ON SHORE: INVESTIGATING SOME OCEAN DYNAMICS

You have had a chance to investigate processes that generate currents in the ocean. Now let’s look at ocean dynamics at the shore, where water meets land.

You are standing at the shore of the Atlantic Ocean (you imagine a location along the Eastern Seaboard). Waves are coming ashore and rushing back into the ocean. Suddenly you ask yourself, “Why are there waves?” Your thought response is:

From your experience, what happens to the height and power of the waves when a storm is near shore? Why do you think this occurs?

Let’s Explore!

Activity 1: Making Waves

1. Obtain a large plastic container filled with fine sand to a depth of about 3 cm. Make a gently sloping beach (5-10° angle) across one end of the container. It should extend about 4 cm above the current water line.
2. Using a small ruler or flat stick, make waves by placing a ruler at the end away from the beach and gently moving the ruler forward and backward. This should generate waves that strike parallel to the shore. Observe how the water reacts at the shore and what happens to the sand over a period of several minutes. Record your observations in the data table.

3. Now, angle the ruler at about 30° from its current position and make waves again. The waves should now hit the shore at an angle. Record your observations over several minutes.

4. Make a “bay” in the beach by making an indentation on the shore, digging out and moving sand from this area. Makes waves and record what happens to the waves and the shoreline over the next several minutes.

5. Finally, make a sandbar in the water a short distance from the shore. The sand bar can be covered with water but should be close to the surface. Make waves again and record what happens to the waves and the sand around the sandbar and shore.
6. Compare the changes in the waves and shore (sand movement) for the various scenarios you constructed and look for any patterns in sand transport.

7. Can you suggest a way to protect beaches from eroding too quickly based on your observations?

8. Suppose that you wanted to simulate a large storm. What would you do in your model? What might you expect to see? (If you have time you can try it out!)
<table>
<thead>
<tr>
<th>Wave Action/Conditions</th>
<th>Observations</th>
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<tbody>
<tr>
<td>Parallel to shore</td>
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<tr>
<td>At angle to shore</td>
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<tr>
<td>With bay</td>
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<td>With sandbar</td>
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Activity 2: Investigating Tides

If you like to engage in activities near the Atlantic Ocean or the Chesapeake Bay, you are probably aware that the water level in these bodies of water changes during the course of the day. These regular changes are called tides.

Is there a pattern to the changes in water levels? How do you know?

Let’s look at some data to investigate.

1. Locate a computer with Internet connection and type in the following URL:

   http://tidesonline.nos.noaa.gov/

2. When you get to the NOAA Tides Online site, go to the left frame and click on State Maps. Select MD or DC on the US map. When the Maryland map appears, select a station of your choice. When the DC map appears select the one station. You should see a graphical display appear in a short time.

3. Look at the water level graph to answer the following questions. Print a copy of the frame with the graph or sketch the graph on a sheet of paper and attach it to this sheet.

   Is there a pattern to the water levels changes? Explain.

   How many high levels and how many low levels occur within a 24 hour period?

   The highest water level marks the **high tide** and the lowest water level marks the **low tide**.

   From the chart, how well did the actual high and low tides match the predicted tides?

   Are the high tides in one 24 hour period the same height?
4. Locate another station anywhere along the Eastern Seaboard (other than MD or DC) and print the water level/temperature frame.

Compare the two water level graphs. Do the patterns appear to be the same? Explain

Do the high and low tides occur at the same times? Is this expected?

4. Look at the graph on the next page that shows the pattern of high tides from a station in Hilo, Hawaii for 60 days.

Is there a change in the height of the high tides during a period of 30 days? Explain or illustrate your answer.

About how many days occur between the maximum tides on this graph?

Does the pattern of days between the maximum tides bring to mind any natural cycle you have studied this semester? Explain.