MNXB01 Project

Thomas Eriksson, Emil Johansson, Albin Jonsson, Saeid Pirani

November 11, 2018

Lund University

1 Comparison of Coastal and Inland climates

For the task not listed in the project description, a comparison is chosen. The idea is to compare the measurements of Visby, located on the small island of Gotland, to another set of measurements taken at an inland location. The produced histogram should thus highlight the differences of the two locations.

One way in which the temperature of coastal regions differs from those more inland is that the temperature changes overall more slowly. This is due to the large body of water acting as either a massive heat reservoir in the autumn of taking large amounts of energy to heat up in spring. Thus, one way to compare the locations would be to plot the temperatures in these transitional months of the year and see the temperature difference.

The second location is chosen to be Boras. It is chosen as it is of approximately the same altitude as Visby and is not a coastal city.

1.1 Code structure

To achieve this, the first step is to read the data. The method used is the **getline()** command, that saves the important data to strings which are then converted to integers and doubles. Before this, in order to make the data in the .csv file more manageable, a bash script is called with the **system()** function. The goal is to trim away all unnecessary text and only leave measurements of green quality marking.

This is all done in a while-loop, which can also be used to extract the temperatures of desired dates. As the only distinction needed for this comparison is to pick out measurements originating from a chosen month, a simple if-statement separates these from unwanted ones. A small script inside the statement calculates the temperature average for each day. These averages are then added to the histograms. To demonstrate more clearly the differences in temperature between the locations each histogram is fitted to a Gaussian function.

1.2 Results

When plotting the results of the comparison in May month, figure 1 is created. As is easily seen, Boras tends to have higher temperatures than Visby during this period. While this coincides with the hypothesis, it alone does not prove it.

To further strengthen the hypothesis the temperature difference in autumn must also be investigated. In figure 2 the temperatures for the two locations in September are shown.

Here, as predicted, Boras has the lower temperature. The water retains the heat of summer, causing Visby to decrease in temperature more slowly than for inland locations.

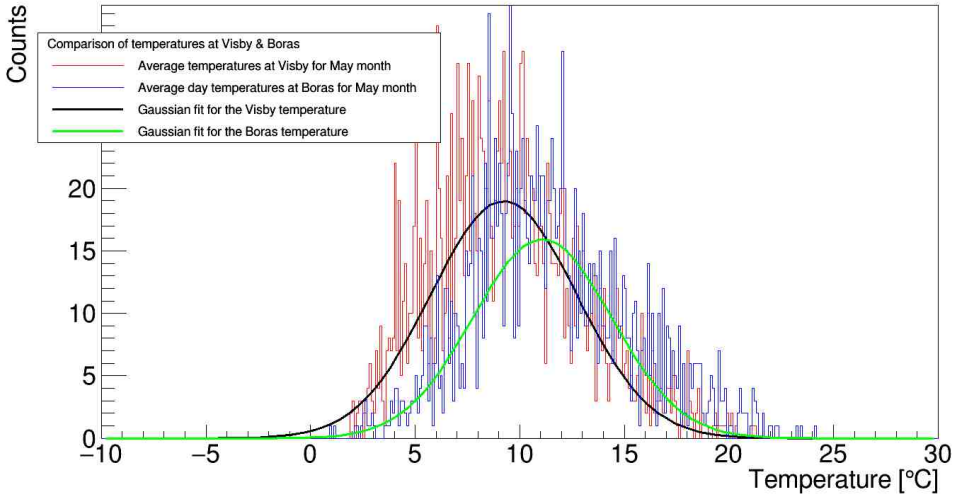

Figure 1: Comparison between the Visby and Boras temperatures in May

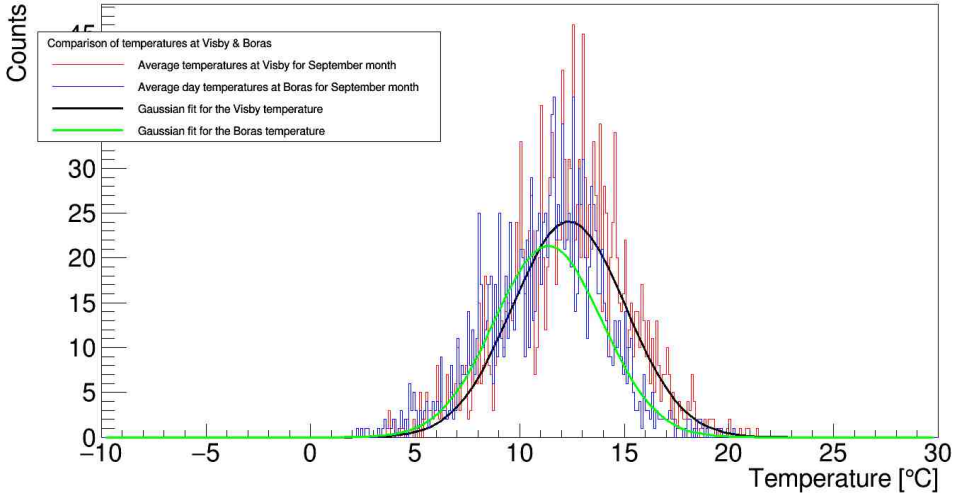

Figure 2: Comparison between the Visby and Boras temperatures in September

2 The warmest and coldest day of each year

In this work measured temperature data between 1961-2015 years for Lund have been gotten as input data then coldest and warmest days in each year are extracted and plotted by Root as the output of project in this section. It is illustrated that how appearance of coldest and warmest days are changed during the 1961-2015 period.

2.1 Code structure

In the 1st step, Bash scripting is performed in order to extract practical data from available "smhi-opendata-Lund.csv" file. Bash output provides required data in separate .txt files as: year.txt, month.txt, day.txt, time.txt and temperature-01.txt, this separate data file extraction strategy is for possible error checking. Only G data have been extracted and Y data considered as low quality data. In the 2nd step C++ coding is performed to process imported data in order to extract coldest and warmest days of each year. These data will tell us variation in appearance of coldest and warmest days in different years. C++ section outputs are stored in two .txt files as "WarmestDaysHist.txt" and "ColdestDaysHist.txt". In 3rd step provided .txt files from C++ are used to fill histograms, fitting histograms provide mean values as expected day for happening of coldest or warmest day in the year based on available statistics.

2.2 Results

Figure 1 shows plotted results in Root for Variation of coldest and warmest days in different years between 1961-2015. Black lines show Gaussian fit, for warmest days it lead to mean value=196.5 which it is the predicted warmest day during a year in Lund. Following bulleted issues which are requested to be covered by performing this project are done except the fitting part related to Coldest days and getting mean value for Coldest days.

- Create histograms of the warmest and coldest day each year.
- Predict when the warmest and coldest day is most likely to occur.
- Can you show both histograms in the same plot?
- Can you make a t function that wraps around as in Figure 3?

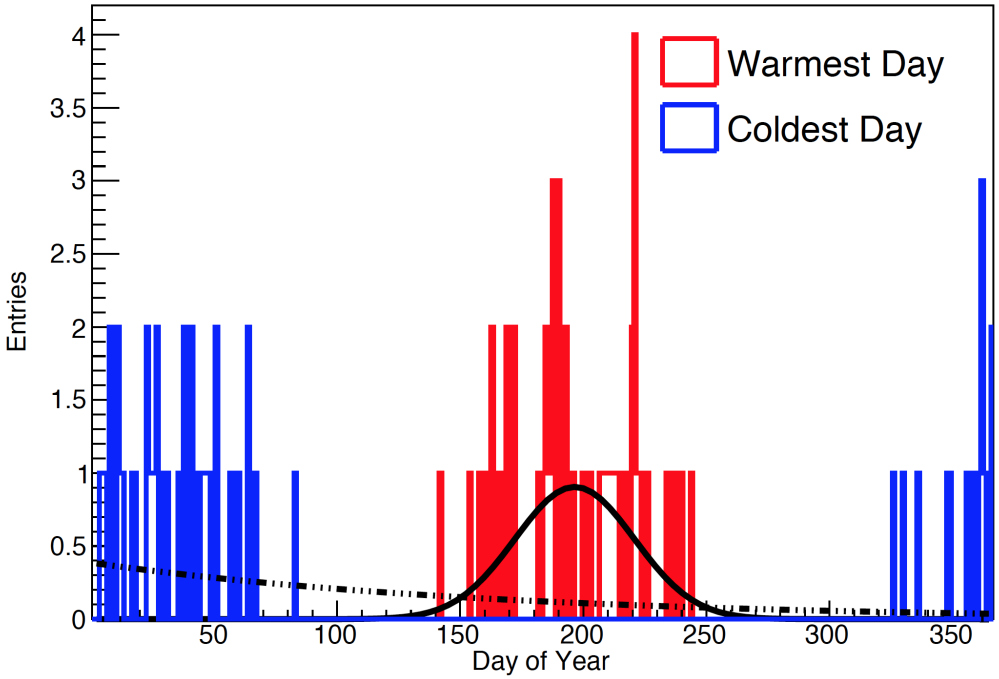

Figure 3: Variation of coldest and warmest days of year between 1961-2015. Black lines shows Gaussian fit