**Fundamentals of Surface Water Hydrology (HWRS 519)**

**Class Project – Part II**

**Due Date: March 31, 2022**

1. Regime curves

For each catchment, create **regime curves** of mean monthly precipitation, temperature, and streamflow. A regime curve plots mean monthly values for each month (x-axis: JAN to DEC; y-axis: mean monthly variable [mm]). Use one plot for each variable, so 3 per catchment. Best is to use bars to represent the mean monthly variable. Compute the standard deviation of the monthly variable and add to bar chart as whiskers.

1. Streamflow generation curves

For each catchment, create a graph that shows for each hydrologic year the cumulative rescaled streamflow (y-axis) versus cumulative rescaled precipitation (x-axis). With cumulative rescaled streamflow and cumulative rescaled precipitation we mean that the range runs from 0 to 1 (in reality, it will run from 0 to say 800 mm for year x, so each value on the axis should be divided by 800). So, if you have 55 years of data, you will generate 55 lines on the same graph and each line will run from 0 to 1 on both axes. We call these graphs **streamflow generation curves** or double-mass curves. Interpret your results.

1. Flow duration curves

For each catchment, create a graph that shows for each hydrologic year the probability of exceedance of stream flow. We call such graphs **flow duration curves (FDC),** and they are nothing else than plots of the complement of the cumulative distribution function of daily flows. On the x-axis you plot the probability of exceedance and on the y-axis the corresponding streamflow (in mm/day). For example, the highest observed flow in a given year has no probability of being exceeded, whereas the lowest observed stream flow has a probability of being exceeded in that year of 1. So, your x-axis ranges from 0 to 1 and can be labeled “Probability of Exceedance” and your y-axis has the corresponding streamflow value. If you have 55 years of data, you will generate 55 lines on the same graph. For better visual effects, use logarithmic scale for y-axis and linear scale for x-axis. Interpret your results.

Next, treat all observations as one long time series and plot the Flow Duration Curve using all data (say, 55x365 data points, and for each we can compute the probability of exceedance). This is the average Flow Duration Curve of the catchment. Again, interpret your results and compare the catchments.

1. Flood frequency curves

Select for each year the maximum daily flow. This will yield a time series of annual maximum flows. Produce a flood frequency curve for each of your catchments. The flood frequency curve is a plot relating return period and magnitude of flow. Try to use the flood frequency curve to understand the behavior of the catchment and compare the different flood frequency curves from your catchments. Additionally, keep recordof the months in which each maximum occurred. Are the floods happening in the same period of the year? If yes, try to understand why.