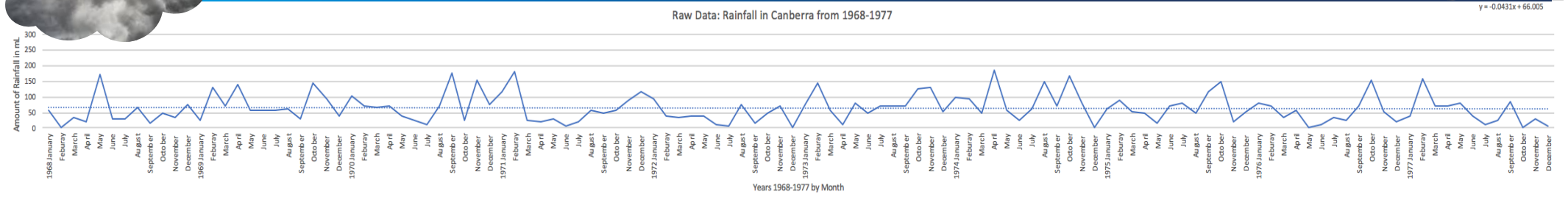
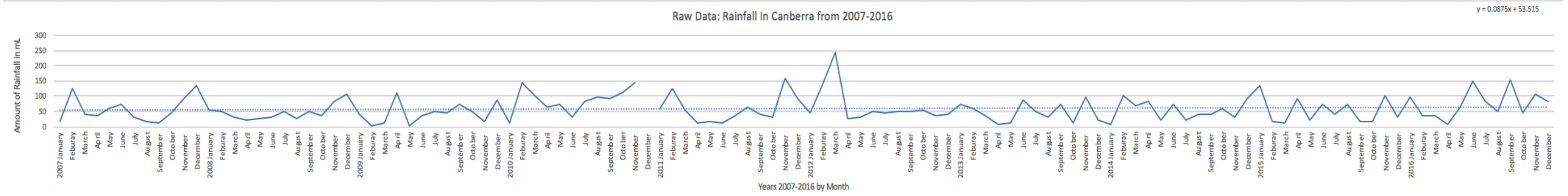
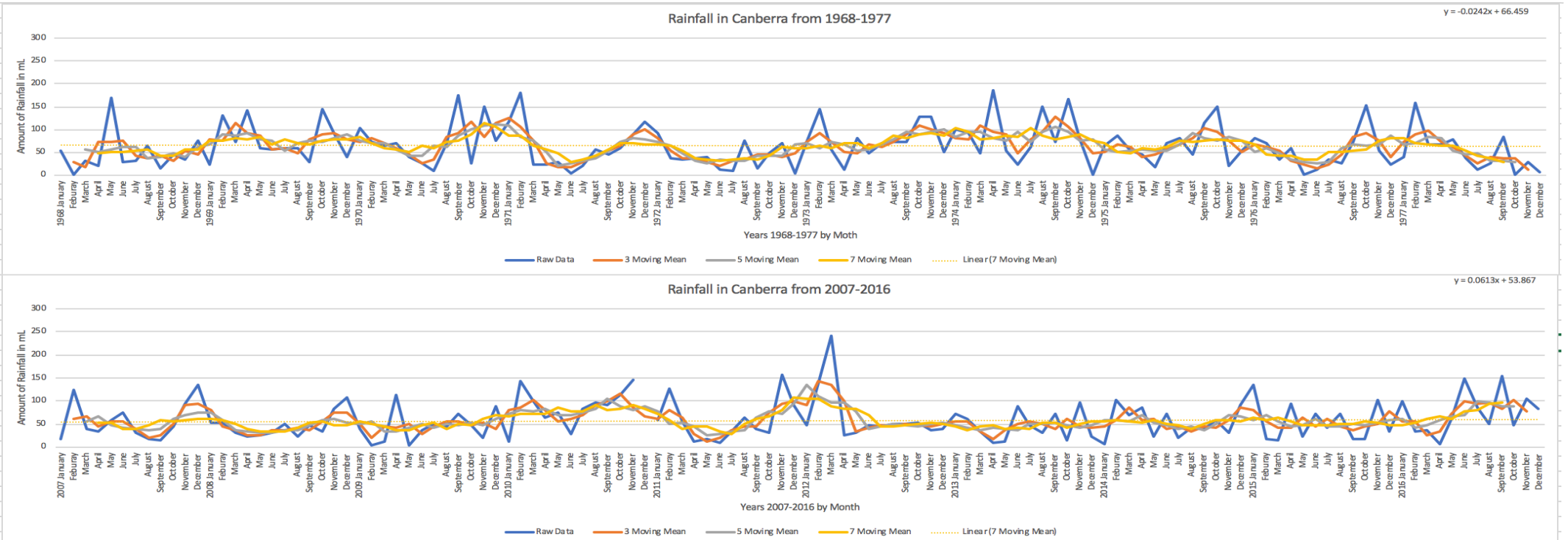
Has Rainfall in Canberra Decreased Since 1968?







Introduction

The data used for this project is from the Bureau of Meteorology. The reason behind the choice of data is because it showed multiple years of rainfall in monthly increments, which shows continuous data in numerical increments. Current research also from the Australian Bureau of Meteorology and Climate Change In Australia shows that Australia is getting drier and that rainfall had declined 11% since the mid 1990s (Meteorology, 2018). Climate Change in Australia also shows that sea surface temperature is rising as well as general land temperature. It also states land temperatures effect on rainfall, with a decline in rainfall as land temperatures rise (Australia, 2018).

The sample size of this data is from one sample area of Canberra, meaning that it only shows the rainfall around the area of data collection. This means that it could potentially not concern the whole of the city. The two variables shown on all graphs are time, shown in years and months, and amount of rainfall, shown in milliliters. The hypothesis for this project is that, in comparison to the first group of 10 years, 1968-1977, the second group of ten years, 2007-2016, will show a decrease in the amount of rainfall in Canberra.

Data Explained

The four graphs seen are split into two groups the raw data graphs and the smoothed data graphs. The top graph of both pairs of data are years 1968-1977 and the lower graph of both pairs are years 2007-2016. All graphs have the y and x axis, The x-axis on all graphs are the years shown in monthly increments, while the y-axis is the amount of rainfall shown in milliliters. The smoothed data graphs also include 3-moving mean, 5-moving mean and 7-moving mean data.

Conclusion

The findings from the analysis of the data show that while rainfall in Canberra decreased at the end of the 1977, it has turned upwards by the end of 2017. The data also shows that from June 2012 the rainfall cycle of highs in November and December and lows in June have not been present, with low rainfall year-round. However, this low rainfall is on a slight increase, leading to positive overall trend. This is all seen in the 7-mean smoothing of the data. This is because that the mean smoothing shows the clearest image of the data's trends and seasonal trends. The summaries of the data can be connected to the research. With the annual rainfall being on average lower, this is reflected in the research with drier days on average. Other factors that could be worth more investigation would be to do a comparison between the amount of rainfall and the humidity for these times or a comparison between the amount of rainfall and the amount of snow levels in previous seasons. This could be interesting to see if there is a correlation between the 2. While the process to find the raw data, 3, 5, and 7 smoothing was easy, this cannot be said for deseasonalizing data. To deseasonalize the data the steps were confusing and I had to redo the process a few times to get it correct. To do an analysis of the data was easy because the smoothing shows clear trends.

Analysis of Data

The Raw Data from 1968 – 1977 shows a negative trend, there is a subtle seasonal spread with a rough high around December and low in June. No cycle or structural changes can be viewed. The Raw Data from 2007 – 2016 in contrast has a positive trend, there is also a subtle seasonal spread with a rough high around December and low in June. No cycle or structural changes can be viewed.

The Smoothed Data 1968 – 1977 shows a negative trend. There is a strong seasonal trend with a peak in Nov/Dec and slump in June/July. A cycle that can be viewed, shows the seasonal trend occurs every year. There is a large structural change where there is on average higher rainfall during winter months in the years June of 1973 – to May of 1975. The Smoothed Data 2007 – 2016 shows a positive trend. There is a strong seasonal trend with a peak in Nov/Dec and slump in June/July. A cycle that can be viewed, shows the seasonal trend occurs every year. There is a large structural change where there is less rainfall on average for spring through autumn in the years June of 2012 – to May of 2016. When the data from both the 1968-1977 and 2007-2016 set were deseasonalized it didn't smooth the data to be able to see a trend. It was for this was the reason why the moving mean method was picked to smooth the data.

In the 1968 – 1977 smoothed data set, during June of 1973 – to May of 1975 there was an increase in rainfall because there was due to an accumulation of high rainfall through out those years. In the 2007 – 2016 smoothed data set, there was a peak in march 2012 due to storms for that month, and the low rainfall in 2012-2015 was caused by an extended drought.

There are two different outliers present in the data, they are December 2010 and March 2012. The December 2010 outlier can be explained as an absence of data, due to an error. An error that could occur in the data could have been due to mis-calculation of rainfall, faulty equipment or plain electronic error. The March 2012 outlier was due to an exceptional rainfall. That month is on record as having the 3rd highest rainfall of all Marchs in recorded Australian history (Meteorology, 2018).

To extrapolate using the line of best fit equation from the 2007-2016 data set, the rainfall for December 2017 would be 65.24 milliliters of rain. In comparison the actual amount of rainfall in December of 2017 was 112.9 milliliters. This estimate of what rainfall of December 2017 could look like (that is 65.24 milliliters), shows that it is only an estimate and that weather in of itself is unpredictable and makes for bad long-term predictions.