

Understanding Weather Fronts Using Surface Maps

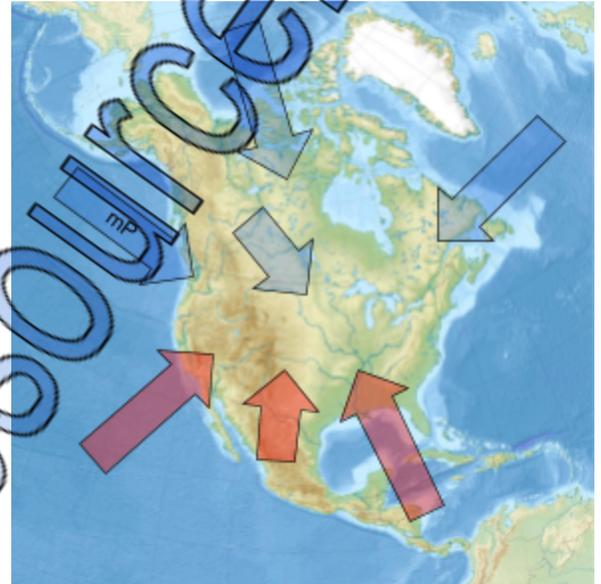
Air temperature determines what type of precipitation an area will receive. There are 4 types: rain, sleet, hail, and snow. Precipitation occurs after condensation has happened and air is no longer able to keep the moisture aloft. Rain occurs when liquid water falls. The larger the rain drops the more time the liquid stayed within the cloud gaining mass. Snow occurs when water vapor changes to a solid. Sleet happens when snow passes through a warm layer of air, melts and then freezes as it approaches the ground. Freezing rain can happen when rain falls through the atmosphere and hits frigid air close to the surface so that the moment it hits an object it freezes. Hail is formed in cumulonimbus clouds as water drops rise and fall through the cloud collecting moisture at the base of the cloud and freezing near the top of the cloud. Remember cumulonimbus clouds can get to about 18,000 meters or 60,000 feet.

Air masses are large bodies of air that have relatively the same temperature and humidity. Their temperature and humidity are based on where they come in from. Air masses determine the changes in weather.

North American Air Masses Coming From:

- Over Ocean: maritime (m)
- Over land: continental (c)
- Way up north: Arctic (A)
- From the north: Polar (P)
- From the south: Tropical (T)

So if an air mass came from over an ocean in the north you would call the air mass Maritime polar or mP and bring in cold wet air. An air mass that came from the south and over a continent would be called Continental tropical or cT and would bring in warm dry air.



1. Fill in the map to the right with the different types of air masses. An example is done for you.
2. What would an air mass be like if it came from the north and over the land?
3. What would an air mass be like that came in from the south and over the ocean?

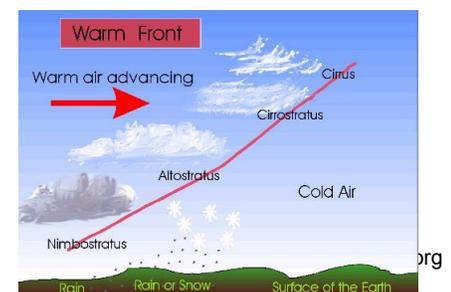
Remember that atmospheric pressure affects weather patterns as well. High pressure occurs when heavy air sinks making cloud formation difficult therefore the area would have clear weather. Low pressure occurs when less dense air rises quickly taking moisture with it causing cloud growth and eventually stormy weather.

Weather fronts are boundaries between two different air masses. Stormy weather happens at these boundaries. Air masses with different temperatures don't mix. Cold fronts happen when a cooler air mass moves under a warm air mass causing air to rise and eventually condensate. Cold fronts on a weather map are symbolised with a string of blue triangles. Cold fronts tend to cause stormy weather and contain cumulus and cumulonimbus clouds.

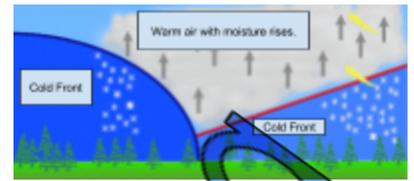


Cold Front

Warm fronts happen when a warmer air mass moves over a cooler air mass, rising relatively slowly. Warm fronts are going to have wide bands of precipitation and be preceded by high cirrus clouds. These types of fronts are symbolized as a string of red lumps.



An occluded front happens when two cold air masses merge together pinching warmer causing it to rise. Strong wind and heavy precipitation can occur. Occluded fronts are symbolised with purple triangles and lumps.



air

The last type of front is called a stationary front. Air pressure differences cause a warm front or cold front to stop moving. These types of fronts can stay in one place for days. Weather along these fronts include light wind and precipitation. Stationary fronts are symbolized by a string of red lumps and blue triangles.



Now that you are familiar with air masses and fronts go to the following website: <http://tinyurl.com/weir-surfacemap> This website contains an analysis of the current surface weather in North America. It will show the locations of all the high and low air pressure areas as well as all of the different fronts.

4. List all of the states that currently have a high pressure system.
5. List all of the states that currently have a low pressure system.
6. Fill in the following table:

	Cold	Warm	Occluded	Stationary
List states with the following fronts. If one type of front is not found on the map, place an X inside the cell.				

7. What type of weather is noticeable in areas with high pressure systems?
8. Which type of weather is noticeable in areas with low pressure systems?
9. Click on your state. What type of front and pressure system does your state currently have?

Above the map contains four squares with 12, 24, 36 and 48 hour forecasts.



10. Fill in the following table for your state based on the future surface analysis forecast:

Time period	Type of Front	Type of Pressure	Explain why the weather is the way it is for each of the time periods.
12 hours			
24 hours			
36 hours			
48 hours			

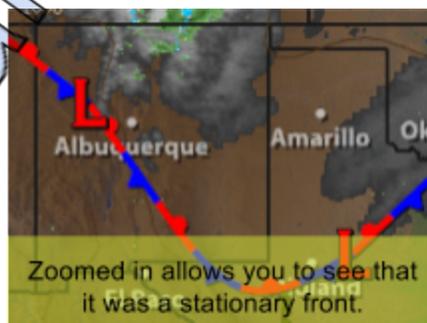
Teacher Instruction and Reflections

Instructions:

1. I have the students read the first four paragraphs and answer number 1-3 and fill in the map first first.
2. We then do whole class instruction and discussion talking about the different types of precipitation and why it is important to understand where the air masses come from and how these directions dictate the type of weather certain areas might have.
 - a. As part of that discussion I also show the following youtube videos or at least parts of them.
 - i. https://www.youtube.com/watch?v=33X49oh15_Q
 1. This video does a great job explaining how sleet and freezing rain form
 - ii. https://www.youtube.com/watch?v=NBHbW3_AOYA and https://www.youtube.com/watch?v=r0aS0Tdy_IQ
 1. These videos are great at showing the results of freezing rain.
3. I have the students work on the rest of the assignment which discusses fronts and analyzes current surface analysis of weather using intellicast.com

Reflections

1. Some years have better surface weather charts than others. I make it a point to discuss this. Sometimes weather in your local area stays pretty stagnant so when analyzing your location, and if it is not the greatest weather examples, I show other parts of the country when doing the whole group discussion.
2. Some years we don't have all of the different types of fronts which is kind of a bummer, but happens. I have them place an X in the front that is missing.
3. Sometimes there are two fronts together and it is difficult to realize that the warm front and cold front attached to each other are actually a stationary and cold front combined. To get around this I demonstrate to the students that if you can't tell 100 percent sure what type of front from the overall US map that they can click on regions and it will zoom in and separate the fronts.



- a.
4. High pressure for the most part is supposed to be very fair weather because clouds have a hard time forming and low pressure systems for the most part are supposed to be full of clouds and have storms. Sometimes you don't see any stormy weather next to a low and you see clouds where the highs are at. If this happens, it just adds to the discussion as to why and also demonstrates that weather is fickle and more conditions than just having a high and a low determine weather types.
 5. The fourth column on number 10 asks students why weather for the different time periods is the way it is. Many students just blow through this section without giving it a good thought or answer. The question is meant for students to analyze their state and try to understand the weather patterns that are coming to the area within the next 48 hours.