Predicting Cherry Blossom Bloom Dates Using Summed Temperatures

Forecasting the peak bloom of cherry blossom trees is an almost impossible task but is an important one in cities that host cherry blossom festivals. I utilized a simple method of comparing historical temperature data and peak bloom dates in Washington DC, Kyoto, Japan, and Liestal, Switzerland to develop a model that can predict bloom dates. The data was then extrapolated to Vancouver, British Columbia since there is a lack of historical bloom dates in that city.

I took the sum of squared temperatures starting at January 1st and ending at the bloom day of year for each year that data was available. Washington DC has the most erratic historic temperatures of the three cities that historical data was obtained for. The standard deviation of the accumulated temperatures from 1949 through 2022 was 1007.79 with a mean of 4851.1. Using this mean, I predicted a bloom date for 2023 by summing the squared temperatures through February 23rd and the forecasted temperatures until the sum reached the mean. With the unseasonably warm temperatures in the DC area in 2023 so far, the predicted bloom day was the 72nd day or March 13th. This would be the earliest bloom day of all of the years on record. The previous earliest being the 74th day in 1990.

Kyoto had the highest mean accumulated temperature at 5273.5 with a standard deviation of 759.48. They are also having a warm year so far, and this results in a predicted bloom day of year of 90. The mean bloom day of year since 812 CE is 104 with a standard deviation of 6.5. Narrowing the range of years to more recent years starting at 1953, we get a mean of 97 days with a standard deviation of 4.53.

Liestal had the lowest mean accumulated temperature at 4058.2 with a standard deviation of 752.64. Liestal has a mean bloom day of year of 101.1 going back to 1894 with a standard deviation of 10.98. If we reduce the range of years to 1954 though 2022, we get a mean of 98.25 and standard deviation of 11.83. Using the current temperature data and forecast for 2023 I predict a bloom day year of 106 or April 16th.

Vancouver only has 1 year of bloom data on record, so it is impossible to predict the bloom day using only data from that city. I took the mean of the accumulated temperatures in the other three cities as well as the mean bloom dates. This results in a mean of 4630.104 with a standard deviation of 541.106. The predicted bloom doy is 108 or April 18th.

Predicting the next 9 years is more challenging. I used simple linear regression to create the predictions and used the 9 most recent predictions generated by the predict function in R.

Creating predictions for bloom dates for these flowers is very challenging and I am looking forward to seeing how accurate my predictions turn out to be.