The Education Program at the
New Jersey Sea Grant Consortium
22 Magruder Road, Fort Hancock, NJ 07732 (732) 872-1300
www.njseagrant.org

UNDERSTANDING STORM SURGE

ACTIVITY #5 - PRESSURE DRIVEN STORMS & SURGE

OVERVIEW

Many people have the misunderstanding that *only* strong winds create storm surge flooding along a coast during a harsh storm or hurricane. In this experiment students will investigate how air pressure affects storm surge levels and how storm surge affects a coastal town.

MATERIALS

- Balloon (round or oval)
- 11x17 paper, pencils, rulers.
- Optional- water and rectangular waterproof container.

PROCEDURE

1. Pair up students. Ask them to inflate a balloon and tape a pencil to it. The balloon will represent ocean water.
2. Ask students to press down on the balloon to create ocean levels during a time with high pressure system. On a sheet of 11x17 (or longer) paper held lengthwise, ask students to use the pencil to mark on the left side of the paper where the pencil meets the paper when the balloon is pressed down. This line will represent the water level when a high pressure system is in place. Students should know by now that high pressure generally means a nice day of fair sunny weather.
3. Next, students draw a profile of a coastal town lengthwise across the paper. About 1/3 of the sheet should be the ocean gradually becoming shallower as it meets the land, in this case a sloping beach. Ask them to add other natural and man-made features to the landscape to represent the coastal town, such as houses, roads, and other landscape features sometimes found in coastal towns at varying

heights above or below sea level (river basins, mud flats, marshes, dunes, houses, roads, boardwalks).

4. Students will predict what will happen when a low pressure system blows a harsh storm onto their "coastal town." Students should **not** press down on the balloon because a low pressure system would not put pressure on water and cause water levels to be higher. Students should make a prediction based on the balloons height with a low pressure system in place and how the ocean will impact the coast as water reaches the land areas. Students should draw on the paper where they think the balloon representing storm water will flood their "coastal town."

5. Now ask students to roll the balloon over their drawing, starting from the ocean side towards the land. The rolling of the balloon will represent winds blowing the storm onto the coast and causing a storm surge. As the balloon reaches the coast and is rolled past the "coastal town," students should measure the top of the balloon representing storm surge levels at various points along the paper at the varying heights. Students should make observations and record on a separate sheet of paper how the man-made and natural features of their "coastal town" were flooded by the storm surge and then compare their observations to their predictions.

6. As the winds circulate during a hurricane (counterclockwise in the Northern Hemisphere), winds push water into the eye of the storm raising sea levels. This is chiefly noticed when the storm moves into shallow water and onto land. Now ask students to place their hands around the sides (not top or bottom) of the balloon, which represents ocean water during a hurricane. Ask students to push the balloon inward. Their hands pressing around the balloon represent winds pushing ocean storm water inward to the eye of the storm. Students will observe how the balloon's vertical height increases. This is similar to what happens to sea levels inside the eye of a hurricane. Now students will repeat Step 5 and record observations about the amount of flooding.

7. **Optional:** Repeat this experiment (Steps 1-6) inside a clear plastic container with a balloon filled with water. Ask students to place their drawing facing inward along the length of the container and then roll the water filled balloon inside the container, starting at the end where the drawing indicates ocean. When the balloon reaches the land, ask students to release the water in their balloon to flood their landscape.

Compare this to a hurricane which breaks apart and weakens as it moves further inland and away from the warm water of ocean fueling.

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