OOI Data Lab Lesson Plan:
Dynamic Sea-Air Interactions

Prepared by: Sara Smith, Bellingham Technical College

Time required: This lab requires a minimum of 45 minutes. With additional optional discussions and demonstrations, this lab could take up to 1.5 hours.

Assumed prior knowledge: This lesson is appropriate for 100-level undergraduate students or advanced high school students who are taking or have completed an introductory oceanography course. Students should be familiar with the concepts of waves and wave properties, including wave period and height.

Equipment required: Access to computers with internet connection, preferably one computer per student or per pair of students.

Pre-class prep: Print out the Air-Sea Interaction Worksheets

Pre-class assignment:
Students will watch this 15-minute video reviewing some basic properties of waves.

1. Wind blowing on the surface of water is called a:
    a. **Generating force**
    b. Restoring force
    c. Mitigation force
    d. Pycnocline force
2. What is wave height?
    a. **The distance from crest to trough**
    b. The distance from equilibrium to crest
    c. The distance from crest to crest
    d. The distance below the surface where no waves are felt
3. What is wave period?
    a. **The time it takes a wave to travel from crest to crest**
    b. The time from low tide to high tide
    c. The time it takes a wave to travel from origin to beach
    d. The time it takes regenerating forces to dampen the wave height

Lesson Overview:

Part 1: Data Exploration

- Direct students to the OOI Dynamic Air-Sea Interactions and have them open the Exploration page.
- Give students about 5 minutes to look through the graphs on their own.
- Hand out Pages 1 and 2 of the worksheet. Have students work through Questions 1 – 6 in pairs, then discuss as a class to make sure everyone has the right answers.
    - If students are filling out the worksheet electronically they can copy and paste a picture from an online source for Question 6.

Part 2: Concept Invitation

- Direct students to the OOI Dynamic Air-Sea Interactions and have them open the Concept Invitation page.
- Hand out Page 3 of the worksheet.
- Students will click the Next button to display wind speed and ocean current. Have them answer Questions 7 and 8 in pairs, then discuss as a class.
    - For Question 8 students might observe that there's a lot more daily fluctuation. You can tie in a discussion of tides here if you have time.
- In pairs, have students answer Question 9. As a class, create a list on the whiteboard. Do not indicate the answer yet.
    - Question 9 asks specifically for what oceanographic data they would need to support their hypothesis. Steer students away from answers like "the weather report". Instead, ask what data the weather is using to keep students thinking about using data to answer questions.

Part 3: Application

- Direct students to the OOI Dynamic Air-Sea Interactions and have them open the Application page.
- Hand out Page 4 of the worksheet.
- In pairs, have students answer Questions 10-13, then discuss as a class.

Homework

Students will read an online article about using oyster reefs to protect against storm surges. They may either write a short summary of the article or answer the multiple-choice questions below.

Matchar, E. 2018. As Storms Get Bigger, Oyster Reefs Can Help Protect Shorelines. https://www.smithsonianmag.com/innovation/storms-get-bigger-oyster-reefs-can-help-protect-shorelines-180967774/ Accessed 8 Dec. 2020.

4. How do oyster reefs protect against storm damage?
    a. **By absorbing wave energy**
    b. Through their water filtration abilities
    c. By influencing the migration of top predators
    d. By altering boat traffic routes
5. Why did the environmental group NY/NJ Baykeeper have to remove their 10-year-old oyster reef?
    a. **There were concerns the oysters would be poached and consumed as food**
    b. The reef became too large and blocked ship traffic
    c. Landowners complained it was unsightly
    d. A large storm destroyed it
6. Why did oyster populations decline in the last 100-200 years?
    a. **Pollution and overharvesting**
    b. Disease and pollution
    c. Invasive species competition
    d. Oil spills