Weather and Climate
Maps and Weather Forecasting

Statement of Purpose

This lesson set gives students an opportunity to apply science, language arts, and mathematical skills in a real-world scenario. Additionally, students are challenged to read various scientific writings and internalize the information.

Daily weather affects everyone and is often a major topic of discussion among individuals in society. Beyond this, global climate change is a major issue which weakens our ecosystem, affecting all living organisms and their habitats. This lesson gives students the opportunity to comprehend the difficulty of predicting weather as well as understanding the complexity of understanding climate.

Through readings, online videos, websites, online slide decks and interactive forms, students work to understand that weather (and climate) are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things (ESS2.D as in MS-ESS2-6). The ocean exerts a major influence on weather by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents (ESS2.D as in MS-ESS2-6).

Additionally, the complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns (ESS2.C as in MS-ESS2-5). Because these patterns are so complex, weather can only be predicted probabilistically (ESS2.D as in MS-ESS2-5) and as such present scientists with real-world mathematical problems requiring multiple steps and tools to solve.

Various strategies and forms of representations of the calculated data (7.EE.B) support the development of these predictive models used to find probabilities of weather events with comparisons of probabilities made from models to observed frequencies; if the agreement is not good, explanations of possible sources of the discrepancy are presented(7.SP.C.7), citing specific textual evidence to support the analysis (RST.6-8.1). This written quantitative and technical information is expressed, in a visual version, scientists can use to understand and convey the information in a meaningful manner (RST.6-8.7).

This lesson is designed to allow for differentiation among students in the class. Although the lessons are designed to have the teacher provide some classroom lecture, students can access the material and complete major components of the assignment independently at their own pace. Self-check questions are provided along the way, with links to additional resources provided, depending on the answer given, for further exploration of a topic. For "turn-in items" students are given the choice as to the amount of technology they choice to use.

Bundle: Climate Diversity

Bundle Question: What causes climates to be so different across the Earth?

Unit: Maps and Forecasting

Unit Essential Question: How does the energy and matter that circulate Earth's systems impact weather and climate?

Grade: 7

NGSS and Common Core Standards

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

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

7.EE.B. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

7.SP.C.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

Crosscutting Concepts

Patterns: Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. Patterns can be used to identify cause and effect relationships. Graphs, charts, and images can be used to identify patterns in data.

Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Systems and System Models: Models can be used to represent systems and their interactions such as inputs, processes and outputs and energy, matter, and information flows within systems.

Time

This lesson is expected to take six to seven days to complete. The first day is used to introduce the lesson and engage the students. Day two through five see the students working through the "Maps and Forecasting" slide deck and accompanying question and answer packet. Day six has the class looking at two maps of the same type and discussing them, with guided questions, using what they learned previously in the lesson. The additional day is included to allow for the self-pace aspect of the lesson.

Objectives

● Students will be able to analyze weather maps in order to make predictions about weather and climate. (DOK 3)
● Students will be able to collect data and create models to provide evidence for how the motion and interactions of air masses can change the weather. (DOK 2)
● Students will be able to develop a model to describe how the unequal heating and rotation of the Earth cause patterns of movements (currents) in the atmosphere and in the oceans. (DOK 3)
● Students will be able to evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (DOK 4)
● Students will be able to cite specific textual evidence to support analysis of science and technical texts related to climate and weather. (DOK 1)
● Students will be able to integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually in weather/climate related models, tables, and graphs. (DOK 3)
● Students will be able to solve multi-step real-life and mathematical problems posed concerning weather and climate with positive and negative rational numbers and assess the reasonableness of answers using mental computation and estimation strategies. (DOK 3)
● Students will be able to develop a probability model and use it to find probabilities of events. (DOK3)

Engage

As students come into the classroom, a set of dry erase markers are in a basket by the door and students are instructed to get a dry erase marker and take their seat. JPL's "Land Surface Temperature" movie (shown with link below) is playing on the screen. Ask students to watch it and quickly write down, on their workspace, their first thoughts of what they are seeing.

Land Surface Temperature (daytime)

℃

-25   10   45
February 2000
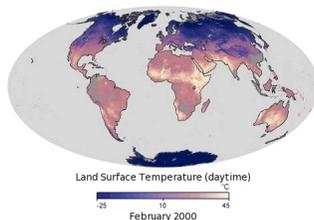
"Courtesy NASA/JPL-Caltech."

Teacher Note: In this scenario, students sit at stations with dry erase surfaces. The method of recording the information could also be done in desired manner.

Tell the class they are going to be analyzing distinct types of visual data associated with weather over the coming week in order to identify patterns that occur in weather and learn to make predictions based on those patterns. Then explain they are going to be looking at many maps during this lesson so it is important they analyze these maps like a scientist.

The class is then asked to look at the animation again and brainstorm things that scientists might do when analyzing this map view. I ask students the question, **"As a scientist analyzing this map, what can you tell us about it?"**

There are no right or wrong answers at this point. The goal is to gain an understanding of their prior knowledge and to facilitate a dialogue among students about the topic of weather data and weather forecasting.

At the completion of the brainstorming session, reiterate that in the upcoming activities they will be analyzing several different maps as they work to develop an understanding of the factors that influence climate, the relationships between air pressure, clouds, weather fronts and the jet stream and how these come together to make weather predictions.

Students are encouraged to remember, as they analyze the visual data throughout the next few days, to slow down and use the following steps for each map they encounter.

1. Read the title to determine what the map is about (the type of data being provided).
2. Determine the author (if available) to get a sense of the purpose of the map.
3. Look at the key - What are the units? What is the scale?
4. Look for patterns.
5. Use previously learned scientific knowledge or explore resources to figure out "why" the patterns in the map exist.
    Teacher Note: Each step is written on the board and left up for the duration of the lesson. The list of steps entitled "Analyzing Maps" is also in Google Classroom for review by the students as needed. The following is a link to the "Analyzing Maps" document.
To help students see these steps in a concrete way, play the "Land Surface Temperature" movie again and draw attention to the heat map key and identify it as as being the range of temperatures of Earth at the surface as they would feel to the touch. Note that seasonal patterns and regional trends can be seen. Also, note that temperatures near the equator remain steady throughout the year.

Tell the class that although the author of the is not directly identified in the movie if they look closely they can gain valuable information from the URL (cast the address), in this case it is https://www.jpl.nasa.gov/edu/images/activities/land_temp.gif, and from here it is clear JPL and NASA are somehow involved in the production of the video.
Additionally, some background research into this video, would show it can be found as part of a lesson entitled "Earth Science Data Visualizations – How to Read a Heat Map" provided by NASA JPL Education at https://www.jpl.nasa.gov/edu/teach/activity/earth-science-data -visualizations-how-to-read-a-heat-map/. Following the link and casting the results provides the opportunity to show students detailed information about the visual representation data.

Explore
Now equipped with the knowledge of how to start analyzing data representations, students will work individually on the "Maps and Forecasting" Google Slides slide deck and accompanying

"Weather Forecasting" question and answer packet. This is a self-paced activity with built in check-ins along the way.
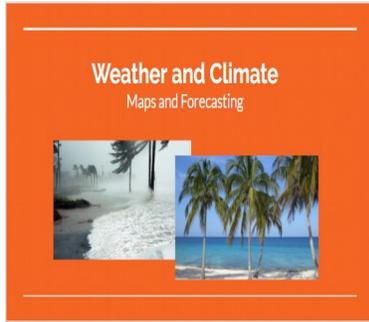
Cast the "Maps and Forecasting" slide deck and explain to students they will be following the directions on each slide to complete the "Weather Forecasting" packet both of which are posted in Google Classroom along with the other materials they may find useful in completing the activity.

Next, cast the packet and show them it is broken down into sections that correlate with the directions on the in the slide deck. Tell the students, "It is important to follow the directions of each slide carefully. If the directions ask you to only answer questions 1 and 2, it is important you go back to the slide deck after answering those two questions. If you click on the link and then try to answer all the questions in the section, it could be confusing as you often need different links to answer different questions."

Activity Breakdown

The slide deck is a compilation of links to articles about weather and climate as well as links to live weather maps, meaning some of the maps will change with the day, and even with the hour.

Teacher Note: Students' answers will vary. Below is a short synopsis of the key points

students should take away from each section.

Maps and Weather:

First, students read an article entitled "Climate and Weather" about factors that influence climate such as elevation, latitude, and distance to water. Students then analyze a map of elevation in the U.S. compared to a map of the average temperatures in the U.S. Students find there is a correlation between elevation and temperature and that areas at higher elevations tend to have colder temperatures.

Students then analyze a map of Michigan that shows extreme cold temperatures. Students find that the most extreme temperatures are found north and inland while the most mild, stable temperatures are found in southern Michigan and along the shores of the Great Lakes. Students begin developing the idea that areas near water are warmer in the winter and cooler in the summer than areas that are landlocked.

Winds and Clouds:

In this section, students learn about isobars and use their previously learned knowledge of air pressure to make predictions about wind speed and direction using isobar maps.

Teacher Note:

This is a point where students do a self "check-in" about their level of understanding so far in the lesson. Here is what that looks like in the packet.

Now that you see where the clouds were, how accurate were your predictions?

- ☐ I nailed it. (90% to 100% correct)
- ☐ I had a pretty good idea. (80% to 89% correct)
- ☐ I was in the ball park (70% to 79% correct)
- ☐ I probably need to get some help with this. (Below 70%)

Some students may take the initiative to come and seek help. For those who are reluctant, they are offered the opportunity to explore another resource by viewing a related video and then answering a question on how they feel about their knowledge now. Here is what that looks like in the packet.

For a review of the reasons why your predictions were what they were, check out the video by entering the link **https://goo.gl/rK8iGT** into your browser and after watching give some feedback on whether it helped.

- ☐ Yep, that's what I thought.
- ☐ Oh, now I get it.
- ☐ I'm still lost. STOP- find the teacher.

Notice, they are prompted to stop and find the teacher if they feel they still need some help.

Weather Fronts and Rainfall:

This section first asks students to predict where cloud cover would be located based solely on an isobar pressure map. The goal is that from previous lessons involving air pressure, that students are aware that areas of low pressure, rising air would result in cloud cover.

Students then look at satellite maps to see if their predictions are correct and can clearly see that low-pressure areas have cloud cover while areas of high pressure have clear skies.

Next, students compare isobar maps, frontal maps, and rainfall maps to determine a relationship between where areas of rainfall are in relationship to pressure systems and frontal boundaries.

Finally, students compare regional weather front maps to a looping interactive map showing the movement of clouds to analyze how the movement of the clouds is connected to frontal boundaries.

The Jet Stream:

Students watch a video and read an article as they gain knowledge and information about how the jet stream impacts weather patterns.

Predicting the Weather:

In this section, students compare maps that show regional fronts and compare the "shape" of the frontal boundaries to the "shape" of the current jet stream. Students see that the shape of the jet stream is similar to the large frontal boundaries across the US. Then, students make predictions about where they feel the cloud cover in the US will be in 3 days.

Mastery Skills:

In this last section, students consider how the lesson has helped them to answer the two mastery skills questions for this lesson from the "Bundle Mastery Skills" list of questions. These questions tie directly back to the standards being explored in this lesson. Here is what they look like in the packet.

1. In thinking about the mastery skill: "I can create models and collect data to provide evidence for how the motion and interactions of air masses can change the weather" how would you rank yourself? Check all that apply.

- ☐ I've totally got this.
- ☐ I've got a pretty good idea.
- ☐ I have kind of an idea.
- ☐ I probably need to get some help with this.

2. In thinking about the mastery skill: " I can develop a model to describe how the unequal heating and rotation of the Earth cause patterns of movements (currents) in the atmosphere and in the oceans" how would you rank yourself?

- ☐ I've totally got this.
- ☐ I've got a pretty good idea.
- ☐ I have kind of an idea.
- ☐ I probably need to get some help with this.

Teacher note:

Unlike in the previous self-check-in, students are not prompted to do further review. This check-in is the final step before submitting the packet. These questions serve a twofold purpose. First, they serve as indicator of how students feel about their level of confidence with the lesson thus far. Secondly, they serve as conversation prompts during the next phase of the lesson.

Explain

As the packets are submitted, students are placed in small groups and instructed to discuss their answers. Each group is informed, that as a starting point, they can share their answers to the final two questions and the reasons why they choose the answer they did.

Elaborate/Extend

After all students have completed the small group discussions, the class will discuss this culminating question for the lesson.

Why do you think that meteorologists can't exactly predict the weather? Why can they only give us a "probable" prediction?

In the discussion, students should identify these key components:
Weather (and climate) are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things (ESS2.D as in MS-ESS2-6). The ocean exerts a major influence on weather by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents (ESS2.D as in MS-ESS2-6). Additionally, the complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns (ESS2.C as in MS-ESS2-5). Because these patterns are so complex, weather can only be predicted probabilistically (ESS2.D as in MS-ESS2-5) and as such present scientists with real-world mathematical problems requiring multiple steps and tools to solve. Various strategies and forms of representations of the calculated data (7.EE.B) support the development of these predictive models used to find probabilities of weather events with comparisons of probabilities made from models to observed frequencies; if the agreement is not good, explanations of possible sources of the discrepancy are presented(7.SP.C.7)

As needed, the students will be asked simple, but pointed questions to help them identify the key components and discuss them.
Examples include:
Why so many different maps (models)?
Does the water cycle ever stop?
What about the influence of the sun?
What about all the different patterns?

Evaluate

The beauty of this lesson is it is student driven, thus providing students a large amount of time to work independently. With little direct teaching, a great deal of learning occurs as students analyze graphs and find and model patterns to weather, on their own.

Formative assessment is ongoing throughout the lesson. As students work through the lesson, frequent checks with individuals and providing feedback and instruction is done. If there appears to be a situation where more than one student is having difficulty, provide a mini lesson covering that topic.

Moreover, the small group discussion and subsequent whole group discussion allows assess student knowledge.   Make notes of those students seeming hesitant with responding and those with misconceptions and then, during the closure, call on students that haven't been heard from or students with previously identified misconceptions.

Summatively, the lesson set is worth 75 points. Students are provided a rubric as part of the assignment. Completing the assignment is worth 5 points. The "Weather Forecasting Packet" and "Climate and Weather Check-in" are submitted and graded. The packet is worth 50 points. The check-in is worth 20 points. Submissions are first graded without being provided the correct answer. They are given the opportunity to correct errors and resubmit for a final grade.

Next Steps

This lesson forms the foundation for the next lesson where students explore our local weather and climate in more detail and make weather predictions for our area, based on available information, and compare their predictions to those of local meteorologists.

References

NASA Jet Propulsion Laboratory. (n.d.). *Earth science data visualizations - how to read a heat map*. Retrieved from https://www.jpl.nasa.gov/edu/teach/activity/earth-science-data-visualizations-how-to-read-a-heat-map/

NGSS Lead States. (2013). Bundling the NGSS. In *Next Generation Science Standards: For States, By States*. Washington, DC: National Academies Press. Retrieved from http://www.nextgenscience.org/

Roehm, L. (2015). *Weather Forecasting Online Activity.* Retrieved from https://betterlesson.com/lesson/638300/weather-forecasting-online-activity

Weather forecasting. (n.d.) Retrieved from https://sites.google.com/a/salineschools.org.

Weather and Climate Slide Deck

Slide 1

Weather and Climate
Maps and Forecasting

Slide 2

With this slidedeck, you will be exploring weather and climate using weather maps and forecasting. This deck is accompanied by a Weather Forecasting Packet that you will need to open and use to answer probing questions and share your responses to writing prompts.

To use the Packet you will make a copy and label it Weather Packet (Your Name)

This slidedeck is based on an online Weather Forecasting Website developed by the Saline Area Schools in Saline, MI found at https://sites.google.com/a/salineschools.org.

Slide 3

Lesson Objective

You will be able to analyze various types of maps in order to make predictions about weather and climate.

Slide 4

Mastery Skills

I can create models and collect data to provide evidence for how the motion and interactions of air masses can change the weather.

I can develop a model to describe how the unequal heating and rotation of the Earth cause patterns of movements (currents) in the atmosphere and in the oceans.

Slide 5

It is important you follow the directions of each slide carefully.

If the directions ask you to only answer questions 1 and 2, it is important you go back to the slidedeck after answering those two questions.

If you click on the link and then try to answer all of the questions in the section, it could be confusing as you often need different links to answer different questions.

Slide 6

Step 1

To get started open and complete the Reading Check-In as you read the article Climate and Weather. Some of the material may seem familiar, from previous lessons, and that's a good thing.
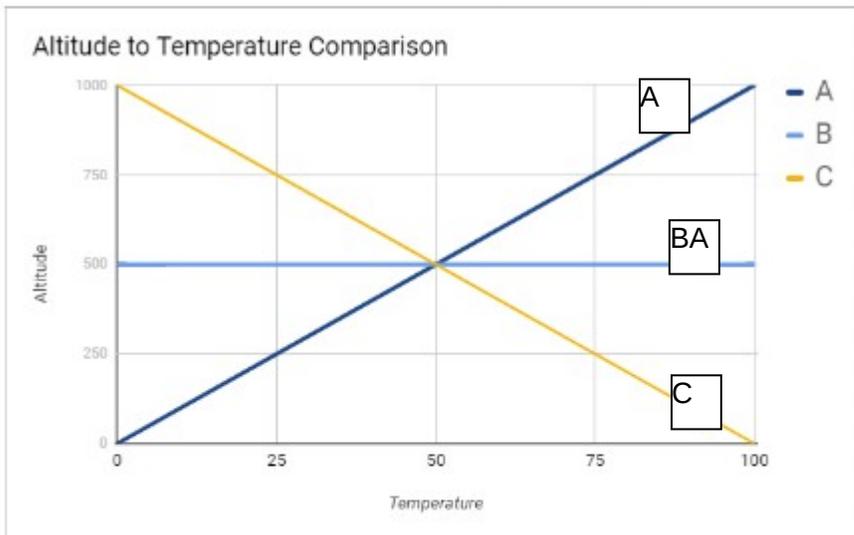
Slide 7

Step 2

Now, compare the two maps shown below. The first map shows elevation in the US. The second map shows average temperatures in the US.

(Click on the picture to open in a new tab.

Answer Questions #1 and #2 in the Maps and Weather section of your packet.

Maps and Forecasting Package

This package accompanies your "Maps and Forecasting" Google Slide presentation to help you to analyze weather maps as you develop an understanding of the factors that influence climate, the relationships between air pressure, clouds, weather fronts and the jet stream and how these come together to make weather predictions.

Mastery Skill: I can create models and collect data to provide evidence for how the motion and interactions of air masses can change the weather.

Mastery Skill: I can develop a model to describe how the unequal heating and rotation of the Earth cause patterns of movements (currents) in the atmosphere and in the oceans.

This package is based on the Weather Forecasting: Online Activity worksheet created by Leigh Roehm found at https://betterlesson.com/lesson/638300/weather-forecasting-online-activity.

Name: _____

Maps and Weather

1. As you analyze the maps, what patterns do you notice when comparing the maps?

2. Which line in the graph shows the general relationship between elevation and temperature?

Altitude to Temperature Comparison

A graph with the vertical axis labeled "Altitude" (ranging from 0 to 1000 with marks at 250, 500, 750, 1000) and the horizontal axis labeled "Temperature" (ranging from 0 to 100 with marks at 25, 50, 75, 100). Legend: A, B, C.

- Line A (increasing diagonal line, dark)
- Line B (horizontal line at 500, light blue) — labeled BA
- Line C (decreasing diagonal line, tan)

Mark only one oval.

- ⬭ Line A (Darkest line)
- ⬭ Line B (Light Blue)
- ⬭ Line C (Tan Line)
- ⬭ None of the Lines

3. Referring to the USDA Hardiness Zone Map of the U.S., what is this map measuring?

4. Again, referring to the USDA Hardiness Zone Map, what patterns do you notice? Clue: Think about what you know about the sun's energy in relation to latitude?

5. Referring to the USDA Hardiness Zone Map for Michigan, what patterns do you notice? Clue: Think about specific heat from the previous readings.

6. Referring to the USDA Hardiness Zone Map for Missouri, what patterns do you notice? What do you think the major reasons are for the patterns?

7. John loves extremely cold temperatures. He is moving to a new country. In a general sense, where in the country should John look for his home if his goal is to live in a place with extremely cold temperatures? (You are not choosing a specific country. You are giving him general advice that he could use in any country when looking for a place to move.)

Winds and Clouds

1. How can you use isobars to determine approximate wind speed and direction using a pressure map? Clue: Think about what you already know about pressure. Note: The map provided here is a visual aid you can use as you answer the question.
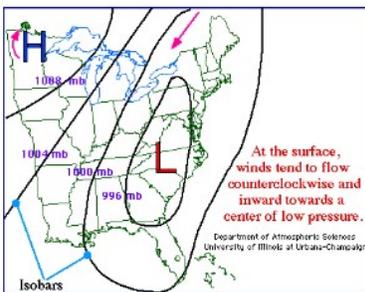
2. Based on the "Sea Level Pressure –Isobars" map, draw clouds on the map where you predict areas of cloud cover to be? Clue: Think about what you know about areas of low pressure and rising air.
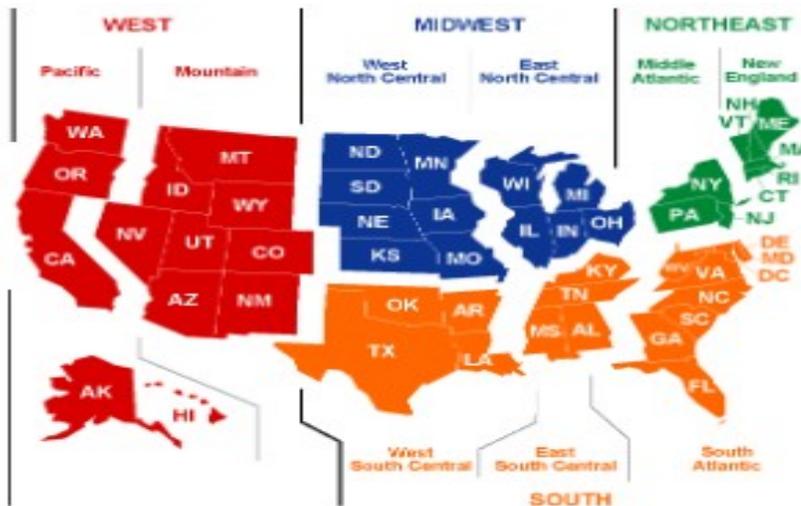
3. Now that you see where the clouds actually were, how accurate were your predictions?

- ☐ I nailed it. (90% to 100% correct)
- ☐ I had a pretty good idea. (80% to 89% correct)
- ☐ I was in the ball park (70% to 79% correct)
- ☐ I probably need to get some help with this. (Below 70%)

4. For a review of the reasons why your predictions were what they were, check out the video by entering the link **https://goo.gl/rK8iGT** into your browser and after watching give some feedback on whether it helped.

- ☐ Yep, that's what I thought.
- ☐ Oh, now I get it.
- ☐ I'm still lost.

5. You have learned in previous lessons pressure and temperature are related. If someone brought you these two maps and asked you to help them understand how these maps could be used as evidence in explaining this relationship, briefly describe what you would share with them.
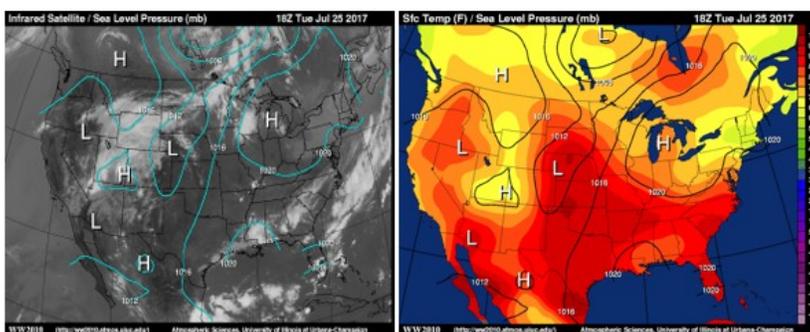
Weather Fronts and Rainfall

1. What is the general relationship between the areas where it is raining and the pressure in those areas?

2. What do you notice about the way the clouds are moving? How is this related to areas of high and low air pressure?

3. If you were standing on the edge of a thunderstorm as it begins to form, would the wind be blowing into the storm or out of it, and why?

The Jet Stream

1. What causes a jet stream?

2. What does the jet stream show?

3. How can meteorologists use the jet stream to predict the weather?

4. What weather would you predict at the ridge of a jet stream?

5. What weather would you predict at the trough of a jet stream?

Predicting the Weather

1. What patterns do you notice when comparing the surface maps to the jet stream maps?

2. What patterns do you notice when comparing locations and movement of the clouds in the "East CONUS" map to the location and movement of the fronts on the "Surface Maps"?

3. Using the information from the maps you have, draw clouds where you predict areas of cloud cover to be in three days?

Mastery Skills

1. In thinking about the mastery skill: "I can create models and collect data to provide evidence for how the motion and interactions of air masses can change the weather" how would you rank yourself? Check all that apply.

- [ ] I've totally got this.
- [ ] I've got a pretty good idea.
- [ ] I have kind of an idea.
- [ ] I probably need to get some help with this.

2. In thinking about the mastery skill: " I can develop a model to describe how the unequal heating and rotation of the Earth cause patterns of movements (currents) in the atmosphere and in the oceans" how would you rank yourself?

- [ ] I've totally got this.
- [ ] I've got a pretty good idea.
- [ ] I have kind of an idea.
- [ ] I probably need to get some help with this.

Climate and Weather

Weather is the condition of the earth's atmosphere at a particular place and time. Each day, you may check the weather to see what kind of clothes to wear. **Climate**, however, is the average year-after-year conditions of temperature, precipitation, winds and clouds in an area. For example, Michigan's climate includes four seasons with cold winters featuring a lot of snow fall. The climate of regions near the equator features higher temperatures and little variation with seasons.

There are a few factors that influence climate. The first is **altitude**. As altitude increases, temperature decreases. Thus, areas at high altitudes often have cooler year round temperatures. The second is **latitude**. At latitude's near the equator, the sun directly hits the earth. This results in areas near the equator to have higher yearly temperatures. At latitudes near the poles, the sun's rays tend to hit the earth at an angle, which can result in more seasonal variation and often cooler temperatures. The third is the **distance an area is to water**. Water has a high specific heat. Specific heat is the amount of energy required to raise the temperature. So, because water has a high specific heat, it requires a lot of energy to warm up. Thus, areas by the water tend to be cooler in the summer compared to inland areas not by water. Because water takes a long time to warm up, the sun's rays that come down in those areas are absorbed by the water. As the water takes a lot of energy to get warm, the cool water keeps the temperatures near the shore cooler. In addition, areas near water tend to have warmer temperatures during the winter. During the summer, the water absorbs an enormous amount of energy due to its high specific heat. This means that during the winter, it takes a long time to release all of the heat it absorbed during the summer. With the water releasing heat, the temperatures along the shore tend to be warmer than inland temperatures. This means that areas near water have cooler summers and warmer winters. Inland areas tend to have more drastic temperature ranges and get hotter during the summer and colder during the winter.

Specific areas also have specific types of air masses that are associated with them. An **air mass** is just a large amount of air over an area that is described by its temperature and humidity. The first word in describing an air mass deals with its temperature. Tropical indicates warmer temperatures (like in the tropics) while polar indicates cooler temperatures (like near the poles). The second word refers to

the humidity of the air. Maritime refers to moist, humid air (often over bodies of water) and continental means dry air (often over inland areas). Scientists put these descriptors together to fully describe air masses. Here are the four types of air masses:

1. Maritime tropical – hot and humid
2. Maritime polar - cold and humid
3. Continental tropical – hot and dry
4. Continental polar – cold and dry

Climate and Weather Check-in

Using the reading Climate and Weather , complete the following check-in.

1.
   Email address *

   _____

Untitled Title

2.
   Define weather and climate. *

   _____

   _____

   _____

   _____

   _____

3.
   What are three factors that affect climate – (for each, be sure to describe HOW they affect the climate *

   _____

   _____

   _____

   _____

   _____

4.
   My cousin is planning on moving to the coast of Oregon. He asked me what he can expect the seasons to be like there. What should I tell him and why? *

   _____

   _____

   _____

   _____

5. **What is the best description of Maritime Tropical?** *

Mark only one oval.

- ⭕ cold and humid
- ⭕ hot and humid
- ⭕ hot and dry
- ⭕ cold and dry

6.

What is the best description of Maritime Polar? *

Mark only one oval.

- ⭕ cold and humid
- ⭕ hot and humid
- ⭕ hot and dry
- ⭕ cold and dry

7.

What is the best description of Continental Tropical? *

Mark only one oval.

- ⭕ hot and humid
- ⭕ cold and dry
- ⭕ hot and dry
- ⭕ Option 4

8.

What is the best description of Continental Polar? *

Mark only one oval.

- ⭕ hot and humid
- ⭕ cold and humid
- ⭕ hot and dry
- ⭕ cold and dry

☐ Send me a copy of my responses.

The jet stream is created by unequal heating of Earth. The fastest winds are found where the temperature change is greatest. From the diagrams below, notice how the general position of the jet stream changes from summer to winter. During summer months there is little temperature difference across the United States and the position of the jet stream moves northward. However, in winter months, when it is considerably warmer in Florida than it is in Wisconsin for example, there is a large temperature change across the United States.

Since the jet stream is a result of temperature differences it is a useful temperature forecasting tool. **The jet stream shows the boundary between colder air to the north and warmer air to the south.**
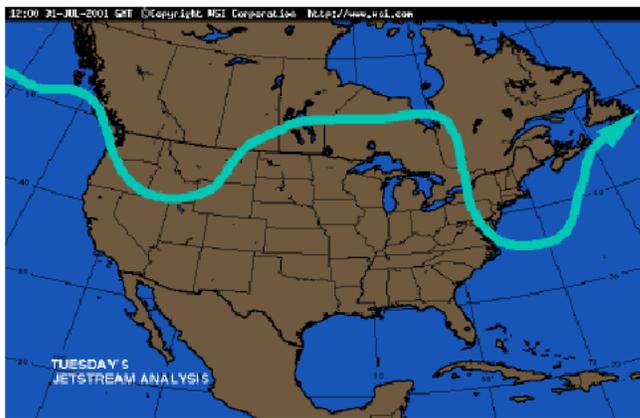
Summer jet stream position   Winter jet stream position

Analyzing Maps

Steps to remember as you analyze maps.

1. Read the title to determine what the map is about.

2. Determine the author (if available) to get a sense of the purpose of the map.

3. Look at the key - What are the units? What is the scale?

4. Look for patterns.

5. Use previously learned scientific knowledge or explore resources to figure out "why" the

patterns in the map exist.

How You Earn Points

(Weather and Climate Lesson)

Description	Points Possible
Complete the project on time.	5
Climate and Weather Reading Check-in	20
Climate and Weather Packet	50
Total	**75**

Here is a screen shot of the assignment in Google Classroom.

Weather and Climate

	0	26
	DONE	NOT DONE

Weather and Climate Online Activity Lesson

In this lesson you will be exploring weather and climate using weather maps and forecasting. To start, open the Weather and Climate Slidedeck and follow the directions. This is a self-paced lesson. An estimated maximum amount of time needed for completion is 3 days. I will be checking in on your progress each day. Extensions beyond the 3 day will be on a case-by-case basis.

Weather and Climate -E
Google Slides

Maps and Forecasting Package -E
Google Docs

Weather and Climate Grading Rubric.docx
Google Docs

Climate and Weather Check-in
Google Forms   View responses

Climate and Weather Reading -E
Google Docs

Jet Stream Reading -E
Google Docs

Analyzing Maps -E
Google Docs

QUESTIONS   RESPONSES 21

What are three factors that affect climate – (for each, be sure to describe HOW they affect the climate

21 responses

The first is altitude. As altitude increases, temperature decreases. Thus, areas at high altitudes often have cooler year round temperatures. The second is latitude. At latitude's near the equator, the sun directly hits the earth. This results in areas near the equator to have higher yearly temperatures. At latitudes near the poles, the sun's rays tend to hit the earth at an angle, which can result in more seasonal variation and often cooler temperatures. The third is the distance an area is to water. Water has a high specific heat. Specific heat is the amount of energy required to raise the temperature. So, because water has a high specific heat, it requires a lot of energy to warm up. Thus, areas by the water tend to be cooler in the summer compared to inland areas not by water. In addition, areas near water tend to have warmer temperatures during the winter.

altitude as altitude increases tempature decreaces latitude as latitude nears the equater the sun hits dirrectly distence the area is to water water has a high specific heat

As altitude increases as temperature decreases. Places with higher altitudes have colder year round temperatures. Lattitude near the equator is warm and closer to the poles is colder. Distance to the water. Water needs specific amounts of energy to heat up. More water less heat.

The three factors that affect climate are altitude, latitude, and distance and area is to water. Altitude affects climate because as altitude increases, temperature decreases. At latitude's near the equator, it is warmer. Latitude farther away from the equator is colder because the sun's angle is different.

As altitude increases, temperature decreases. At latitude's near the equator, the sun directly hits the earth. At latitudes near the poles, the sun's rays tend to hit the earth at an angle, which can result in more seasonal

My cousin is planning on moving to the coast of Oregon. He asked me what he can expect the seasons to be like there. What should I tell him and why?

21 responses

You should tell him, areas near water have cooler summers and warmer winters.

Reason:
Areas by the water tend to be cooler in the summer compared to inland areas not by water. Because water has a high specific heat, it requires a lot of energy to warm up. Because water takes a long time to warm up, the sun's rays that come down in those areas are absorbed by the water. As the water takes a lot of energy to get warm, the cool water keeps the temperatures near the shore cooler.

Areas near water tend to have warmer temperatures during the winter. During the summer, the water absorbs an enormous amount of energy due to its high specific heat. This means that during the winter, it takes a long time to release all of the heat it absorbed during the summer. With the water releasing heat, the temperatures along the shore tend to be warmer than inland temperatures.

summer will probl be hot because it i right on the coast line but winters will most likely be cold because Oregon is closer to Canada

You should tell him it is warmer in the winter but cold in the summer do to the water on the coast. The collects most of the heat during the summer but releases it during the winter therefore making the winter warm.

I would tell him that because he is moving towards the coast, it will be warmer because the water stores heat, and during the winter it releases it. I would also tell him to consider the latitude and altitude of where he is moving to.

Winds and Clouds

1. How can you use isobars to determine approximate wind speed and direction using a pressure map? Clue: Think about what you already know about pressure. Note: The map provided here is a visual aid you can use as you answer the question.

___ / 2
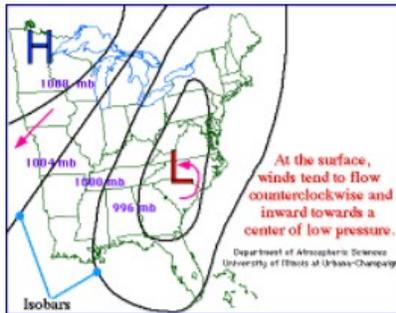
Pressure flows from areas of high pressure to pressure. We know that wind flows roughly parallel with the isobars. According to the Coriolis Effect in the northern hemisphere areas of high pressure flow clockwise and vice versa for low pressure. You can use isobars and pressure to determine wind speed coriolis

2. Which line in the graph shows the general relationship between elevation and temperature? *

2   / 2
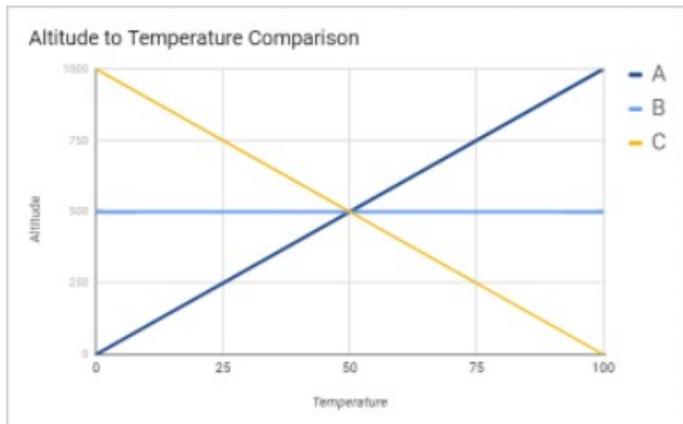
○ Line A (Darkest line)

○ Line B (Light Blue)

◉ Line C (Tan Line)   ✓

○ None of the Lines

1. As you analyze the maps, what patterns do you notice when comparing the maps?

When analyzing the two maps, I notice that the temperature map is color coded. It gets more blue,(cold) and the yellow at the bottom represents the warmest. On the second map I noticed that again, it's color coded. It gets more red in the north-northwest region of the U.S, which is 17-2800ft, and more green in the East-southeast region (0-500ft)

3. Now that you see where the clouds actually were, how accurate were your predictions?

- ☐ I nailed it. (90% to 100% correct)
- ☑ I had a pretty good idea. (80% to 89% correct)
- ☐ I was in the ball park (70% to 79% correct)
- ☐ I probably need to get some help with this. (Below 70%)