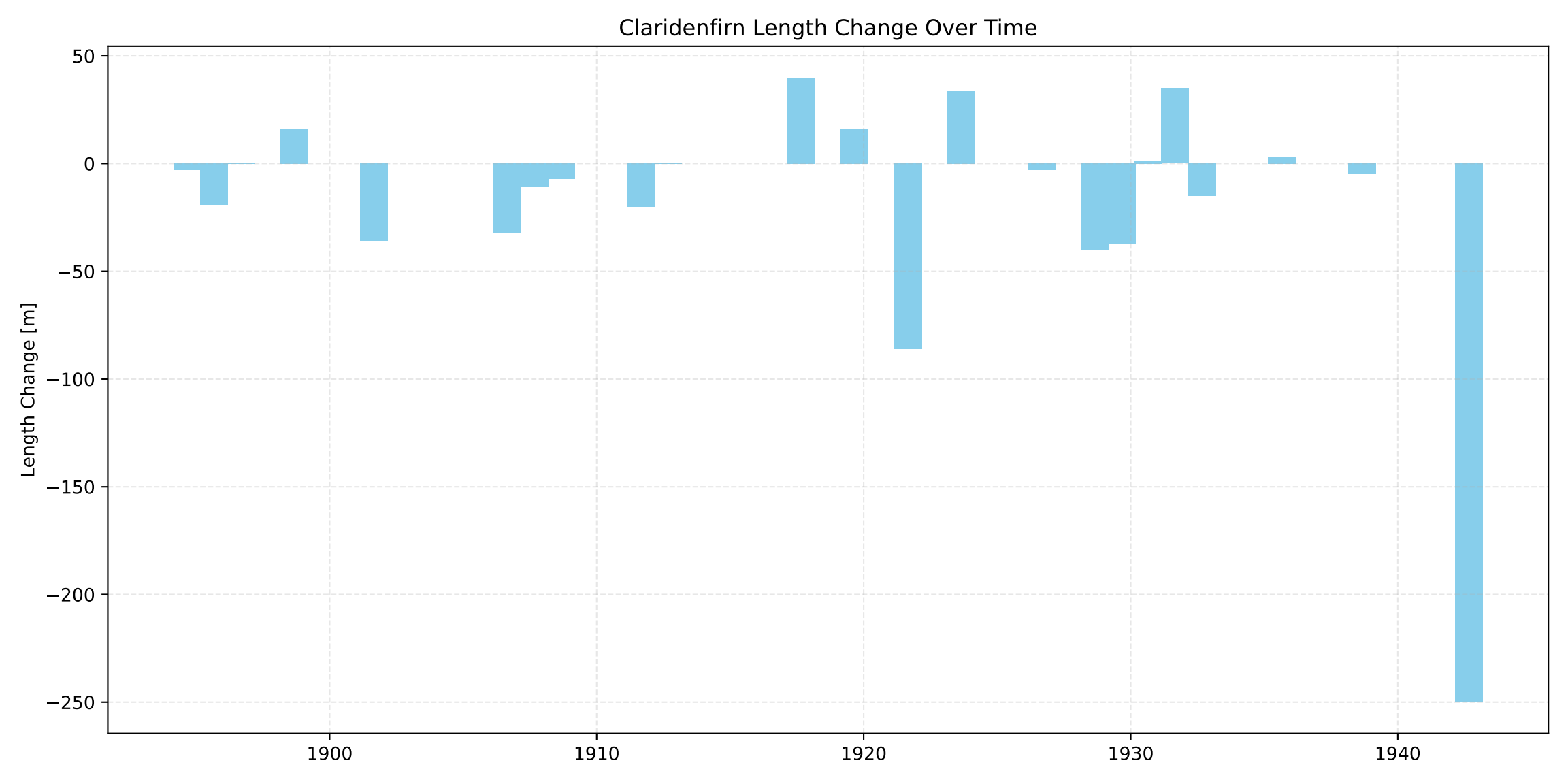
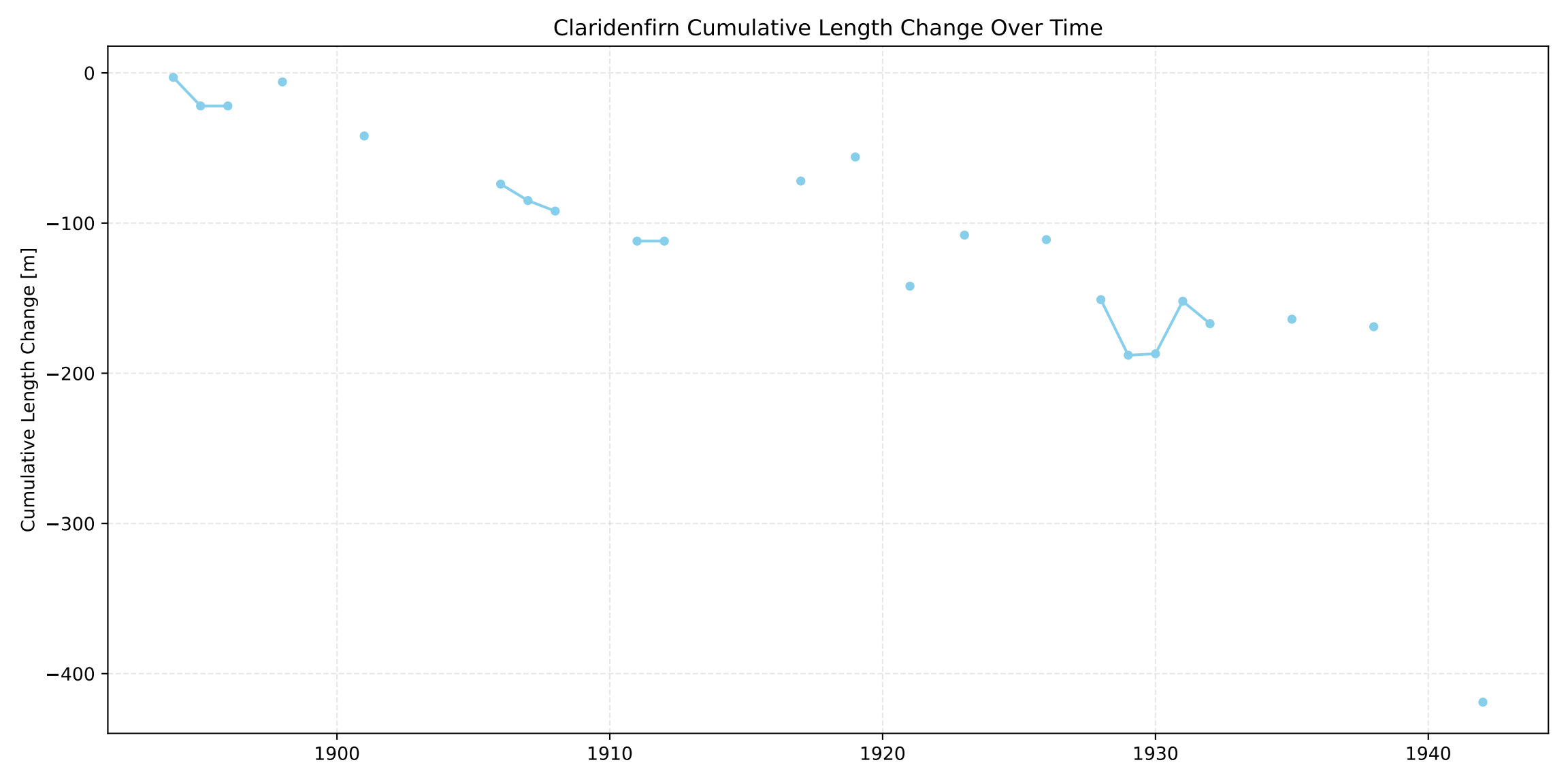
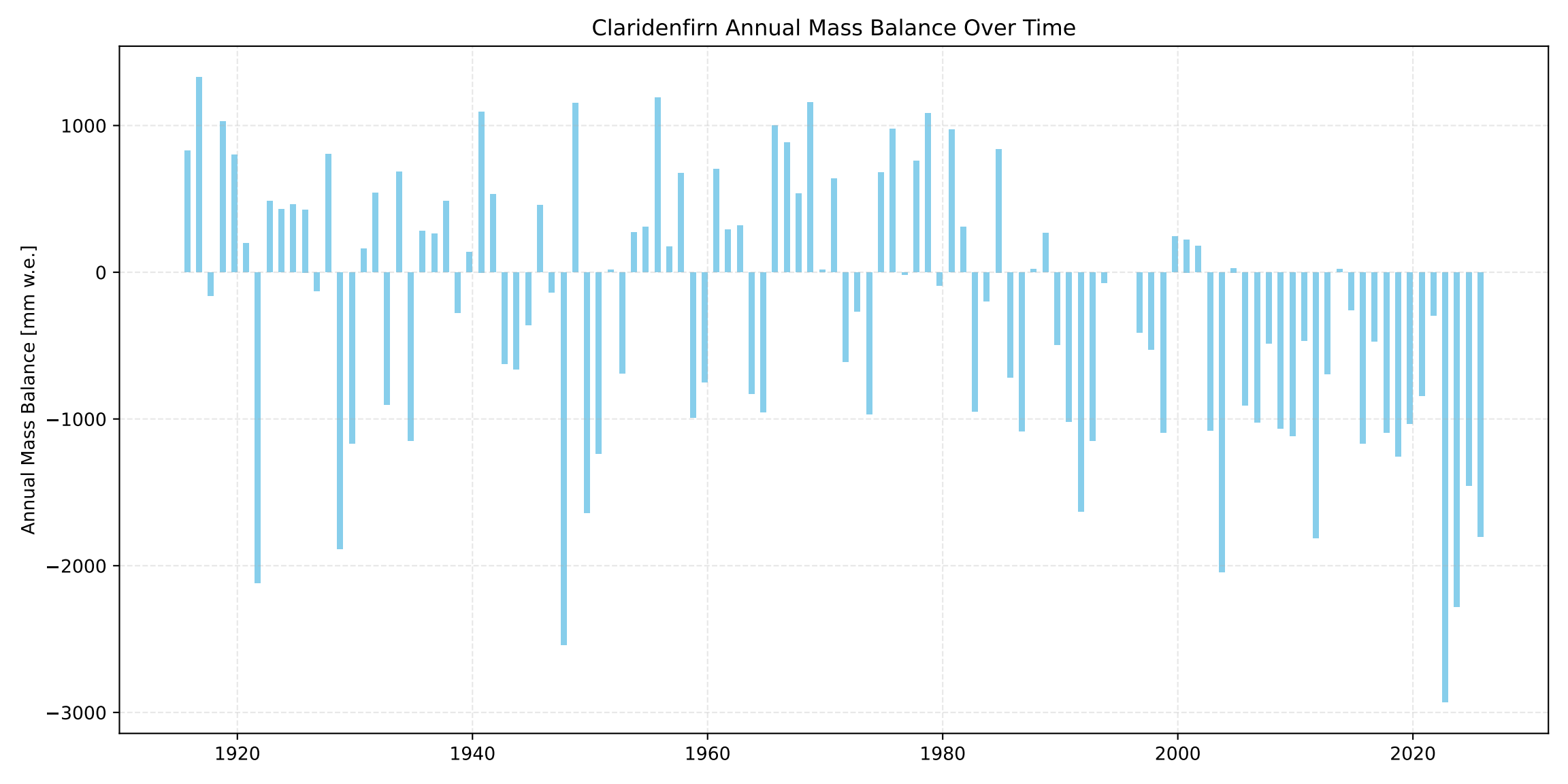
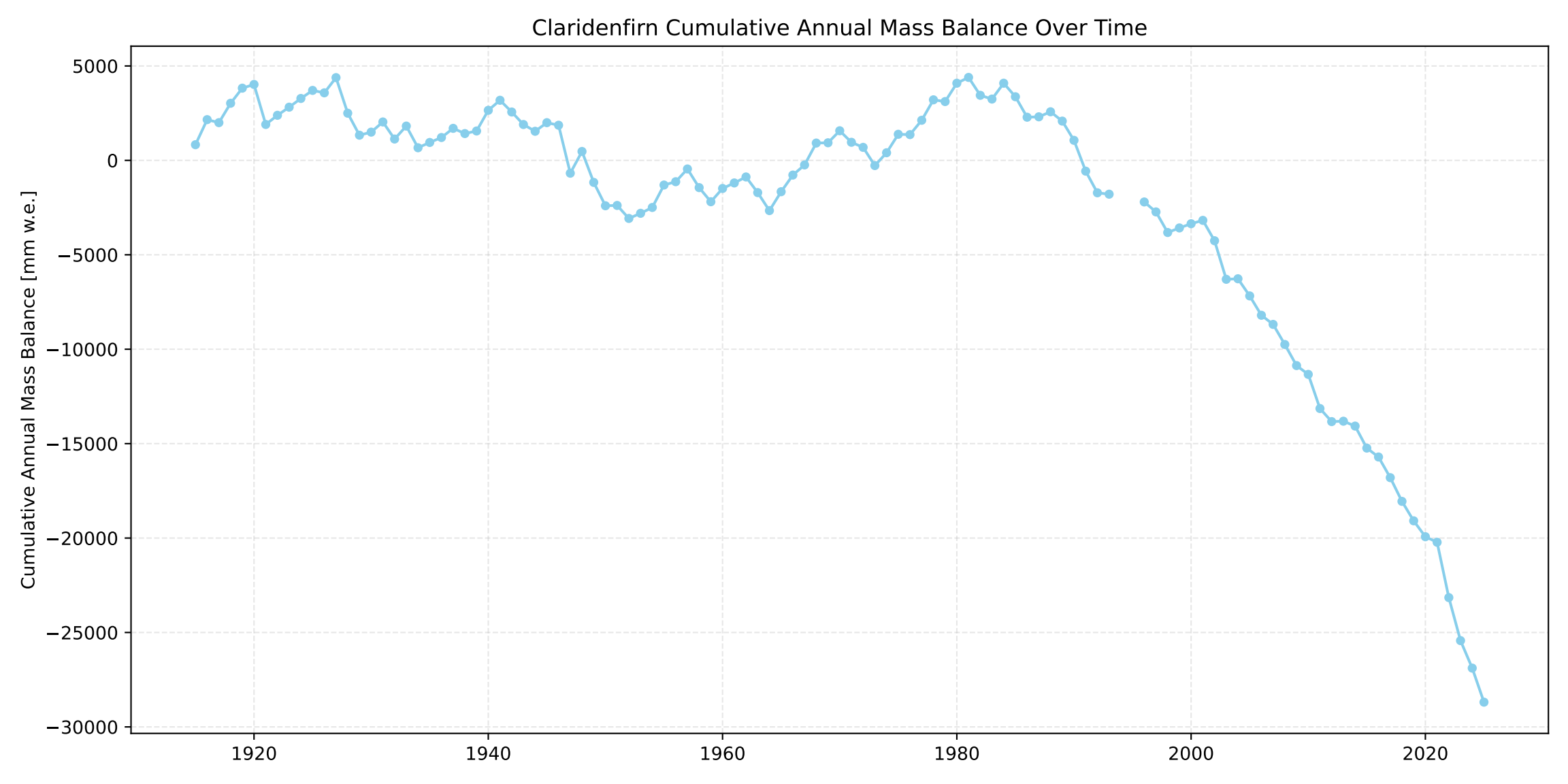
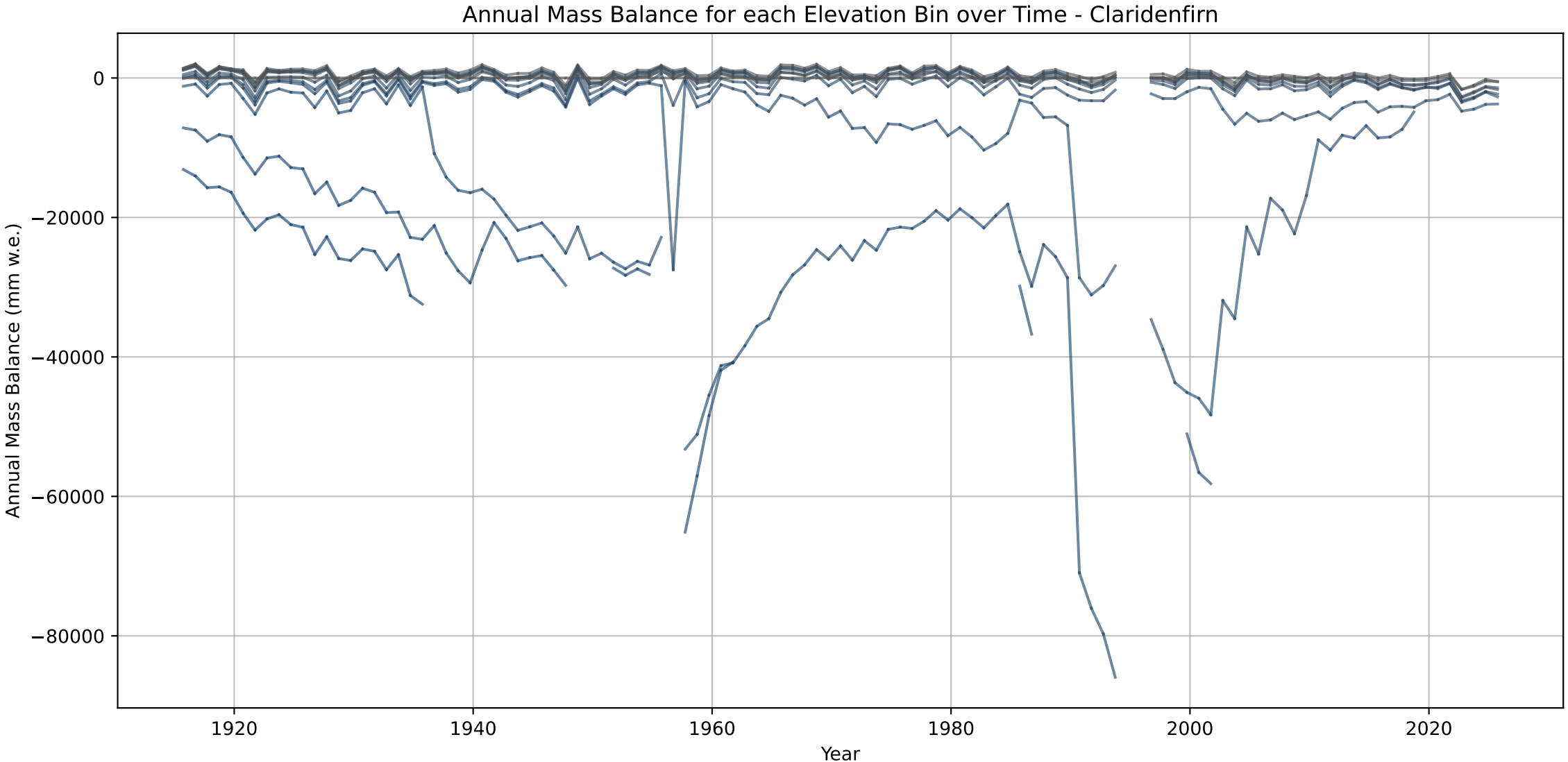
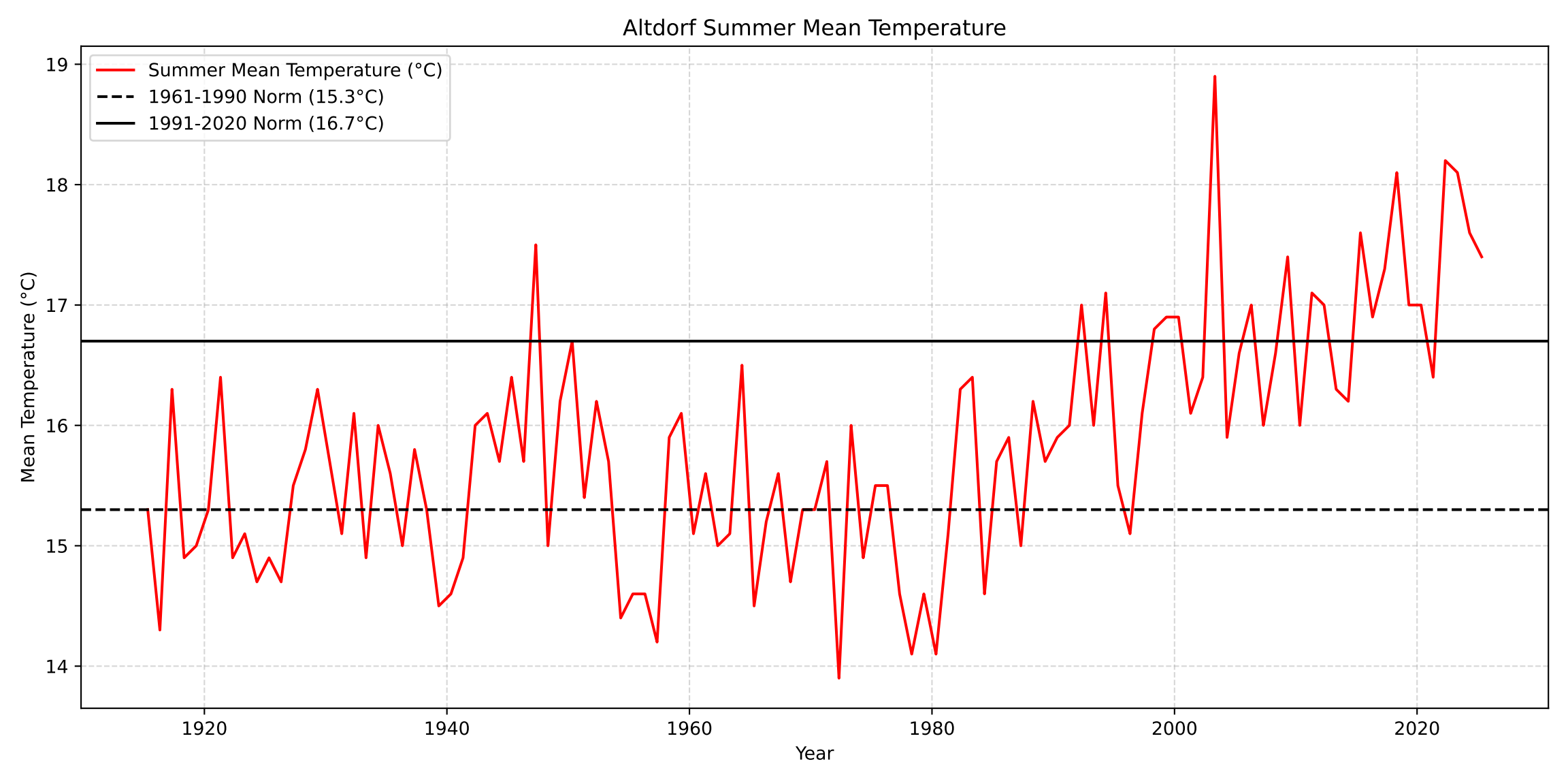

Claridenfirn Length Change Over Time
Length Change [m]
50
0
−50
−100
−150
−200
−250
1900
1910
1920
1930
1940

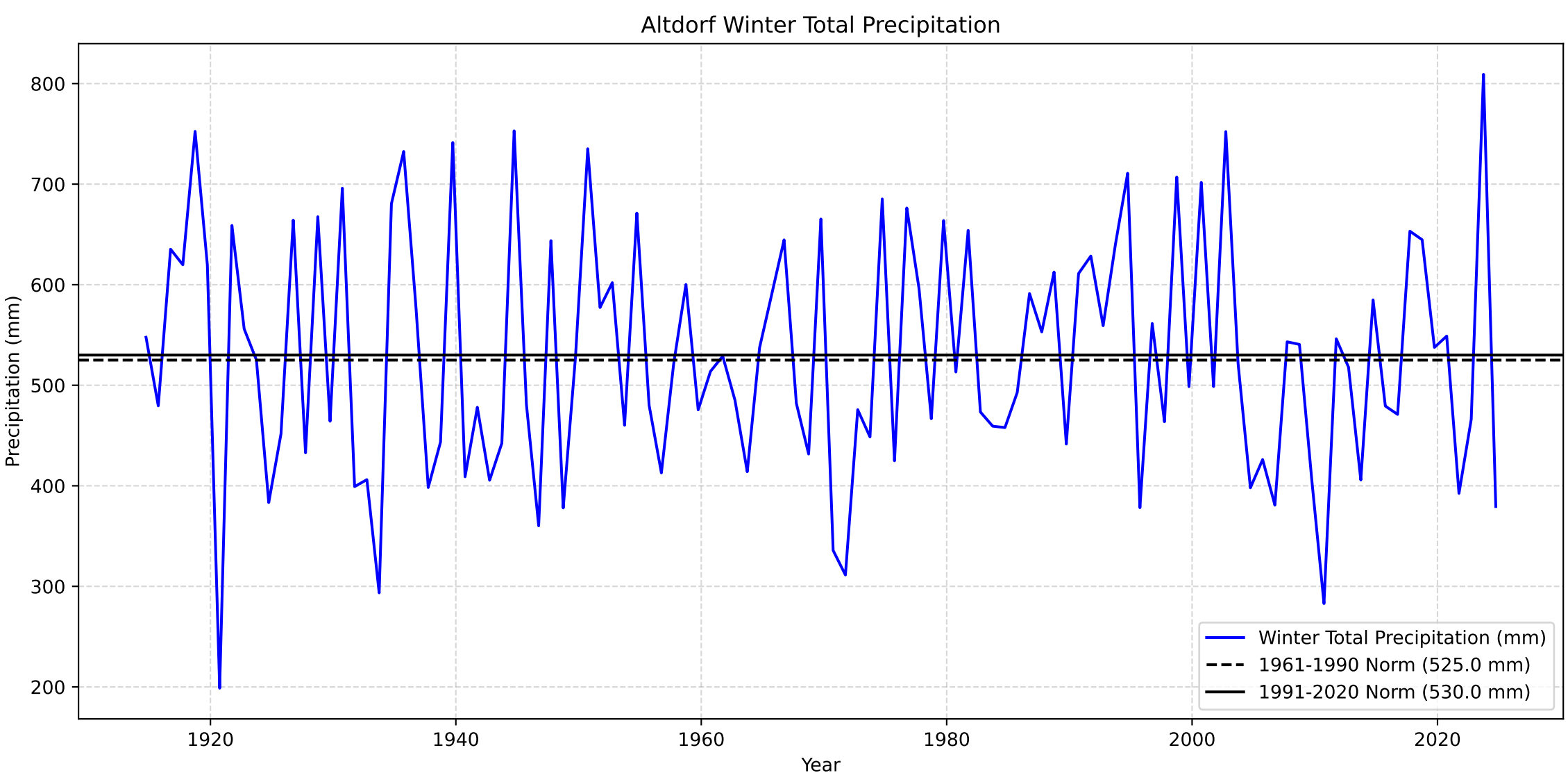

Claridenfirn Cumulative Length Change Over Time
Cumulative Length Change [m]
0
−100
−200
−300
−400
1900
1910
1920
1930
1940

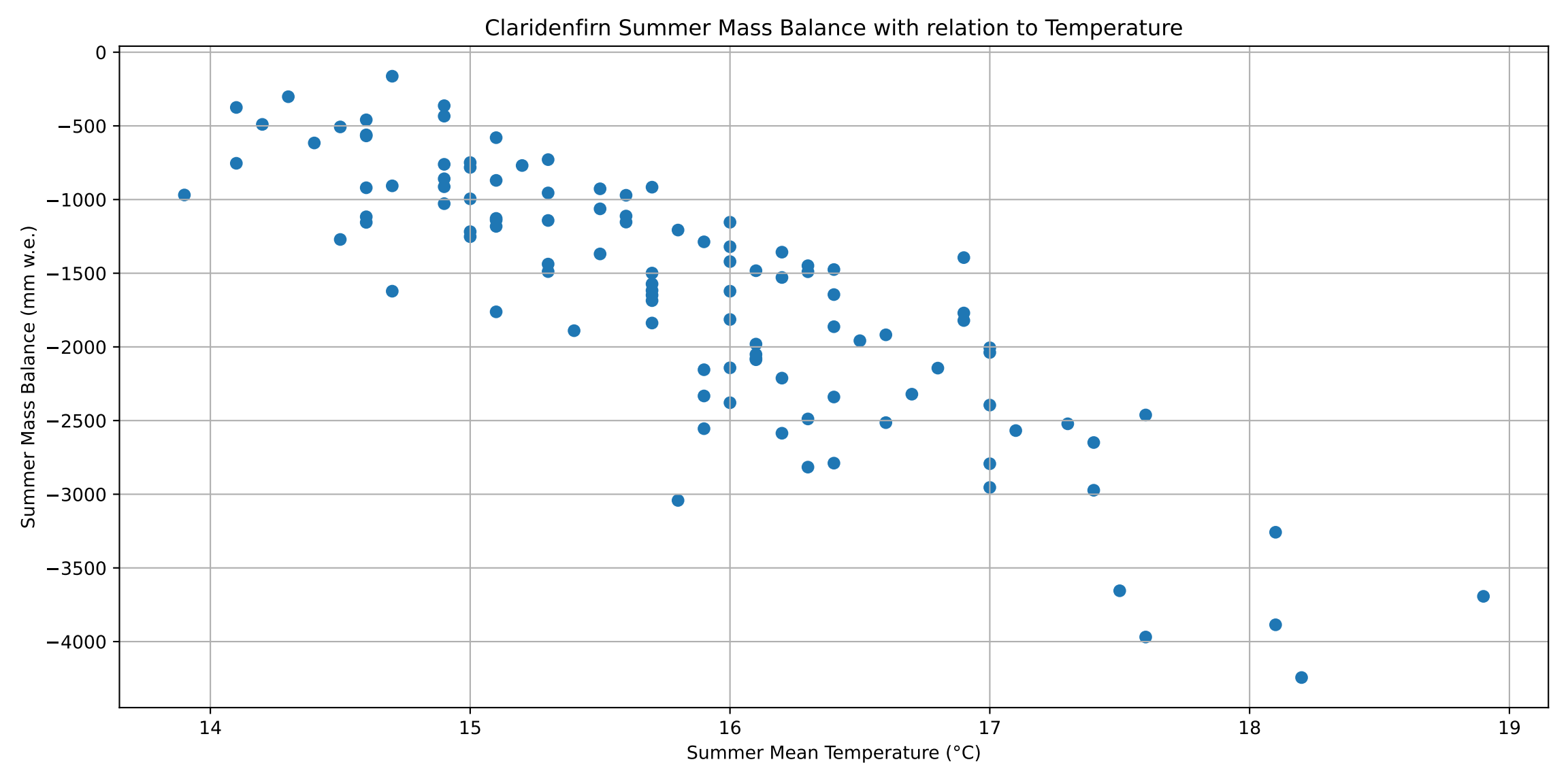

Claridenfirn Annual Mass Balance Over Time
Annual Mass Balance [mm w.e.]
1000
0
−1000
−2000
−3000
1920
1940
1960
1980
2000
2020

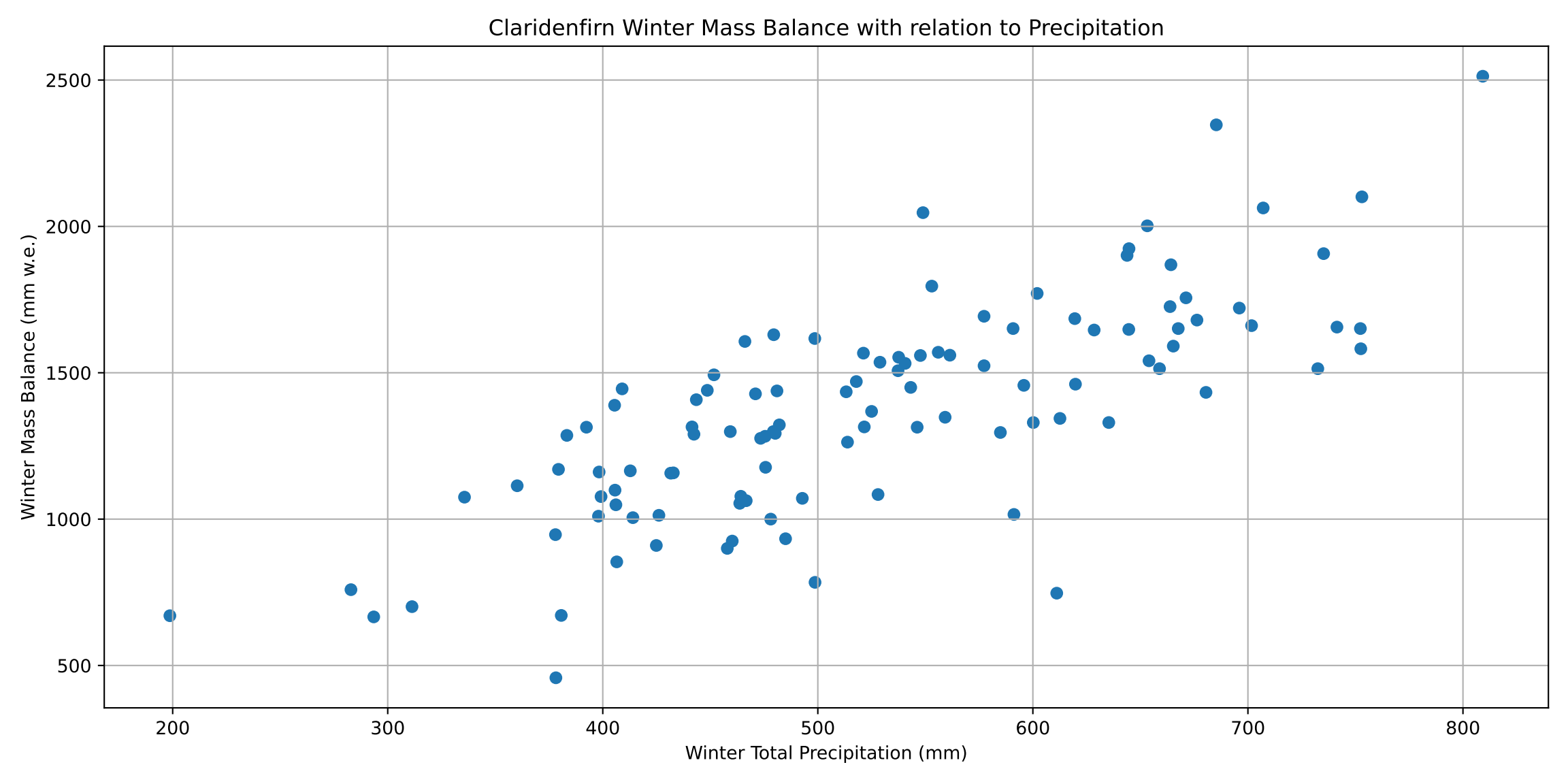

Claridenfirn Cumulative Annual Mass Balance Over Time
Cumulative Annual Mass Balance [mm w.e.]
5000
0
−5000
−10000
−15000
−20000
−25000
−30000
1920
1940
1960
1980
2000
2020


Annual Mass Balance for each Elevation Bin over Time - Claridenfirn
Annual Mass Balance (mm w.e.)
0
−20000
−40000
−60000
−80000
1920
1940
1960
1980
2000
2020
Year


Altdorf Summer Mean Temperature
Summer Mean Temperature (°C)
1961-1990 Norm (15.3°C)
1991-2020 Norm (16.7°C)
Mean Temperature (°C)
19
18
17
16
15
14
1920
1940
1960
1980
2000
2020
Year


Altdorf Winter Total Precipitation
Precipitation (mm)
800
700
600
500
400
300
200
1920
1940
1960
1980
2000
2020
Year
Winter Total Precipitation (mm)
1961-1990 Norm (525.0 mm)
1991-2020 Norm (530.0 mm)


Claridenfirn Summer Mass Balance with relation to Temperature
Summer Mass Balance (mm w.e.)
0
−500
−1000
−1500
−2000
−2500
−3000
−3500
−4000
Summer Mean Temperature (°C)
14
15
16
17
18
19


Claridenfirn Winter Mass Balance with relation to Precipitation
Winter Mass Balance (mm w.e.)
2500
2000
1500
1000
500
200
300
400
500
600
700
800
Winter Total Precipitation (mm)

Regression: Monthly 1961-1990

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

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

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:                           Fri, 05 Dec 2025   Prob (F-statistic):           2.55e-25
Time:                                   00:05:20   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.

Coefficient Interpretation:
Intercept (normal mass balance): 59.21 (p=0.2723)
may_td: -78.59 (p=0.0118)
june_td: -98.56 (p=0.0019)
july_td: -192.95 (p=0.0000)
august_td: -189.53 (p=0.0000)
september_td: -137.72 (p=0.0001)
october_pd: 3.71 (p=0.0002)
november_pd: 2.07 (p=0.0138)
december_pd: 2.23 (p=0.0164)
january_pd: 3.45 (p=0.0030)
```

Regression: Optimal 1961-1990

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

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

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:                     94.85
Date:                           Fri, 05 Dec 2025   Prob (F-statistic):           2.44e-24
Time:                                   00:05:20   Log-Likelihood:                -841.88
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            85.8759     60.914      1.410      0.162     -34.891     206.643
opt_season_td  -606.4413     48.442    -12.519      0.000    -702.483    -510.400
opt_season_pd     2.8707      0.511      5.615      0.000       1.857       3.884
==============================================================================
Omnibus:                        1.941   Durbin-Watson:                   1.774
Prob(Omnibus):                  0.379   Jarque-Bera (JB):                1.431
Skew:                          -0.252   Prob(JB):                        0.489
Kurtosis:                       3.246   Cond. No.                         133.
==============================================================================

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

Coefficient Interpretation:
Intercept (normal mass balance): 85.88 (p=0.1615)
opt_season_td: -606.44 (p=0.0000)
opt_season_pd: 2.87 (p=0.0000)

Variance Inflation Factors (VIF):
        Variable       VIF
0          const  1.313855
1  opt_season_td  1.000102
2  opt_season_pd  1.000102

R-squared: 0.6415
Adjusted R-squared: 0.6348
```

Regression: Seasonal 1961-1990

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

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

Number of observations: 109

Regression Summary:
                                OLS Regression Results
==============================================================================================
Dep. Variable:     annual mass balance (mm w.e.)   R-squared:                       0.721
Model:                                       OLS   Adj. R-squared:                  0.715
Method:                            Least Squares   F-statistic:                     136.7
Date:                           Fri, 05 Dec 2025   Prob (F-statistic):           4.49e-30
Time:                                   00:05:20   Log-Likelihood:                -828.30
No. Observations:                            109   AIC:                             1663.
Df Residuals:                                106   BIC:                             1671.
Df Model:                                      2
Covariance Type:                       nonrobust
================================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
--------------------------------------------------------------------------------
const        114.5984     53.269      2.151      0.034       8.987     220.210
summer_td   -710.8417     47.033    -15.114      0.000    -804.089    -617.594
winter_pd      2.6414      0.394      6.699      0.000       1.860       3.423
==============================================================================
Omnibus:                        3.392   Durbin-Watson:                   1.634
Prob(Omnibus):                  0.183   Jarque-Bera (JB):                2.839
Skew:                          -0.377   Prob(JB):                        0.242
Kurtosis:                       3.235   Cond. No.                         155.
==============================================================================

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

Coefficient Interpretation:
Intercept (normal mass balance): 114.60 (p=0.0337)
summer_td: -710.84 (p=0.0000)
winter_pd: 2.64 (p=0.0000)

Variance Inflation Factors (VIF):
    Variable       VIF
0      const  1.289019
1  summer_td  1.000000
2  winter_pd  1.000000

R-squared: 0.7206
Adjusted R-squared: 0.7153
```

Regression: Monthly 1991-2020

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

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

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:                           Fri, 05 Dec 2025   Prob (F-statistic):           2.55e-25
Time:                                   00:05:20   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.

Coefficient Interpretation:
Intercept (normal mass balance): -885.91 (p=0.0000)
may_td: -78.59 (p=0.0118)
june_td: -98.56 (p=0.0019)
july_td: -192.95 (p=0.0000)
august_td: -189.53 (p=0.0000)
september_td: -137.72 (p=0.0001)
october_pd: 3.71 (p=0.0002)
november_pd: 2.07 (p=0.0138)
december_pd: 2.23 (p=0.0164)
january_pd: 3.45 (p=0.0030)
```

Regression: Optimal 1991-2020

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

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

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:                     94.85
Date:                           Fri, 05 Dec 2025   Prob (F-statistic):           2.44e-24
Time:                                   00:05:20   Log-Likelihood:                -841.88
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          -842.3231     70.756    -11.905      0.000    -982.603    -702.043
opt_season_td  -606.4413     48.442    -12.519      0.000    -702.483    -510.400
opt_season_pd     2.8707      0.511      5.615      0.000       1.857       3.884
==============================================================================
Omnibus:                        1.941   Durbin-Watson:                   1.774
Prob(Omnibus):                  0.379   Jarque-Bera (JB):                1.431
Skew:                          -0.252   Prob(JB):                        0.489
Kurtosis:                       3.246   Cond. No.                         155.
==============================================================================

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

Coefficient Interpretation:
Intercept (normal mass balance): -842.32 (p=0.0000)
opt_season_td: -606.44 (p=0.0000)
opt_season_pd: 2.87 (p=0.0000)

Variance Inflation Factors (VIF):
        Variable       VIF
0          const  1.772729
1  opt_season_td  1.000102
2  opt_season_pd  1.000102

R-squared: 0.6415
Adjusted R-squared: 0.6348
```

Regression: Seasonal 1991-2020

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

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

Number of observations: 109

Regression Summary:
                                OLS Regression Results
==============================================================================================
Dep. Variable:     annual mass balance (mm w.e.)   R-squared:                       0.721
Model:                                       OLS   Adj. R-squared:                  0.715
Method:                            Least Squares   F-statistic:                     136.7
Date:                           Fri, 05 Dec 2025   Prob (F-statistic):           4.49e-30
Time:                                   00:05:20   Log-Likelihood:                -828.30
No. Observations:                            109   AIC:                             1663.
Df Residuals:                                106   BIC:                             1671.
Df Model:                                      2
Covariance Type:                        nonrobust
================================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
--------------------------------------------------------------------------------
const       -868.7667     62.142    -13.980      0.000    -991.969    -745.564
summer_td   -710.8417     47.033    -15.114      0.000    -804.089    -617.594
winter_pd      2.6414      0.394      6.699      0.000       1.860       3.423
==============================================================================
Omnibus:                        3.392   Durbin-Watson:                   1.634
Prob(Omnibus):                  0.183   Jarque-Bera (JB):                2.839
Skew:                          -0.377   Prob(JB):                        0.242
Kurtosis:                       3.235   Cond. No.                         182.
==============================================================================

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

Coefficient Interpretation:
Intercept (normal mass balance): -868.77 (p=0.0000)
summer_td: -710.84 (p=0.0000)
winter_pd: 2.64 (p=0.0000)

Variance Inflation Factors (VIF):
    Variable     VIF
0      const  1.7542
1  summer_td  1.0000
2  winter_pd  1.0000

R-squared: 0.7206
Adjusted R-squared: 0.7153
```