My NASA Data - Lesson Plans

Hurricanes as Heat Engines Story Map: Lesson Plan

Overview

Using various visualizations (i.e., images, charts, and graphs), students will explore the energy exchange that occurs when hurricanes extract heat energy from the ocean. This story map is intended to be used with students who have access to a computing device in a 1:1 or 1:2 setting.

Virtual Teachers: Make a copy of the Google Form of your choice so that you may assign it directly from your Google Drive into your Learning Management System (e.g., Google Classroom, Canvas, Schoology, etc.). Do you need help incorporating these Google Forms into your Learning Management System? If so, read this Guide to Using Google Forms with My NASA Data.

Learning Objectives
Students will analyze NASA sea surface temperature data to use as evidence to explain a phenomenon.

Students will explore how hurricanes gain energy from the ocean surface.

Why Does NASA Study This Phenomenon?

Hurricanes are the most violent storms on Earth. They are like giant engines that use warm, moist air as fuel, which is why they form only over warm ocean waters near the equator. The warm, moist air over the ocean rises upward and as the air continues to rise the surrounding air swirls in to take its place. As the warm, moist air rises and cools off, clouds form creating a system of clouds and wind that spins and grows, fed by the ocean’s heat and water evaporating from the surface. NASA satellites gather sea surface temperature data that can be used to explore changes that occur.

Essential Questions

1. How is the development of a hurricane affected by sea surface temperature?
2. How is thermal energy transferred within a hurricane system?
3. How does a hurricane affect the different spheres within the Earth System?

Cross-Curricular Connections

National Geography Standard

How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.

Materials Required

Per Student:

- “Hurricanes as Heat Engines Story Map Datasheet”

Per Student/Small Group:

- Computer or Tablet
- Internet Access

Technology Requirements

- Internet Required
- One-to-One (tablet, laptop, or CPU)
- Visualization Tool Required

Teacher Background Information

The passage of a hurricane causes a large transfer of heat between the ocean surface and the atmosphere. It also causes surface waters to diverge, bringing cooler water from below to the surface (upwelling). These effects are so large that they can be seen by a drop in sea surface temperature (SST) in satellite data observations along the path of the storm. The cooler water conditions may last
for a week or longer after the storm.

**Procedure**

1. Using an internet accessible device, students open the link to the **Hurricanes as Heat Engines Story Map Lesson: link** to begin their exploration of this phenomenon.
2. Distribute the Hurricanes as Heat Engines Story Map Student Sheet. Have students navigate on their own through the Engage, Explore, Explain, Elaborate, and Evaluate tabs of the story map to answer the questions and complete the activities on their student sheet.

**Teacher Answer Key**

Teachers who are interested in receiving the answer key, please contact My NASA Data from your school email address at [larc-mynasadata@mail.nasa.gov](mailto:larc-mynasadata@mail.nasa.gov).

**Extensions**

If your students need additional practice with data analysis, consider incorporating this story map with the My NASA Data [Data Literacy Cubes](https://www.nasa.gov/).