**ESS162 Lab4: CA source regions water budget**

This will be due right before class on Mon Feb 8

This is a partner report lab:

The rules for partner report labs are: Groups of two will hand in a single assignment. You may do the writeup alone or in a group of 2 for this assignment (no larger groups allowed). You may help a larger group of classmates with the data analysis – the partner vs solo and 2-person vs breakout group distinction applies only to what you hand in, not the in class work.

It’s up to you to decide whether to work with a partner. Advantages of working with a partner: easier to share ideas and maybe learn more; maybe a bit less work. Advantages of working alone: you get to decide how to do things; you’ll learn everything and may be better prepared for the final; you can still ask for help during the breakout. One thing to avoid is splitting the questions 50:50 with a partner (you each just take half the questions) – this usually doesn’t work well - you’re better off truly working as a team where each is contributing to each question.

**Goals:**

You will be plotting and analyzing datasets that describe the spatial patterns of water production across California, and will do a couple of back of the envelope analyses of the sensitivity of water supply to warming. The datasets are contained in a single zip file on the class website (Lab4.zip), which you will download and unzip into a single folder. You will be working with Google Earth Pro and Excel. The key datasets are:

1. AET.kmz is a Google Earth kmz image of the annual mean AET across CA, where red indicates higher rates of AET
2. PET.kmz is a Google Earth kmz image of the annual mean PET across CA, where red indicates higher rates of PET
3. Precipitation.kmz is a Google Earth kmz image of the annual mean Precipitation across CA, where red indicates lower rates of Precipitation
4. P-ET.kmz is a Google Earth kmz image of the annual mean P-AET across CA, where red indicates ET > P (probably relies on imported irrigation water) and blue indicates ET < P (probably produces runoff).
5. WDBHU8.shp is a shape file of the watersheds in CA, including the Kings, Stanislaus and Mokelumne.
6. California\_Power\_Plant.shp is a shape of the main (large) hydroelectric generating plants in CA
7. nhd\_majorrivers\_20180820.shp is a shape file of the major rivers in CA
8. CAwater balance 2.xlsx is an Excel spreadsheet of the gridded raster data for the local water across all of CA. You can think of it as the actual numbers that underlie the various shp and kmz described above.

**Tools, steps and commands – same deal as last week**

Google Earth Pro

Open and familiarize yourself with the various kmz and shp files. These kmz should already have their own embedded style templates and should open directly into Google Earth. The shp files will require that you setup a template. In general, red means drier and blue means wetter.

Take a look at the whole state patterns

Take a look at the Kings River patterns

Excel

Open CAwater balance 2.xlsx

Add columns for P-ET and (P-ET)/P

Discuss what each of these means

Plot the relationship between Air T and PET, do a regression

Filter for just the Kings River basin and calculate the basin means

Filter for just the Kings River basin and do elevation plots

Discuss how to estimate the effect of warming on the water produced by the Kings River

**Writeup**

Include copies of the statewide Google Earth layers for AET, Precipitation, PET and P-ET. Describe in 2-4 sentences the main cause of the patterns for each of these layers (for example, what controls the spatial patterns of PET across CA?).

It is expected to rain 2 inches at UCI over the next few days. How many acre feet of water will fall on Aldrich Park during the time?

What is the total annual runoff (P-ET) in Acre-ft produced by the Sierra Nevada ecozone? (the area of the Sierra Nevada is 52000 km2)

Identify the Upper Kings River Basin and include a Google Earth image of P-ET, the watershed boundary and the location of hydroelectric plants. Describe the general geography

Plot and include graphs for the elevation dependence of precip, PET, AET, P-ET and (P-ET)/P in the Kings River basin. Explain the patterns. Where is most of the water produced (higher P-ETs) and why is water production greatest there?

Calculate how much the amount of runoff produced by the Kings River might change with 6oC warming.