**P4DS Coursework 3 Outline: Global Warming and the UK**

**Objective**

To use MetOffice data to investigate what evidence there is that average temperatures are rising in the UK, and whether this is associated with changes in rainfall/temperature and maybe sunshine patterns.

**Hypothesis**

UK temperatures have been rising on average. Since this implies higher energy in the atmosphere, this is associated with more extreme weather events (more heatwaves and intense periods of rainfall, and possibly more rainfall overall).

**Data**

There are freely available datasets (as text files) from the met office at the level of the whole UK, monthly. These cover mean temperature, rainfall, number of rainfall days, and number of sunshine days. Our current version already has these.

Additional data is available with daily resolution, on a grid over the UK that would allow finer resolution (for example, “Yorkshire rainfall over a rolling week”), but (a) you need to be registered (which I (David) am), (b) this data is in .nc format, (c) there are separate files for each year, and (d) it potentially is a HUGE dataset.

**Specific Objectives**

1. Test whether mean temperature has been higher in recent years than in the late years of the 19th century. Temperature data will be obtained, converted into a PANDAS data frame, cleaned, and graphs plotted for different months, seasons, and the whole year. Mean temperatures (and standard deviations), and Linear correlations will be obtained for different time periods, to assess whether (a) the mean temperature has risen over the last ~100 years (e.g. by t test), and whether the rate of change is significantly different. Data will be presented as summary statistics, and graphs, perhaps using rolling averaged data to smooth out severe annual fluctuations. If daily/local temperature data can be obtained, then it will be analysed to determine whether there are more “heatwaves” (periods of several days where temperatures are above a threshold, and/or substantially higher than the mean).
2. Test whether rainfall patterns have changed over the last ~100 years. An approach similar to that described for (1) will be used to investigate whether there have been annual or seasonal changes in rainfall pattern. If daily/local rainfall data can be obtained, then it will be analysed to determine whether the intensity of rainfall has increased (i.e. peak rainfall over one, or a few consecutive, day(s)).
3. Test whether sunshine patterns have changed over the last ~100 years. As for 2.
4. Test whether particularly high/low temperatures correlate with more intense rainfall/sunshine. This will probably require more detailed data than the basic monthly set. Correlations between different data sets will be used toinvestigate if there are consistent relationships between them, and whether the balance is changing with time.