Qualitative event identification

Ploit the SWE for each year

Count amount of midwinter melt events (dips in SWE). Add to table.

Identify timing of start and end of spring melt. Add to table.

Identify amount of SWE at the start of spring melt. Add to table.

Generalized Workflow

Identify SNOTEL site

Identify USGS gage site

Download data from the PNNL site

Download data from USGS

Preprocess data with data/pre-process_sno-tel.py

Combine data with data/com-bine_data-sets.py

Plot each water year and get minimum and maximum values for each water year for any data column in either the SNOTEL or USGS files.

For an individual water year, call processing/plot-year.py. To make plots for all of the years in the dataset, call processing/plot_all_years_individu-ally.py which just calls the script several times in a row for the years in the dataset

plotyear.py prints out the minimum and maximum values for the time period run, along with the timing of each of those values. These printed values go into the data tables.

Combine data tables created from output by processing/plot_all_years_individual-ly.py with SNOTEL data table. Year in this table referrs to the spring year of the water year.

Manually combine data tables created from output by processing/plot_all_years_individual-ly.py with SNOTEL data table for years of SNOTEL measurements.

Run date_difference.py to compute days between important dates, and add those columns to the master table.

Run make_final_plots.py to create plots comparing SWE and discharge data correctly, and timing/rate of spring melt for each year.

Run processing/getminmax.py to plot all water years on a single time series plot - for any snotel or USGS site variable.

Compute Z-score to determine if a change has occurred using the methodology listed and explained in z-test.pdf.

Calls for Tolt River project

USGS site: 12147600: Lat=47.706944, Lon=121.598889
SNOTEL site: Skookum Creek: lat=47.68 lon=121.61

SNOTEL site: https://www.pnnl.gov/data-products
Download the zip files with bias and error corrected data for each snotel site in the network.

USGS site: https://waterdata.usgs.gov/wa/nwis/u-v/?site_no=12147600&PARAmeter_cd=00060,00065
Download each data variable for each respective availability period.

Scripts are written for the specific filenames downloaded from the previous step. Change variables within the script as necessary.

e.g: to plot discharge for the 2008-2009 water year:

```
python plotyear.py -infile_stream /Users/ginevramoore/Desktop/CE-WA568/final_project/data/all_data_12147600.csv -op water_-years/12147600_09.01.08-12.01.09.png -b 09.01.08 12.01.09 -p1dm y -p15dm y -p30dm y -c1 mean_discharge -u1 [ft^3/m] -mm 1d
```

e.g: to plot SWE for 2008-2009 water year:

```
python plotyear.py -infile_stream ../data/all_data_12147600.csv -infile_snotel ../data/skookum_snotel.csv -nl y -b 09.01.%s 12.01.%s -c1 SWE_in -u1 [inches] -op water_-years/09.01.%s-12.01.%s_SWE.png -p1dm y
```

processing/plot_all_years_individually.py is customized for this analysis. Use as an example template and change arguments within script as needed to match the column names and date formats that you are interested in working with if using a different dataset or looking at different variables than those investigated here.

processing/date_difference.py is customized for this analysis. Use as an example template and change arguments within script as needed to match the column names and date formats that you are interested in working with if using a different dataset or looking at different variables than those investigated here.

Again, customized for this analysis.

e.g: to plot discharge for all water years, with 07/08 and 14/15 yrs highlighted:

```
python getminmax.py -op minmaxs/09.01.1959-12.01.2020.png -infile_stream /Users/ginevramoore/Desktop/CEWA568/final_project/-data/all_data_12147600.csv -infile_snotel ../data/skookum_snotel.csv -b 09.01.1959 12.01.2020 -c1 mean_discharge -u1 [ft^3/m] -plothighyear y -plotlowyear y
```

e.g. SWE for same period:

```
python getminmax.py -op minmaxs/09.01.1995-12.01.2020.png -infile_stream /Users/ginevramoore/Desktop/CEWA568/final_project/-data/all_data_12147600.csv -infile_snotel ../data/skookum_snotel.csv -b 09.01.1995 12.01.2020 -c1 SWE_in -u1 [inches] -nl y -plothighyear y -plotlowyear y
```