ASSIGNMENT 6 - METEOROLOGICAL DATA ANALYSIS
Due: Wednesday, 27 March 2019 — Total Marks: 50

Objectives:

To learn and use methods of analysing and displaying meteorological data using Excel spreadsheets and the R plotting and analysis program. To perform Quality Assessment/Quality Control (QA/QC) on the CAMnet data. To find the correlation between air and soil temperature. To assess the frequency of precipitation events and relationships to atmospheric and snowpack conditions.

Resources:

Data at 15-minute intervals from either the Nipika Mountain Resort or Ancient Forest weather station spanning 1 October 2018 to 28 February 2019.

Method:

1. Clean up the start of the data so that the measurements begin at 00:00 local time on 1 October 2018 and end at 23:45 local time on 28 February 2019. It may make plotting time series x coordinate simpler to define a "decimal date" column made up of the Julian day plus hour/2400. The formula to do this in R is available on the course website.

2. Obtain the coordinates and elevation for your site of interest from the CAMnet wiki. Provide a short description of your study site (including a photo) along with the relevant metadata for the instruments you use for data analysis (e.g. height of the instruments, frequency of measurements, precision, etc.) Feel free to consult Hernández-Henríquez et al. (2018) for more details on the CAMnet meteorological stations and equipment. [5 marks]

3. Assess the quality of the data that were collected, and discuss any issues or problems encountered. Are any of the data suspect or likely in error? Highlight any suspect data in the Excel spreadsheet in yellow and attach this to your (electronic) report. [5 marks]

4. Plot in R and discuss the following time series. Make sure you label your graphs and refer to all graphs used in your written text.

    (a) Daily cumulative precipitation since 1 October 2018. [5 marks]
    (b) Daily mean atmospheric pressure and wind speed (two panels, one above the other). [5 marks]
    (c) Daily mean air and soil temperatures (on the same graph). [5 marks]
    (d) Make a scatter plot of the daily mean air temperature vs. the daily mean soil temperature – how does this differ from the 1:1 line? [5 marks]

(e) How do the soil temperatures vary - how are they related to the air temperatures? [2.5 marks]

(f) Is there a correlation between the air and soil temperatures? If so, what is the coefficient of determination (r^2)? Is the relationship linear? If so, what is the regression equation? What do the regression slope and intercept tell you about the relationship? [2.5 marks]

(g) Are there relationships between any of the meteorological parameters? For example, are periods of low surface atmospheric pressure associated with precipitation events and changes in snow depth? [5 marks]

(h) Plot the mean daily snow depth and describe the evolution of snowpack conditions and relationships to ambient conditions [5 marks]

5. Provide an overall assessment of hydrometeorological conditions from October 2018 to February 2019 at your site of interest. You can use additional data to place these conditions in a climatological and/or regional context. Alternatively, consider performing a joint cross comparison of meteorological conditions observed at the Ancient Forest and Nipika Mountain Resort. [5 marks]

References

Hernández-Henríquez, M. A., Sharma, A. R., Taylor, M., Thompson, H. D. and Déry, S. J., 2018: The Cariboo Alpine Mesonet: Sub-hourly hydrometeorological observations of British Columbia's Cariboo Mountains and surrounding area since 2006, Earth System Science Data, 10, 1655-1672, https://doi.org/10.5194/essd-10-1655-2018.