Armchair Research: Using Online Ocean and Climate Data

Over the past decade a growing number of monitoring and research programs have produced an extraordinary amount of ocean observing data and field observations that are available through publicly-accessible databases. As a result, we are free to explore these datasets and conduct hypothesis-driven research without leaving the comfort of our desks and never getting seasick, cold or bitten by mosquitoes.

As part of this assignment, you will be collecting *real-time data* or *near real-time data* from marine or coastal ecosystems, then analyzing these data to identify and interpret the interactions between biological, physical, climatic, and/or meteorological processes.

You will select a marine, estuarine, or coastal ecosystem as your study site (or select two ecosystems if you want to do a cross-system comparison), make some preliminary observations of the natural system to get familiar with the data visualization tools, then choose a research questions and/or hypothesis that you would like to explore. The research question is entirely up to you, but there are many interesting things to be learned by asking questions about how ecological processes change temporally (e.g. tidal, season, daily) and/or spatially (e.g. vertically in the water column, along an estuary, among different estuaries). Once you have decided on a general research question of interest, I will work with you to define a testable hypothesis and data collection strategy.

The final research paper should include the following:

1) Introduction: 2-3 pages of background information on the ecosystem and/or the problem being investigated. This could include a description of the coastal or marine ecosystem being investigated, the biological, physical or chemical processes you are exploring, or background on the ecological/environmental issue that you will address. ***This is where you will also set the stage (e.g. provide the rationale) for your primary question or hypothesis***;
2) Objective: Includes a clearly stated question or hypothesis, detailing the specific question that you will try and answer, or hypothesis you will test;
3) Methods: Description of the data sources that you used in your investigation. Include, where possible, an estimate of the number of observations included in your analyses (e.g. how many data points). This is where you will also provide a brief description of the data analyses and/or statistics you used.
4) Results: 2-4 graphs or figures showing patterns in the data you have collected and that address your question and/or hypotheses;
5) Discussion and conclusion: the discussion is where you will interpret the patterns you have illustrated in your figures, describing what they show and what these patterns MEAN. (e.g. what biological processes and interactions do they reveal, what are the implications of your findings?). When possible, make connections between your observations and concepts covered in the course.
6) Resources: list of the literature, web resources, and online data sources you have used (not part of the total required pages);

Important Dates:

Jan 31st: Half-page summary of your topic, research question and relevance, sources of online data.
Feb 20th: Draft of introduction (~1-2 pages), statement of hypothesis or specific question, initial results.
Mar 7th: Rough draft of paper. Meetings to discuss strengths and revisions will follow.
**all the above will count towards your final paper grade.*

Potential research questions

- Comparison of a single process or biological pattern in different estuaries, especially when they represent different parts of the country or different estuary types.
- Salinity and temperature changes in the water column during upwelling and downwelling events.
- Impact of extreme weather events (e.g. hurricanes, tsunamis) on coastal ecosystems.
- Meteorological events (e.g. fronts) and the relationship wave height, barometric pressure, or wind.
- Changes in chlorophyll, light and oxygen availability throughout the day or in the water column.
- Long term changes in temperature (maximum and minimum) across many years.
- Relationship between tides, water temperature and salinity in different estuaries.
- How are atmospheric CO2 concentrations in Seattle vs. coastal waters connected?