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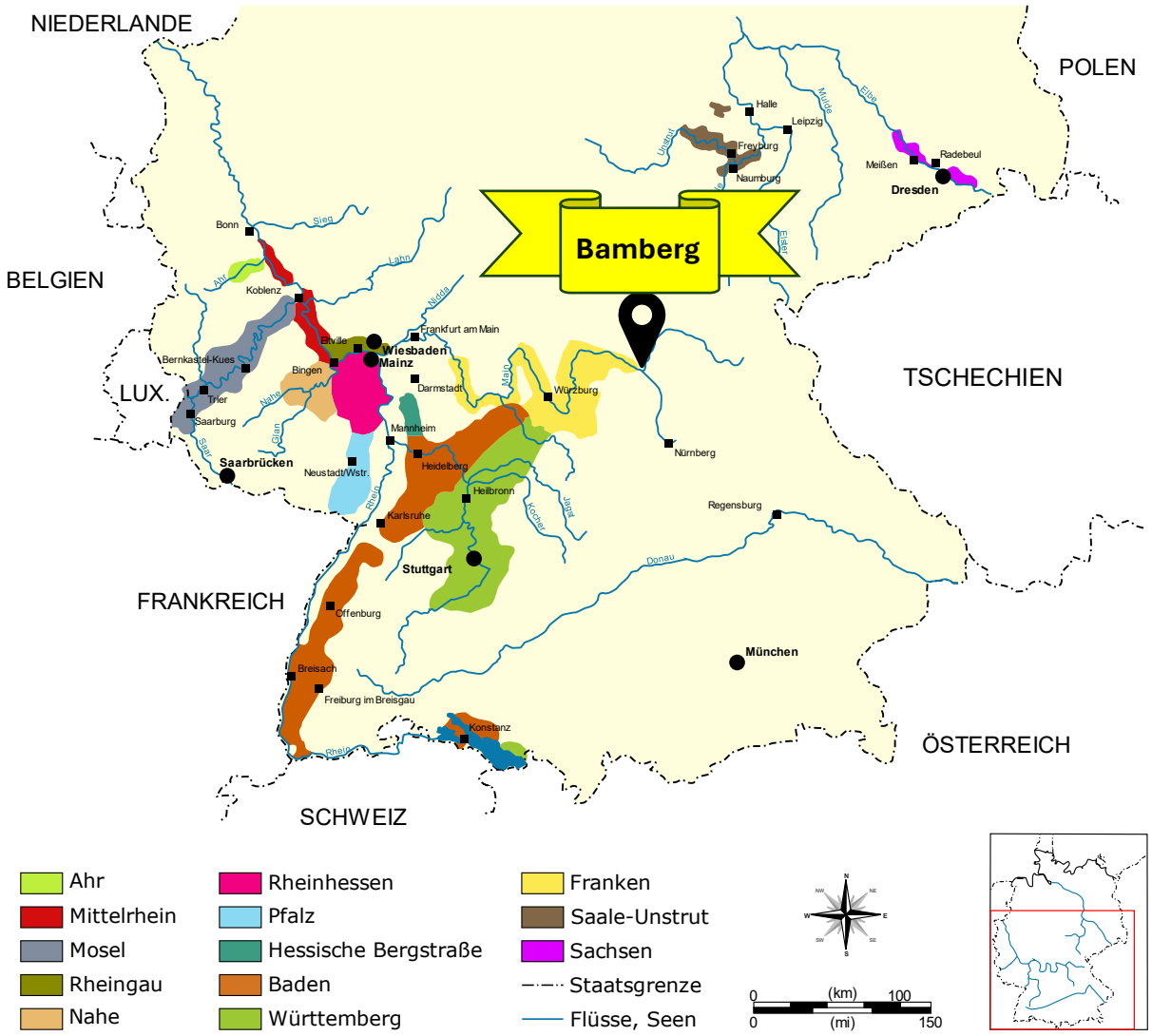
Can Franconia's wine region now include Bamberg due to warmer weather?

Despite the negative effects of climate change, some wine varietals thrive in warmer climates. For instance, Bamberg, once a wine-producing region, could potentially regain its former status due to rising temperatures. We compare the climate of nearby Wuerzburg, at the heart of the Franconian winemaking region, to Bamberg's which is currently just outside of it.



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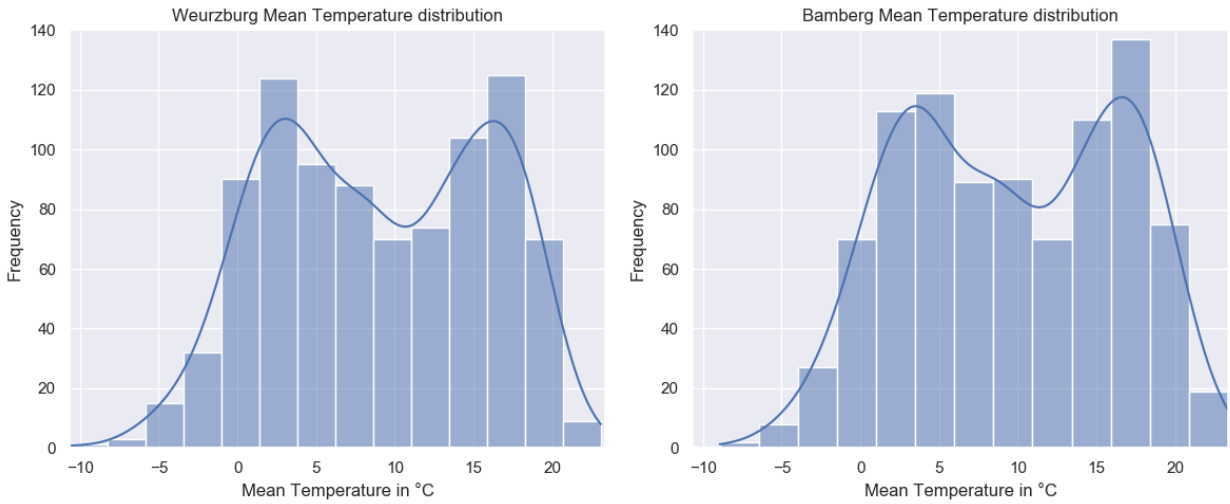
The Data

The data was obtained from the Deutscher Wetterdienst and includes readings from 2 stations, one in Wuerzburg and the other in Bamberg, from 2 meters above ground. The temperature readings are in Celsius (C) and the rainfall readings are in millimeters (mm).

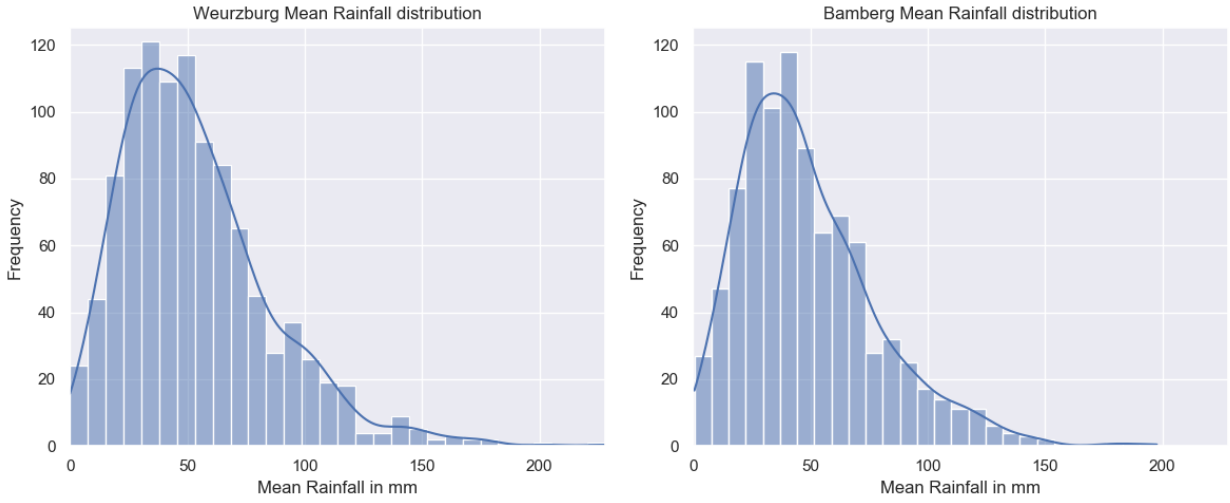
First, we check to see if there are any visual similarities between the two distributions. We compare the monthly mean of daily temperature means at both the Wuerzburg and Bamberg stations.



Histogram of monthly mean of daily temperature means from 1940's - 2023

They follow a similar frequency pattern. While Wuerzburg seems to have a peak around 2.5 C, this is likely due to the histogram buckets and minor variations.

Rainfalls also shows a similar pattern.



Histogram of monthly total precipitation height from 1930's - 2023

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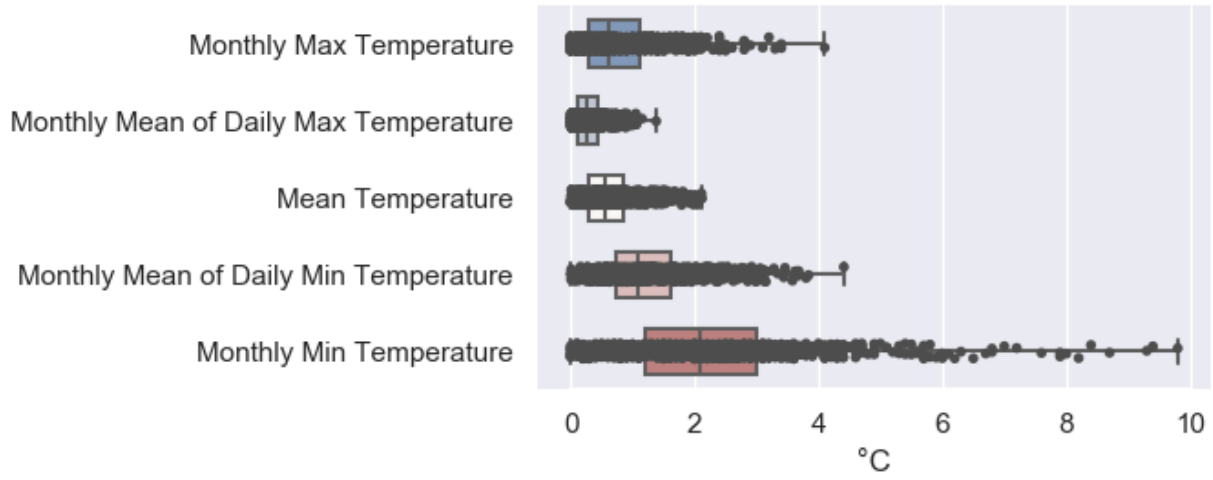
Analysis

Next, we analyze the (absolute) difference in features between the two stations.



Box plots of absolute temperature differences each month between Wuerzburg and Bamberg from 1949 – 2023

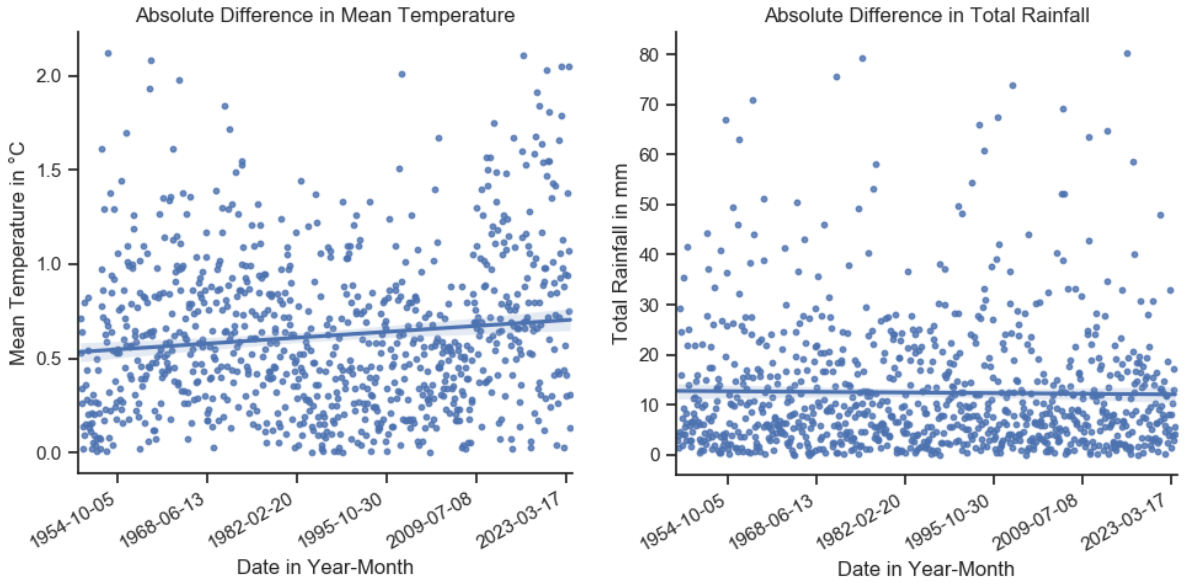
On the whole, there is less than 2 degrees difference between the two cities. The notable exception is the monthly minimum temperature which is an indication that the two cities may have a significant difference, on occasion, of the coldest days of their months.

Winegrapes are rather sensitive to freezing temperatures and according to the data, Bamberg had 564 months with a day below freezing, which is around 63 % of its months on record whereas Wuerzburg had 515 months with a day below freezing, which is around 56% of its months on record.

It may very well be the case that Bamberg is still too cold to grow vineyards at the same yield or quality as Wuerzburg. If that's the case, is there a trend towards change?

Below are regression lines superimposed on scatterplots of the difference between some key factors. An upward or positive trend on the regression line means the difference between the two regions is growing.

It appears that the mean temperature is slightly trending towards a shift of over 0.5 degrees C between the two cities. However, upon closer inspection, one can see that this may be a quirk of the underlying pattern in the data, as can be seen by the scatterplot on the left. To total rainfall appears to be steady with a difference of around 12 millimeters on average.



Absolute difference in mean temperature and total rainfall between Wuerzburg and Bamberg from 1949 – 2023

Finally, we take a closer look at the monthly temperature minimum, where we find that not only is the difference greater than the mean temperature difference (at about 3 degrees C) but that it is trending positively towards a bigger gap in the future.

Conclusion

There is evidence to suggest the temperature and rainfall of Bamberg is similar to Wuerzburg. Freezing temperatures remain a concern however, as grapes tend to be sensitive to frost and there is some difference in this regard between the two cities.

Further research is needed on the fragility of the varietals grown in the Franconian wine region to determine if a 3 degree C shift towards a colder climate will have a significant effect.