



IN THE PATH OF THE STORM



NAME:

DATE:

In this exercise you will be watching several storm surge animations from hurricane models as they approach the Gulf coast. You will see how storm surge changes with coastline shape and hurricane intensity.

If you have a hurricane of the same strength and speed headed towards the coastline, the storm surge can be drastically different depending on the bathymetry of the ocean (shape/depth of the ocean floor) and the topography of the coast (shape/elevation of the land). Look at the map of the northern Gulf of Mexico on the next page. Before watching the hurricane model animations, you will need to know where these landmarks are located along the northern Gulf of Mexico.

1. When a hurricane makes **landfall**, this is the geographic location that the eye of the hurricane moves onto land. The eye wall of a hurricane is where the most intense wind speeds can be found.

Label these locations in **RED** where our model storms will make landfall.

- | | | |
|---|--|---|
| <input type="checkbox"/> Gulfport, MS | <input type="checkbox"/> Horn Island, MS | <input type="checkbox"/> Dauphin Island, AL |
| <input type="checkbox"/> Petit Bios Island, MS/AL | <input type="checkbox"/> Fort Morgan Peninsula, AL | |

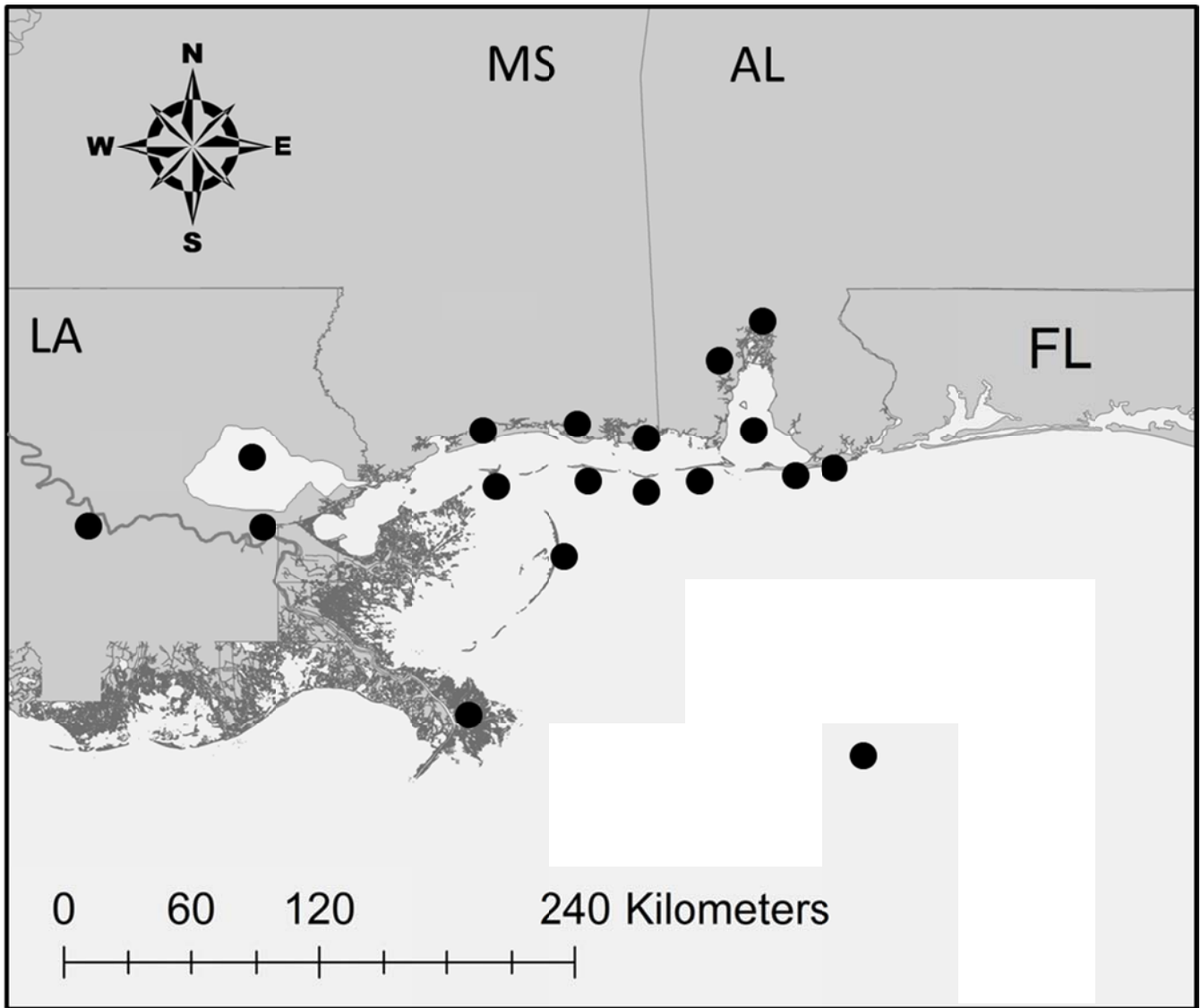
2. Along the coast, storm surge is often the greatest threat from a hurricane. Storm surge is produced by water being pushed toward the shore by the force of the winds rotating within the hurricane.

Label the locations in **BLUE** that could be affected by the storm surge of the model hurricanes

- | | | |
|--|--|---|
| <input type="checkbox"/> New Orleans, LA | <input type="checkbox"/> Mobile, AL | <input type="checkbox"/> Pascagoula, MS |
| <input type="checkbox"/> Biloxi, MS | <input type="checkbox"/> Mississippi River | <input type="checkbox"/> Mobile-Tensaw Delta |
| <input type="checkbox"/> Lake Ponchartrain, LA | <input type="checkbox"/> Mississippi River Delta | <input type="checkbox"/> Chandeleur Islands, LA |
| <input type="checkbox"/> Cat Island, MS | <input type="checkbox"/> Gulf of Mexico | <input type="checkbox"/> Mobile Bay, AL |
| <input type="checkbox"/> Gulf Shores, AL | | |



IN THE PATH OF THE STORM



Label the map of the northern Gulf of Mexico with the locations listed on page 1.



IN THE PATH OF THE STORM



3. Look at the map on page 2. Make a hypothesis about the **landfall location** (question 1) that will have the most severe and widespread storm surge during a category 4 storm. Explain your hypothesis.

4. Look at the map on page 2. The Mississippi River Delta is a very low-lying area of the Gulf Coast. Make a hypothesis about the maximum storm surge elevation in the Mississippi River Delta while a hurricane passes. How might the storm surge elevation compare at this location compared to the landfall locations? Explain your answer.

5. Look at the map on page 2. Make a hypothesis about the storm surge elevation of a hurricane as it approaches the coastline. Do you think storm surge will increase, decrease, or stay the same? Explain your answer.



IN THE PATH OF THE STORM



Now it is time to watch the animations of storm surge as each of the hurricane models approach land.

There are five landfall locations for our model storms: Gulfport, MS; Horn Island, MS; Petit Bois Island, MS/AL; Dauphin Island, AL; and Fort Morgan Peninsula, AL.

Each landfall location has model animations for a weaker storm (Category 2-3, approximate sustained winds of 110mph) and a stronger storm (category 4, approximate winds around 145mph). The depth of the storm surge is measured in height above mean sea level (MSL) and shown with a color code shown on the left of every video. As you watch the animation, you will see the storm progress along the storm track line, and the color of the water change as the storm surge depth changes.

There is a zoomed-in map and a zoomed out map for each model run. Use the animation that best answers each question.

6. Answer the following questions while watching the hurricane storm surge model animations. Fill in the tables for each storm surge model.

If there was no storm surge in a given location, fill in the box with [0 feet].

| LANDFALL LOCATION Gulfport, MS | Category 2-3 Hurricane | Category 4 Hurricane |
|---|------------------------|----------------------|
| Maximum storm surge depth in Mobile-Tensaw Delta, AL | | |
| Maximum storm surge depth in the Mississippi River Delta | | |
| Which Gulf Coast city had the highest surge elevations? How high? | | |
| Maximum storm surge depth at Gulfport, MS | | |

| LANDFALL LOCATION Horn Island, MS | Category 2-3 Hurricane | Category 4 Hurricane |
|---|------------------------|----------------------|
| Maximum storm surge depth in Mobile-Tensaw Delta, AL | | |
| Maximum storm surge depth in the Mississippi River Delta | | |
| Which Gulf Coast city had the highest surge elevations? How high? | | |
| Maximum storm surge depth at Horn Island, MS | | |



IN THE PATH OF THE STORM



6. (continued) Answer the following questions while watching the hurricane storm surge model animations. Fill in the tables for each storm surge model.

If there was no storm surge in a given location, fill in the box with [0 feet].

| | | |
|---|------------------------|----------------------|
| LANDFALL LOCATION Petit Bois, MS/AL | Category 2-3 Hurricane | Category 4 Hurricane |
| Maximum storm surge depth in Mobile-Tensaw Delta, AL | | |
| Maximum storm surge depth in the Mississippi River Delta | | |
| Which Gulf Coast location had the highest surge elevations? How high? | | |
| Maximum storm surge depth at Petit Bois, MS/AL | | |

| | | |
|---|------------------------|----------------------|
| LANDFALL LOCATION Dauphin Island, AL | Category 2-3 Hurricane | Category 4 Hurricane |
| Maximum storm surge depth in Mobile-Tensaw Delta, AL | | |
| Maximum storm surge depth in the Mississippi River Delta | | |
| Which Gulf Coast location had the highest surge elevations? How high? | | |
| Maximum storm surge depth at Dauphin Island, AL | | |

| | | |
|---|------------------------|----------------------|
| LANDFALL LOCATION Fort Morgan, AL | Category 2-3 Hurricane | Category 4 Hurricane |
| Maximum storm surge depth in Mobile-Tensaw Delta, AL | | |
| Maximum storm surge depth in the Mississippi River Delta | | |
| Which Gulf Coast city had the highest surge elevations? How high? | | |
| Maximum storm surge depth at Fort Morgan, AL | | |



IN THE PATH OF THE STORM



7. Which landfall location appeared to have the most severe storm surge during a category 4 model hurricane? How did this compare with your hypothesis in question 3?

8. Find Mobile Bay and the Mobile-Tensaw Delta, Alabama in the animations and review the tables in question 5.

Which landfall location(s) had the strongest storm surge in Mobile-Tensaw Delta area?

Did the path of this storm pass through Mobile Bay?

Why do you think this landfall location(s) had the greatest impact on storm surge in Mobile Bay?

When does the maximum surge occur? (before landfall, during landfall, after landfall)

Where in the bay does maximum storm surge occur?

Why do you think the highest surge occurs primarily in this location? Explain your answer.

9. From the predictions of these models, which side of the storm would be more intense, the eastern side or the western side? Why would this be? Explain your answer using what you know about hurricanes.



IN THE PATH OF THE STORM



10. Look at your hypothesis in question 4. Were you correct about the Mississippi River Delta and storm surge? Why or why not? Did the animations surprise you?
11. Look at your hypothesis in question 5. Were you correct? Why or why not? What happened to the model storm surge as the storms traveled through the Gulf of Mexico?
12. Watch one of the category 4 hurricane animations. How do the barrier islands affect storm surge as a hurricane approaches shore?
13. How do models of storm surge and hurricanes benefit scientific research?