**Introduction to Plotting Oceanographic Data in MATLAB**

Overview of Matlab windows [led by instructor]

* Command window, workspace, file directory, history
* Simple mathematical operations
* **clear** (clears variables from workspace), **clc** (clears text in command window)

Instructions for lab exercise

1. Open **Matlab\_example1.m** script

* On the Editor tab, click the green Run button to run the entire script.
* The script is also separated into sections that can be run one at a time with the Run Section button. Click within a section of the code to run (the section will be highlighted in yellow)
* Run each section and find the created variables in the workspace and graphs in figure windows to follow along with the output of the code.
* **clear** your workspace

1. Import Tides data (NOAA\_Tides\_25Feb2019\_hourly.xlsx). This file contains water level data (referenced to mean sea level) at two NOAA tide gauge stations (Atlantic City and Cape May) and meteorological data from the Cape May, NJ station. To load these data into your Matlab workspace:

* Click Import Data button on Home tab
* Change to “Column Vector” in drop-down menu
* Make sure all columns and rows of data are selected
* Import, check workspace

1. Compute tides descriptive statistics by using the listed **functions** in the Command Window

* use **mean**, **min**, and **max** functions to find average and range of predicted water level
* subtract actual water level from predicted water level and save the result in a variable named **difference**
* find average, minimum, maximum difference between actual and predicted water level

1. Plot tides data

* Open **plot\_tides.m**
* Follow instructions at the top of the script to import the Atlantic City tide data.
* Run the script and examine the resulting graphs.

1. Repeat tides statistics and plotting for the Cape May tide station:

* **clear** workspace but leave figures open (or save copies)
* Import the Excel data (select worksheet in the Import Data tool)
* Edit the name of the station at the top of the script. Run the script.

1. Meteorological data analysis

* Clear workspace and import Cape May wind data
* Open **plot\_wind.m** and run the script
* Compare the data plotted in each panel of the figure.
  + How does the information we get from the wind velocity vectors differ from the wind speed line plot?
  + Are there any notable changes in wind velocity over the four days?
  + What happened to barometric pressure and temperature when wind velocity changed?

*Stop here for class discussion of results*

1. CTD vertical profiles

* Clear workspace and figures
* Import sample CTD data (Ocean3\_inner\_20181004\_190845.xlsx)
* Open **plot\_ctd.m**
* Run script to see profile plots of temperature and salinity
* Modify script to convert units from feet to meters
* Copy the section of the code that plots temperature and salinity vs. depth and paste lower in the script. Modify the code to plot temperature and salinity with depth in meters instead of feet
* Copy the code for plotting profiles again and modify it to plot density and sound velocity vs. depth in meters

Work on your own

1. Write captions for the plots of tide and meteorological data from Cape May. A good caption is a stand-alone description of the data that are displayed in the graph. The caption should explain the sources of plotted data and important trends.
2. Write a paragraph comparing the variables that you plotted from the tide dataset and the meteorological dataset. Consider the following questions to guide your interpretation:
   1. What are the scales of variability (min/max) of each variable?
   2. Does water level change at periodic intervals? What about the wind?
   3. Do the observed and predicted tides closely match? What are the biggest differences between observed and predicted water level?
   4. Are there any notable events when all or most of the variables change at the same time? What do you think caused the simultaneous changes?
3. Make your own MATLAB script to plot Chestnut Neck YSI data, following the examples in the other scripts. Create at least two different graphs (e.g., salinity vs. time, oxygen vs. turbidity, …) of the YSI data. Label all axes and write a descriptive caption.

***Submit modified MATLAB scripts and a Word document with all graphs, graph captions, and interpretation paragraph***