

Super Storm Sandy A Natural Disaster

Grade 6

90 minutes

It is important to recognize the impact of hurricanes as being a problem on all societies. Students will have the task of answering the question of how global warming is causing Hurricanes like Super Storm Sandy (Oct 29, 2012) to be a problem in the north east. The students will view and use photo data captured from the NASA Goes 13 satellite. The Lesson will focus on data taken from the hydrosphere and the atmosphere.

Learning Objectives

Evaluate the model for determining impact to coastal communities.
Assess the limitations of the model.

Essential Questions

Students will research the answer to the questions:

- What was the effect of the Superstorm Sandy on the coastline of New Jersey?
- How can we use models to understand severe storms?
- What allowed Superstorm Sandy to become so powerful?
- What happens to the coastline in NJ as a result of the storm damage?

Driving Question

With the severity of Hurricanes, what can people do to prepare for the storm?

Materials Required

Hurricane Sandy Pictures from NASA Satellite

A rectangular plastic container

A sharp knife or scissors

Sand

Aquarium gravel

Technology and internet required

NGSS Disciplinary Core Ideas:

- **MS-ESS2.D Weather and climate**
Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of sea water drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features.
Complex interactions determine local weather patterns and influence climate, including the role of the ocean.

NGSS Science and Engineering Practices:

- **Developing and Using Models**
Develop and/or use a model to predict and/or describe phenomena.

NGSS Crosscutting Concepts:

Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Engagement:

Opening questions,

Ask students if they have ever seen a Hurricane?

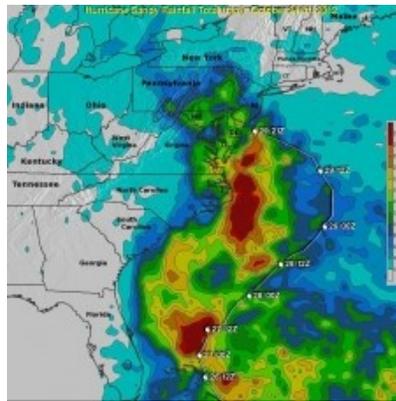
What do you think, people effected by the storm would need to prepare for a hurricane?

The teacher will begin the conversation by having students view pictures, asking the students

What do you see in the picture?



Aerial photographs of the NASA Wallops facility and coastline. On the left is from August 2012 after completion of a Shoreline Protection Project. On the right is from November 2012 after Hurricane Sandy swept by. **Image Credit: NASA**



TRMM rainfall analysis indicates that the heaviest rainfalls of greater than 10.2 inches were over the Atlantic Ocean. Rainfall totals of over ~ 7 inches are also shown over land in many areas near the Atlantic coast from New Jersey to South Carolina. Sandy's track is overlaid in white.

Image Credit:

SSAI/NASA, Hal Pierce

Next:

2. Have students to read NASA article: **Two years later: Remembers Hurricane Sandy**

3. **The teacher will show the students the two pictures above and ask the following questions:**

What was the impact of the force of Superstorm Sandy on the coastline?

What was the size and directions of the winds?

What NASA satellites recorded the data?

The answers to the questions will be used to develop a KWL chart and completed throughout the activity

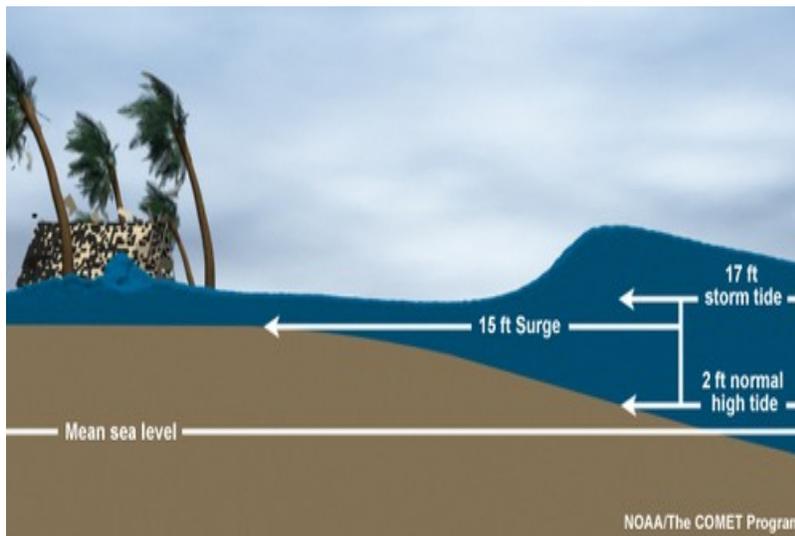
Explore:

Have Students to take a closer look at the storm surge and track the travel of Superstorm up the east coast.

The teacher will show the students a picture will be used to from the NOAA Website that demonstrate storm surge vs tide way to help the students to understand how the storm surge during a tide can cause flooding.

Storm Surge vs. Storm Tide

Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical [tides](#). Storm surge should not be confused with storm tide, which is defined as the water level rise due to the combination of storm surge and the astronomical tide. This rise in water level can cause extreme flooding in coastal areas particularly when storm surge coincides with normal high tide, resulting in storm tides reaching up to 20 feet or more in some cases.



Have student create a model of how storm surge can cause damage
Steps for building the model:

Procedure for building the model

NOTE: Put your model inside a larger container, such as a plastic tray, to contain whatever mess you may make. Also, work hard to prevent sand from going down the drain because it may settle in traps and cause plumbing problems.

1. Have students to cut one end out of the plastic container, fill it about 1/3 full with sand or gravel. Prop up the other end, so everything flows downward. You have created a little beach. By simulating rain and surf, you can observe how the sand erodes. To recreate the rain and surf, use plastic (or paper) cups. For rain, punch holes in the bottom. For hard rain, make the holes bigger. For surf, slosh the water onto the beach.
2. The students will keep changing your experimental conditions, such as the type of sand or gravel and the length and intensity of the rain. Make careful observations and measurements of exactly what you do, what happens, and what changes.

3. The teacher will encourage the student to explain what happens to the sand on the slope as the rain falls on it? Does it stay in place or move? How much of it moves? Experiment with different slope angles to see the effect.
4. The students can simulate roads, buildings, and parking lots by covering part of your beach with plastic wrap or other material that water will not pass through. You can simulate drains by channeling the water that falls on this "impermeable" material to a single release point. On a roof, that models a downspout; on a road, it models a storm drain.
5. The teacher will allow the students time to look at what other things might you try with your model? What is the effect of changing the size of the sand (perhaps by using the aquarium gravel instead)? Measure the amount of erosion to compare the effects of design changes.

Explain: Have students build a model to show how the storm can cause costal damage. Teacher- have the students take a moment to look at the picture of the beach at the shore, before and after the storm and examine the changes.

- 1.The teacher would what to create the visual scenario using the picture of what happen before and after superstorm sandy hit.
- 2.The teacher would ask the students the question: What’s the biggest difference in the picture with the coastline?



Aerial photographs of the NASA Wallops facility and coastline. On the left is from August 2012 after completion of a Shoreline Protection Project. On the right is from November 2012 after Hurricane Sandy swept by.

Image Credit: NASA

- 3.The students will take a moment to view the picture and note some of the visual differences.
4. The teacher will ask the students to work with their team to write a descriptive paragraph of their observation.
Next: The teacher will ask the students to use the materials and the steps to design a model to represent how beach erosion occurs when the shoreline is impacted by the rains and wind.

Elaboration:

- 1.The students will need to draw a reasonable conclusion to the outcome of the model they have designed and worked on with their team.
- 2.The students will critique the model, explain or argue their points on the design with their peers.

3. The teacher will answer questions to help the students to build a model that represent what occur on the beaches because of the wind and rain.
4. Next: the teacher will have the students view and elaborate on the counter clockwise spinning of the winds and wind gust.
5. The teacher will ask the students what do they see in the picture? Next teacher will ask the students where do you think the most damage will occur when the storm hits land?
6. The students detail of the picture will need to include an explanation of what they see in the picture.
7. The students will need to make a conceptual connection between the picture and the model they are creating.

1. This GOES-13 satellite image was captured on Oct. 31 at 1240 UTC as Sandy's circulation was winding down over Pennsylvania. Sandy had been downgraded a remnant low pressure area.

Image Credit:
NASA GOES Project



2.



After

r Hurricane Sandy, N.J. roller coaster back in action

May 26, 2017 | 8:53 PM EDT

Seaside Heights, N.J., has been revitalized since Hurricane Sandy devastated the boardwalk area in 2012. The Hydrus roller coaster is ready to roll again on Memorial Day weekend, revitalized five years after being destroyed.

Evaluation:

1. Have students make sure they are satisfied with their model of beach erosion. Discuss their model with their group.
 2. The students in the group will give feedback about how they felt about their model. Make a poster showing the details of how the rain, surf and human development has affected the beach. The students will need to create a plan with 5 recommendations on how to prepare for future storms.
 3. The teacher will ask additional questions like Why do you think storms are so dangerous? What evidence does your group have? Make sure to include your findings in your poster along with recommendations on how to prepare for future storms.
- All posters will be presented to the class. Students will be able to ask questions to their classmates. The poster will be scored using a rubric, checking to see if students followed directions.

Extension:

Has Hurricanes gotten worse?
What was the impact of Hurricane Irene?

Resources:

- NASA Earth Observatory Image- Hurricane Sandy
https://www.nasa.gov/mission_pages/hurricanes/archives/2012/h2012_Sandy.html
- NASA. (n.d.). Retrieved from <https://www.nasa.gov/content/goddard/two-years-later-nasa-remembers-hurricane-sandy/>
- NASA. (2013, March 13). Hurricane Sandy. New Jersey.
- NOAA. (n.d.). *Storm Surge vs. Storm Tide*. Retrieved from NOAA:
<https://www.nhc.noaa.gov/surge/>
- Post, W. (2017, May 26). After Hurricane Sandy, N.J. roller coaster back in action. Seaside Heights, New Jersey.
- Two years later: Remembers Hurricane Sandy*. (n.d.). Retrieved from NASA:
<https://www.nasa.gov/content/goddard/two-years-later-nasa-remembers-hurricane-sandy/>
- University, R. (<https://www.nasa.gov/content/goddard/two-years-later-nasa-remembers-hurricane-sandy/>). *What was the size and directions of the winds?*