Weather station analysis laboratory

The aim is to quality control, analyze, intercompare, and interpret data gathered during the deployment of the Davis weather stations throughout the quarter.

Specific tasks:

There are **two parts** to this lab, which will be written up in the form of a formal report (as with the temperature lab at the beginning of the quarter).

The first part is compulsory, and focuses upon intercomparisons between the different weather stations, and between the stations and the data collected by the department weather station situated on the roof of the ATG building. This first part requires data sharing between all the groups operating weather stations.

The second part allows more flexibility for each group to decide what to focus on. Each group should choose analyses of interesting features in the data, and use external data of various types to aid the interpretation. Examples are given below.

The aim is for each group to collaborate in the analysis, but then for each person to write an independent laboratory report that details the analysis. Equal weighting is given to the analysis of the first and second parts.

PART 1: COMPARING STATIONS WITH EACH OTHER

This part requires a quantitative intercomparison of the data from the different stations. Each group should have logged data at 30 minute intervals in accordance with the instructions[1] provided prior to the set-up period. Each group should provide a text file with their data in to the data sharing site[2].

Each group should acquire the data from everyone else's stations and align these in time either in Excel or in Matlab. Missing Davis data should be clearly labeled as missing. This should be done for the temperature, wind speed, and precipitation. Periods of overlap between different stations should be chosen. Ideally, there will be a reasonably long period where data from all the stations is available. If so, this section of data should be chosen for intercomparison analysis.

In addition, ATG rooftop weather station data (not the Davis) should be obtained from the departmental site: *http://www-k12.atmos.washington.edu/k12/grayskies/nw_weather.html*. Use the spreadsheet option (tick-box on right of screen). This gives data every one minute, which you should average to give half hourly data. Note that the time is given in date and time in the second column.

Correlation, bias, and offset tables should be constructed of the correlation between each station and every other station, like this.

Table: Temperature correlation coefficient between different stations

Station	ATG rooftop	Davis 1	Davis 2	Davis 3	Davis 4
ATG rooftop					
Davis 1					
Davis 2					
Davis 3					
Davis 4					

[1] See http://www.atmos.washington.edu/~robwood/teaching/451/labs/weather_station_cheatsheet.pdf

[2] https://catalysttools.washington.edu/sharespaces/space/joelt/5141

Similar tables should document the gain biases between stations, and the mean offsets.

These tables will immediately allow you to see how different stations compare with one another, both in the degree of closeness in the records (correlation), and if there are gain biases (as might be the case with wind speeds) and mean offsets (as there may be if there are altitude differences between stations).

You should try to interpret these tables as best you can, and explain any differences you see. Some of the differences may be instrument-related, some may involve siting problems, and some may be true meteorological differences. The tables should allow you to pick out potentially faulty data (e.g. if biases are small between three stations and large between these three and the other, then this would lead you to suspicious of the quality of the fourth station).

Each group should share the basic siting characteristics of their station (brief description with photographs if possible, altitude, coordinates etc.). This will aid in the interpretation.

PART 2: DATA FEATURE INTERPRETATION

Here, each group should consider interesting features they find in the data, and devise scientific questions to address regarding these features. **Emphasis is on quantitative assessment** not just eyeballing features and writing about them. Focusing upon one particular feature is probably sufficient. Some examples you may choose to focus on are:

a) **DIURNAL CYCLE**: What are the diurnal cycles of meteorological parameters such as wind speed and temperature? Does cloud cover modulate the strength of the diurnal cycle? Is the diurnal cycle in temperature different for the different stations, and if so, why? Here, you could include cloud cover observations from e.g. Seatac. Can any diurnal cycle in precipitation be detected? **Compositing of measurements (e.g. to give a single mean diurnal cycle) is an important part of this analysis**. You might wish to choose 8 times/day and average data using these bins. Consider the errors in these composites using standard error in the mean.

b) **NOTABLE WEATHER SYSTEMS:** If particularly notable weather systems (wind storms, frontal systems, convergence zones, rainshadow events, Arctic fronts) occurred during the deployment you might wish to use the station data to paint a picture of the system. Here, you would want to draw data from additional sources to complement your analysis. Did the Weather Discussion bring up any topics that you could explore further? Did the MM5 do a good or bad job of forecasting important events? **Quantitative analysis is preferred to eyeballing**. This is not the weather discussion.

c) **FOG**: Was fog a prevalent feature during the deployment period? If so, what conditions favored its existence?

For this second part, the incorporation of supporting information from other sources is an important component of the lab. For example chemistry/aerosol data, satellite imagery, synoptic charts, NWS observations may all serve as useful information to aid the interpretation.

Remember to keep the report relatively brief (typical length 4-6 pages including tables, plus additional figures) so the key is conciseness without sacrificing content.