

# GOES Satellite: Understanding Fronts



## Lesson Overview:

The goal of this lesson is to look at real data collected by the National Weather Service through the satellite GOES satellites. Students will look at weather maps showing fronts from previous data and then data from that day to predict the weather in the future.

## Lesson Objectives:

Students will be able to understand how different fronts create different weather patterns. Students will evaluate how weather changes as fronts move through an area by looking at weather maps and radar maps to see what type of weather was caused in certain areas after a front moved through.

## NGSS Standards:

**MS-ESS2-5:** Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

**Grade Target:** 7th grade (6-8 range) NGSS standards for weather

## Background Information:

The GOES satellite (Geostationary Operational Environmental Satellite) is a joint program between NASA and the National Oceanic and Atmospheric Administration (NOAA) (NASA, 2017). The GOES program is a family of satellites positioned in different locations in order to monitor weather events all over the planet. These satellites have supported the ongoing effort to predict severe weather events and keep the population safe through advanced warning systems.

## Materials:

Computer access for interactive maps and simulations

Paper for creating booklets/graphic organizers and advertisement

Rubric for advertisement

([https://docs.google.com/document/d/14GhZTHjbcxiLrnZzksZmPUr\\_q8lhdCmlHuw-L8h-ZRc/edit?usp=sharing](https://docs.google.com/document/d/14GhZTHjbcxiLrnZzksZmPUr_q8lhdCmlHuw-L8h-ZRc/edit?usp=sharing))

Rubric for evaluating CER statement ([CER Rubric .docx](https://dpi.wi.gov/sites/default/files/imce/science/CER%20Rubric.docx)<https://dpi.wi.gov/sites/default/files/imce/science/CER%20Rubric.docx>)

## Time Requirements: 7-9 days

1 day: Engage and Front simulator

1-2 Day(s): Investigate GOES missions and create an advertisement for the mission

1-2 Day(s): Students will work with interactive maps to evaluate what weather comes with which type of front.

1-2 Day(s): Make predictions CER statement. Could take 2 days in the case of peer editing and reviewing statements.

1-2 Day(s): Create script for meteorologist; present news scripts.

### **Vocabulary/Key Words:**

Air Mass	Stationary Front
Front	Occluded Front
Warm Front	Humidity
Cold Front	High Pressure
Precipitation	Low Pressure

### **Engage:**

Show students this Extreme Weather video: [https://www.youtube.com/watch?v=WyZ\\_wJgM\\_g](https://www.youtube.com/watch?v=WyZ_wJgM_g)

There are lots of youtube videos about severe weather, find one that would be interesting in your area.

Students discuss what could cause these weather events. Create a notice/wonder chart about these events.

### **Explore:**

Students will first explore what fronts are, and what effect they have on the weather. The Weather Channel has an interactive model of fronts that students can explore. They are able to move the front coming in and see the type of weather it creates. They also can click on the front and it explains the weather that is seen with each type. (Interactive model here:

<https://learn.weatherstem.com/modules/learn/lessons/105/index.html>) If the simulator isn't working, or more help is needed, the National Weather Service has a web page about fronts (<https://www.weather.gov/jetstream/airmass>)

Once students are familiar with what each front does, they can investigate how we look at weather through satellites. Show students the video about the GOES missions (<https://youtu.be/6Q7Leqvzfg4>). Students can then investigate the GOES mission page and see how what the satellite measures. (<https://www.goes-r.gov/#MissionVideo>). Have students create an advertisement campaign for the GOES mission. (Rubric found here:

[https://docs.google.com/document/d/14GhZTHjbcxiLrnZzksZmPUr\\_q8lhdCmlHuw-L8h-ZRc/edit?usp=sharing](https://docs.google.com/document/d/14GhZTHjbcxiLrnZzksZmPUr_q8lhdCmlHuw-L8h-ZRc/edit?usp=sharing)). One source of information for those without computer access is the fact sheet on the website ([https://www.goes-r.gov/education/docs/GOES-R\\_Overview\\_FS\\_FINAL.pdf](https://www.goes-r.gov/education/docs/GOES-R_Overview_FS_FINAL.pdf)) which is also found in spanish for ELL students.

Students will then look choose their location on the GOES map and observe air mass data here: <https://www.star.nesdis.noaa.gov/GOES/index.php>. Students will then compare the data to the National Weather Service weather data. There are multiple animated models to choose from (24 hours up to 6 days of fronts) for students to see fronts traveling across their region.

([https://www.nws.noaa.gov/outlook\\_tab.php](https://www.nws.noaa.gov/outlook_tab.php)) There is a map that shows precipitation and radar that students can compare the front map to, to see how the fronts changed the weather. Another

neat animation to look at real time images of weather is here:

<https://www.nesdis.noaa.gov/content/imagery-and-data>. These maps show satellite data from the last 24 hours. One of the maps shows water vapor in the atmosphere. Comparing that data to the fronts weather maps, would be a great way for students to realize how fronts change the amount of water vapor, thus changing the weather.

Students can create their **Explain** graphic organizers here if desired.

Next, students should be shown the front map for today and make predictions for the weather we may see later, or tomorrow. Students should use a claim/evidence/reasoning statement, gathering evidence from the maps and simulations they have explored.

### **Explain:**

Students should be able to explain how fronts change the weather. They should understand the difference between warm, cold, stationary and occluded fronts, and how the weather is affected by each.

Students can create a graphic organizer or booklet showing what each type of front is and the weather expected for each one.

### **Evaluate:**

Students should be able to utilise evidence in their CER statement to accurately predict the weather. A fun way to assess their predictions is showing them the prediction map from the NWS ([https://www.wpc.ncep.noaa.gov/national\\_forecast/natfcst.php?day=2](https://www.wpc.ncep.noaa.gov/national_forecast/natfcst.php?day=2)). Their final statements should meet the CER rubric here: [CER Rubric .docx](https://dpi.wi.gov/sites/default/files/imce/science/CER%20Rubric.docx)<https://dpi.wi.gov/sites/default/files/imce/science/CER%20Rubric.docx>. Students may take time building and fixing their statements, using peer editing to build their statements.

This document

([https://drive.google.com/file/d/1nSN2f\\_QpJSzTTqgaZxdIRcMWMoCz1SG0/view?usp=sharing](https://drive.google.com/file/d/1nSN2f_QpJSzTTqgaZxdIRcMWMoCz1SG0/view?usp=sharing)) would be a small assessment that students could fill out looking at weather information and predicting the next day's weather.

### **ELA Standards:**

[CCSS.ELA-LITERACY.RST.6-8.4](#)

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (Students need to evaluate the symbols and terms learned through the maps in order to understand how air masses and fronts affect weather)

[CCSS.ELA-LITERACY.RST.6-8.1](#)

Cite specific textual evidence to support analysis of science and technical texts. (Students

should cite evidence to their claims for tomorrow's weather)

CCSS.ELA-LITERACY.RST.6-8.9

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (Students will be able to use the information gathered through the simulators and interactive maps to connect concepts in order to meet the lesson objectives)

**Elaborate/Extend:**

Students can then use their predictions of the weather for their area for tomorrow to create a script for a meteorologist to read on tonight's weather. The script should include precipitation, temperature estimates and cloud cover. It could be fun to have a few volunteers read theirs off as if they were news anchors.

**Resources:**

WeatherSTEM. (2017). Weather Fronts. Retrieved from

<https://learn.weatherstem.com/modules/learn/lessons/105/index.html>

GOES-R. NOAA & NASA. (n.d.) Retrieved from <https://www.goes-r.gov>

GOES Image Viewer. NOAA. (2019). Retrieved from

<https://www.star.nesdis.noaa.gov/GOES/sector.php?sat=G16&sector=sp>

GOES Satellite Network. (2017). NASA. Retrieved from

<https://www.nasa.gov/content/goes-overview/index.html>

Weather Prediction Center. (2019). NOAA/National Weather Service. Retrieved from

[https://www.wpc.ncep.noaa.gov/national\\_forecast/natfcst.php?day=2](https://www.wpc.ncep.noaa.gov/national_forecast/natfcst.php?day=2)

Satellite and Information Service. (n.d.) NOAA National Environmental Satellite, Data, and Information Service (NESDIS). Retrieved from

<https://www.nesdis.noaa.gov/content/imagery-and-data>

Air Masses. (n.d.) The National Weather Service. Retrieved from

<https://www.weather.gov/jetstream/airmass>