



Introduction to Satellites: K-5 Activity Sheet

Activity 1: Do you want to Build a Satellite?

Materials: Toilet paper or paper towel rolls, pipe cleaners, paper plates, tinfoil, stickers, markers, tape, and scissors.

Now that we've learned all about satellites, it is time for you to build your own.

Satellite body

Start with the toilet paper/paper towel roll, or another similar household product. The toilet paper roll represents the body of the satellite, which holds all of its main parts, including the computer, camera, and all the other parts needed to make the satellite function. Hold the tube up to your eye and look through it. This is what the camera sees when it is pointed at something. The cameras can be pointed up or down, toward Earth or out to space.

Protective Shielding

When most people think about space, they picture it totally empty. That is not true! While space is very, very big, there is a lot going on out there. It can be a very dangerous environment. Energy from the sun is extremely powerful and can damage our satellites if we do not protect them correctly. To protect the satellites from the Sun's energy, as well as other dangers in Space, we put all of the important parts inside the satellite shell (toilet paper roll). To add even more protection to the walls of the satellite, we add shielding, like armor a Knight would wear in a fairy tale. The lightest and strongest material we use is Aluminum. To protect your satellite model, wrap the body in aluminum foil (our version of protective shielding). Lay the aluminum foil flat on the table, pinch the ends into the tube and roll, like you are wrapping a burrito. Use tape on the seam of the foil to keep it tight.

Solar Panels:

The same energy discussed earlier that could damage our satellites if we didn't have that shielding can also be used to power the satellite. That special way we capture sunlight and turn it into energy is by using solar panels. Use the paper plates to represent the satellite's solar panels. They can be made many different ways, but the best way is to cut straight into the paper plate to the halfway point and then make another cut perpendicular to the first cut. Basically, make a rectangle, with the edge of the plate being a bit curved. Make two of these rectangles. These rectangles should resemble wings for the satellite. Once the rectangles have been cut, draw a crisscross pattern on them to resemble a solar panel. Next, tape the paper plates to the toilet paper roll. Use tape on both sides of the plates to

make sure they are stuck symmetrically like wings. Ask your parent for help if this part is difficult. You have now successfully added solar panels to your satellite!

Antennae:

The pipe cleaner is the last step and represents the antennae on the satellite. The antennae allow us on Earth to communicate with the satellite and get the pictures it takes. The antennae can be represented any which way, straight up and down, curled, or wrapped around the satellite. Get creative with it! One good method is to roll the pipe cleaner in a spiral and push down the center just a bit to make it look like a dish, then tape it to the outside. Feel free to use your markers and stickers to decorate your satellite however you want.

Voila! You are now a satellite engineer on top of being a satellite analyst!

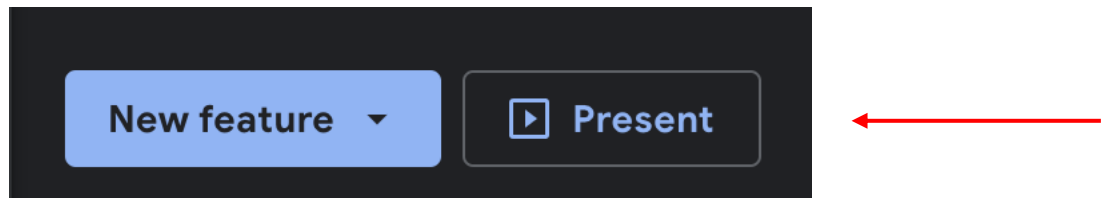
Activity 2: iSpy

Materials: Computer

To get our feet wet with satellite image analysis, we are going to play a game of iSpy! You will be shown images of famous landmarks, and you will need to analyze the image and figure out which site you are looking at. Start by clicking the link below:

https://earth.google.com/earth/rpc/cc/drive?state=%7B%22ids%22%3A%5B%221NKW_c9v_u2wauCGVCGNLhnywF7JswQg1%22%5D%2C%22action%22%3A%22open%22%2C%22userId%22%3A%22105579686581861036685%22%7D&usp=sharing

Select the “Present” button, shown below.



Move through the presentation and have fun identifying landmarks.

Activity 3: Eye of the Storm

Materials: Computer, pen/pencil, paper

You are now the GEOINTer in Chief of Geo Beach, a city on the beach. It is your job to use GEOINT, specifically satellite imagery, to solve problems your city faces. It is hurricane

season, and meteorologists have warned that there is a category 4 hurricane barreling toward Geo Beach. Satellite imagery plays a big role in helping cities better prepare for hurricanes and the impact they have on the landscape. Geo Beach has never been hit by a hurricane before, so you are having a hard time preparing a plan to deal with this emergency. Luckily, the geography of your town is almost identical to that of Mexico Beach, Florida, which was hit by Hurricane Michael in 2018. Let's study that storm to better understand how to prepare for the one approaching your town.

Read through the following articles to learn more about Hurricane Michael.

Source 1: <https://newsforkids.net/articles/2018/10/12/hurricane-michael-hits-florida-hard/>

Source 2: <https://www.sciencenewsforstudents.org/article/hurricane-michael-slams-florida-then-speeds-north>

Hurricanes are ranked using a category system based on their wind speed. These articles tell us that Hurricane Michael was a category 4 at its strongest. The fastest wind speed recorded in Mexico Beach, Florida was 155 miles per hour. However, despite being ordered to evacuate, many Mexico Beach residents decided to stay in their homes. Some stayed because they wanted to protect their homes. Others felt like they were not given enough warning to leave. Some residents did not have anywhere to evacuate to. These are all factors to consider when dealing with a Hurricane.

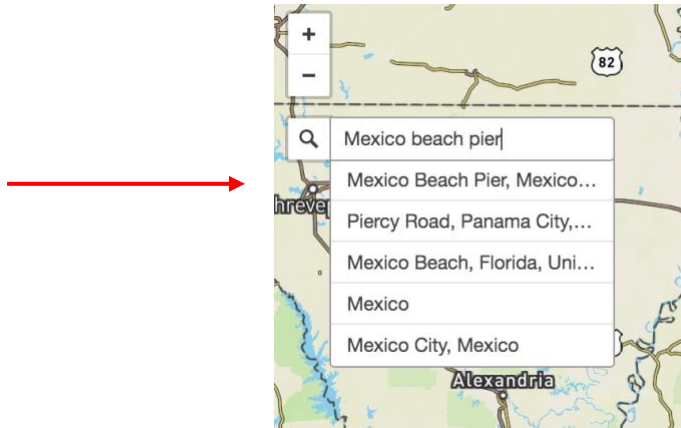
Now let's look at aerial imagery of Mexico Beach and the impact of Hurricane Michael. Please open the following link:

<https://storms.ngs.noaa.gov/storms/michael/index.html#7/30.137/-85.599>.

This is a map of Florida. On the upper left corner of your screen, please click on the magnifying lens button.



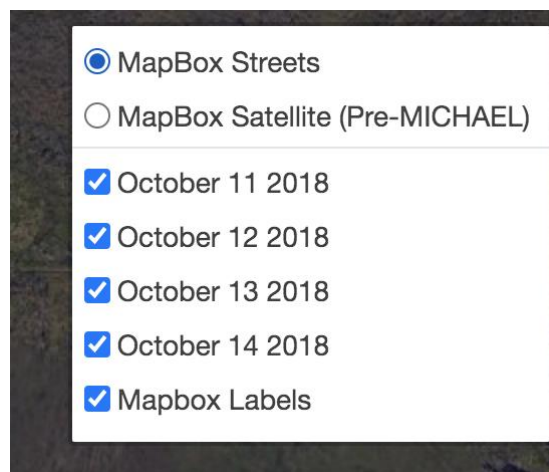
This brings up a search bar. Type in "Mexico Beach pier" and select the first option that appears on the list.



This will zoom you to a close-up view of the city of Mexico Beach. Now, select the layers button, which is found in the upper right corner of the screen.

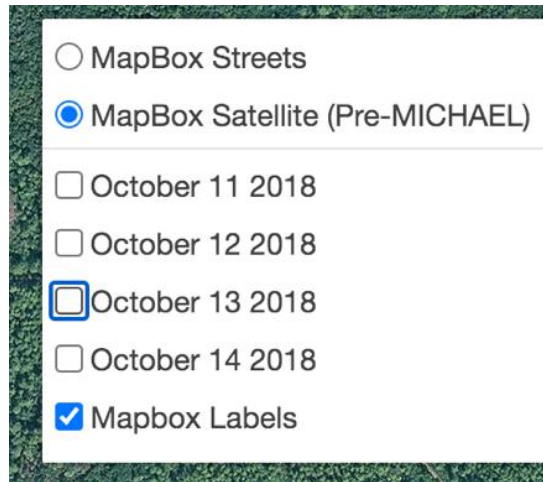


The pop up box should look like the picture below:

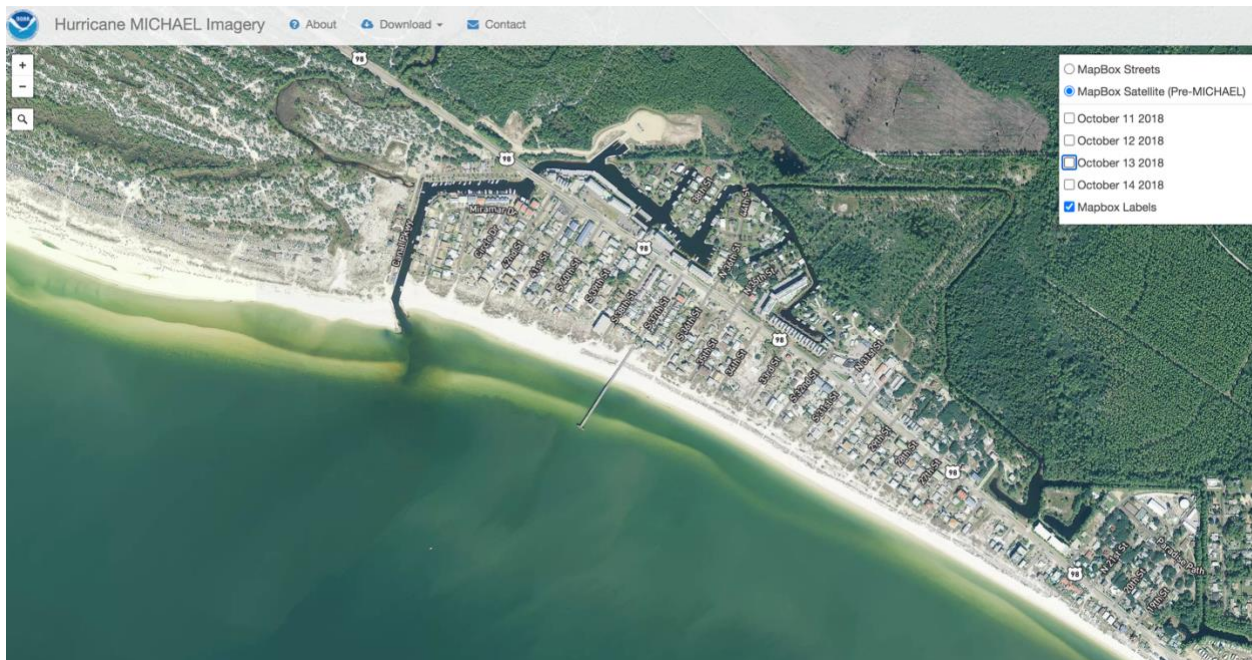


Click the button next to "MapBox Satellite (Pre-MICHAEL)". Unselect the buttons next to "MapBox Streets", "October 11 2018", "October 12 2018", "October 13 2018", and "October

14 2018". Keep the "Mapbox Labels" button selected. It should now look like the picture below:



You should now be looking at an aerial image of Mexico Beach that looks something like this:



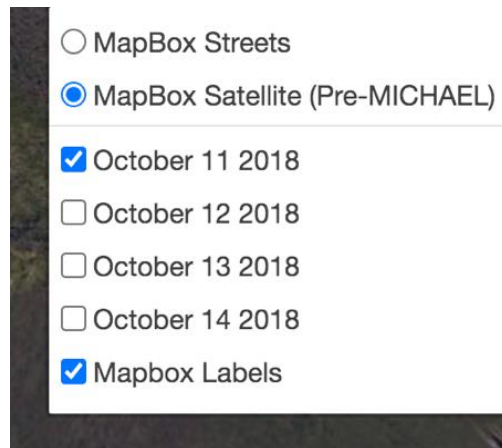
Take some time to zoom in and out and investigate what Mexico Beach looked like before Hurricane Michael. Using the satellite image, answer the questions below:

1. How would you describe the landscape of Mexico Beach?

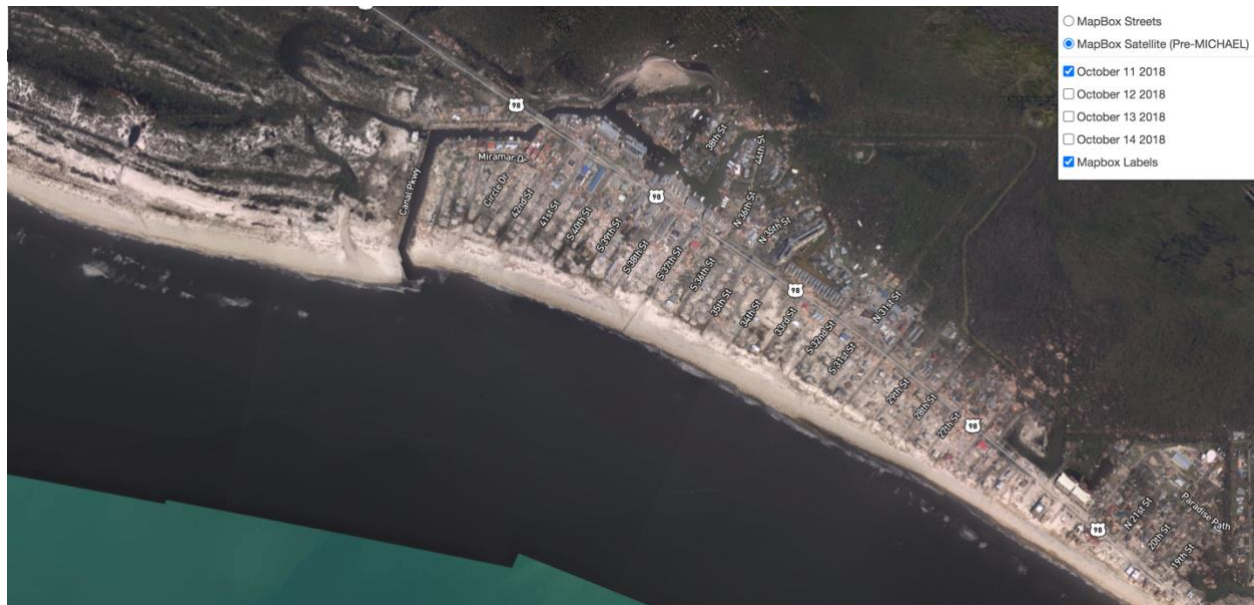
2. What about Mexico Beach makes it vulnerable to hurricane damage?

3. Which structures or buildings can you identify on the map that are particularly vulnerable to hurricane damage? Which areas would be extra prone to flooding during a hurricane?

Now, click again on the layers button in the upper right corner. Click the button next to “October 11 2018” to turn that imagery on. It should look like the picture below:



Your map should now look like this:



The imagery now shows us what Mexico Beach looked like a few days after it was struck by Hurricane Michael. Click the button next to “October 11 2018” on and off to see how the area looked before and after the hurricane. Do this as much as you would like and spend time zooming in and out to study the damage. Answer the following questions:

Think about how the landscape has changed since Hurricane Michael hit?

1. How has the landscape changed since Hurricane Michael hit?
2. What happened to the structures that you identified as vulnerable in the earlier question? Specifically look at the buildings closest to the beach and the pier.
3. Spend time looking at the rivers and canals beyond the beach. What do they look like after the storm? Were these areas that you thought would flood?

Using satellite imagery, we were able to gain a strong understanding of how Hurricane Michael impacted Mexico Beach, Florida. Now, let’s apply that knowledge to prepare for the hurricane approaching Geo Beach.

There are many long-term solutions that can help beachfront communities prepare for hurricanes. You can reinforce existing buildings and build new ones using materials made to withstand hurricanes. Cities can also build levees to deal with flood waters. However, we only have a week before our storm is supposed to hit. We need to come up with some immediate solutions to make sure our residents and their homes are safe. Think back on the articles we read about Hurricane Michael.

The City of Mexico Beach ask residents to do evacuate before the storm hit land, but many stayed in their homes because they were only told by the government to evacuate only a few days before Hurricane Michael hit. Others stayed because they wanted to protect their homes. Others had no place to evacuate to.

This tells you that your residents of Geo Beach need to be told to evacuate sooner. A week should be enough time. Let's think through how you can persuade residents to evacuate in a timely manner while still protecting their homes. One way would be offering residents money to evacuate. Another would be to send city officials to each home to help put up barriers between the homes and the storms. You could also set up hotels for people to evacuate to if they have nowhere else to go. These are all possible solutions to keep your residents safe while also protecting their homes.