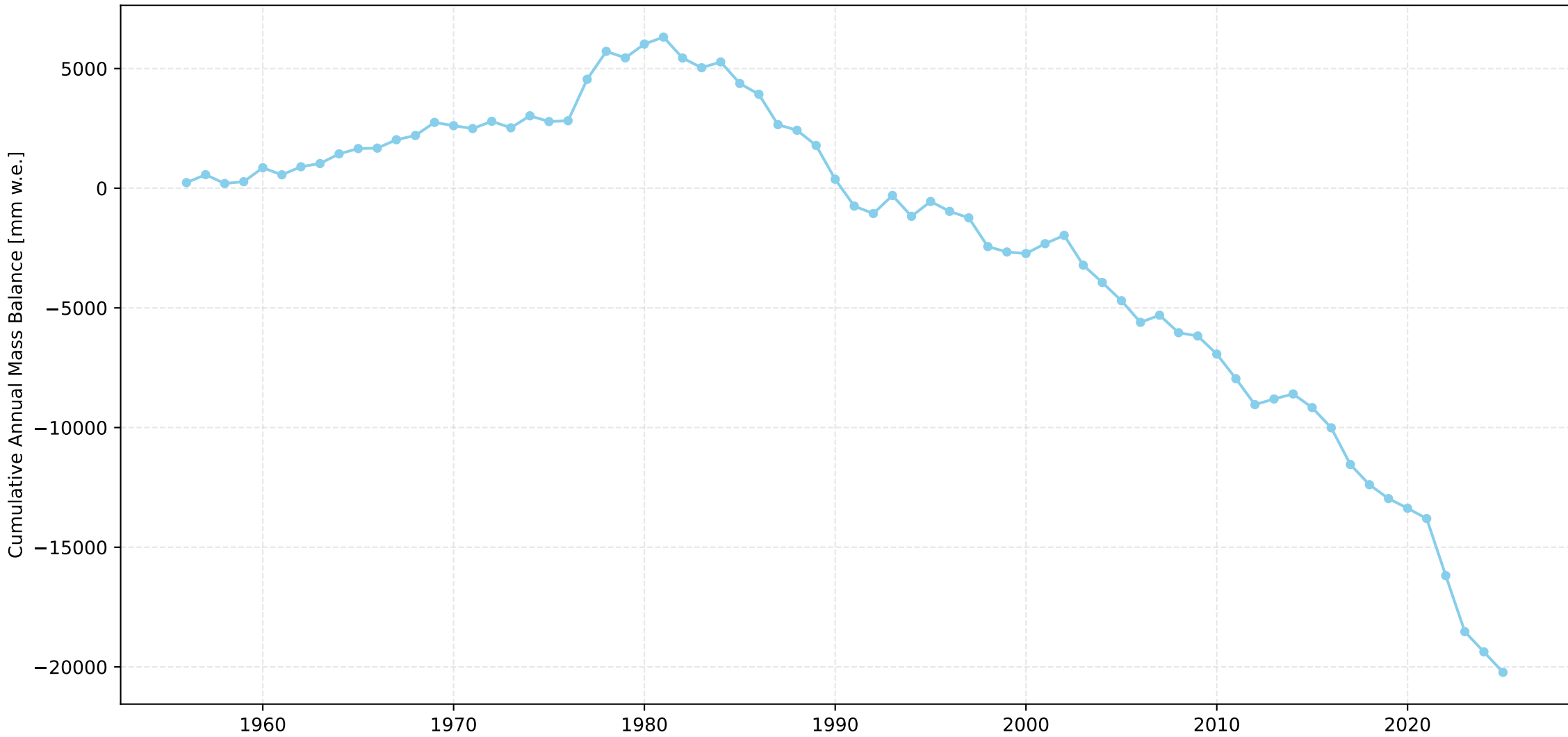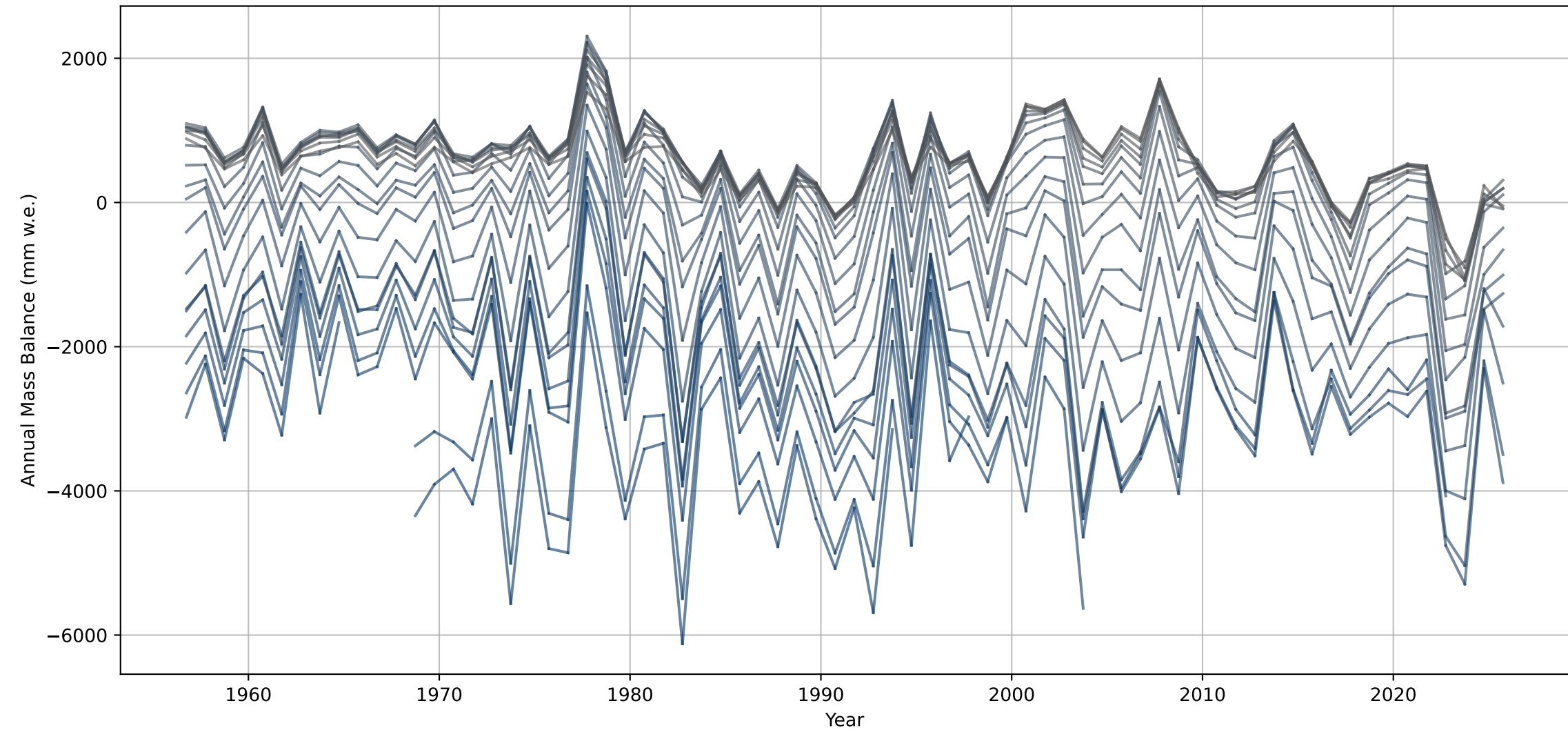
Allalingletscher Annual Mass Balance Over Time

Allalingletscher Cumulative Annual Mass Balance Over Time

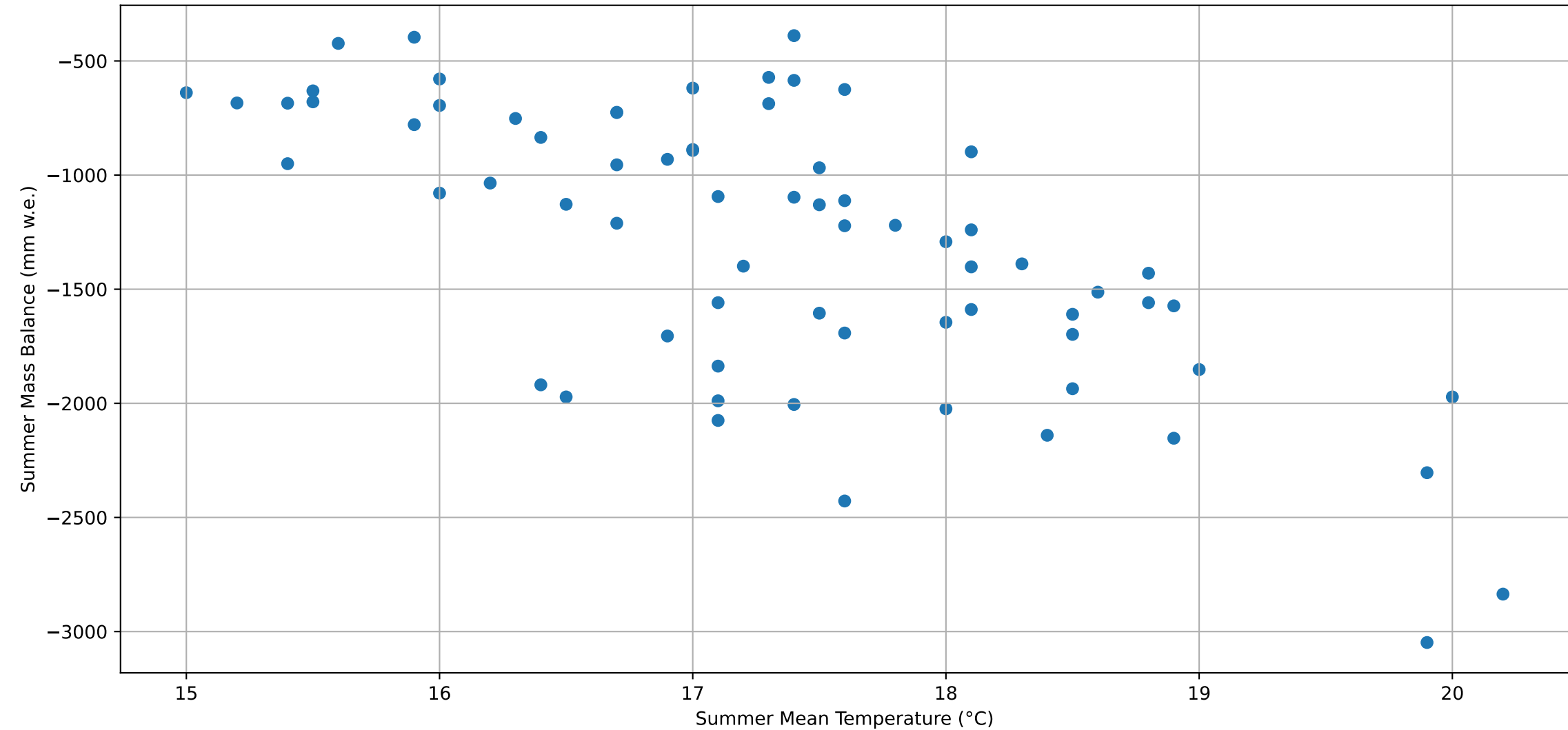Annual Mass Balance for each Elevation Bin over Time - Allalingletscher
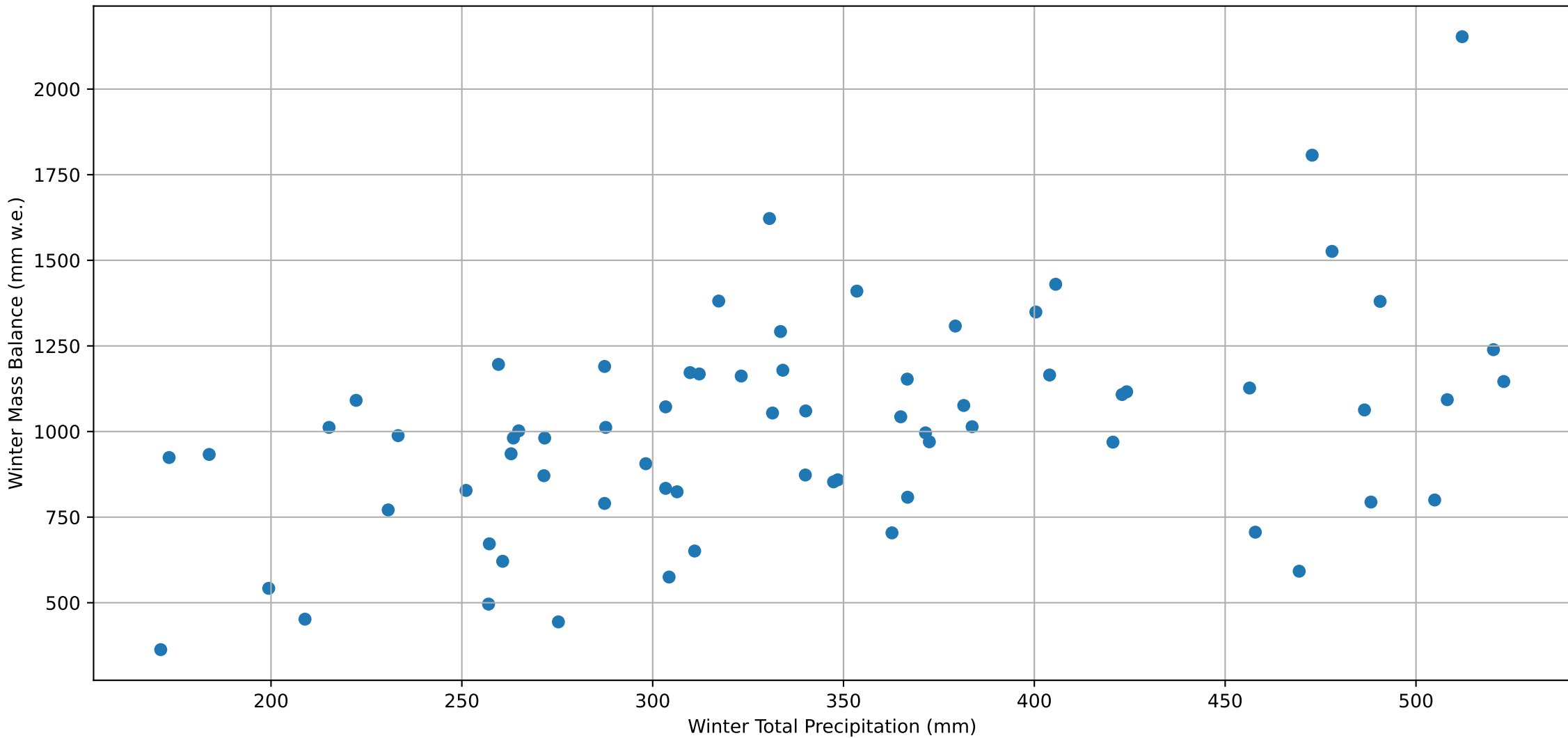
Sion Summer Mean Temperature

Sion Winter Total Precipitation

Allalingletscher Summer Mass Balance with relation to Temperature

Allalingletscher Winter Mass Balance with relation to Precipitation

```
================================================================================
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:                         Thu, 11 Dec 2025    Prob (F-statistic): 4.26e-07
Time:                                 23:54:11    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.
```

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================================================================================
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:                           Thu, 11 Dec 2025   Prob (F-statistic): 1.59e-09
Time:                                   23:54:11   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.
```

```
================================================================================
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:                           Thu, 11 Dec 2025   Prob (F-statistic):           1.25e-11
Time:                                   23:54:11   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.
```

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================================================================================
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:                          Thu, 11 Dec 2025   Prob (F-statistic):  4.26e-07
Time:                                  23:54:11   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.
```

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================================================================================
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:                           Thu, 11 Dec 2025   Prob (F-statistic):           1.44e-09
Time:                                   23:54:11   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.
```

```
==================================================================================
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:                           Thu, 11 Dec 2025   Prob (F-statistic):          1.38e-11
Time:                                   23:54:11   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.
```