

Weather Map Creation and Discussion Questions

Meteorological Forecasting like a Tuskegee Airman

Atmospheric Pressure

Charles Anderson was an expert meteorologist and an impressive asset for the US Air Force. Much of modern forecasting, which follows the flow of atmospheric pressure, humidity, and temperature as it ebbs and flows, is directly derived from the work Anderson did in World War II studying atmospheric physics.

The atmosphere is composed of masses of air, with water vapor and other particles suspended in them, that flow over, under, and around each other.¹ Generally, there are sections that tend to cycle within themselves, alternating between warmer, less dense air and cooler, more dense air. Demarcations of these air masses are shown in the image below.

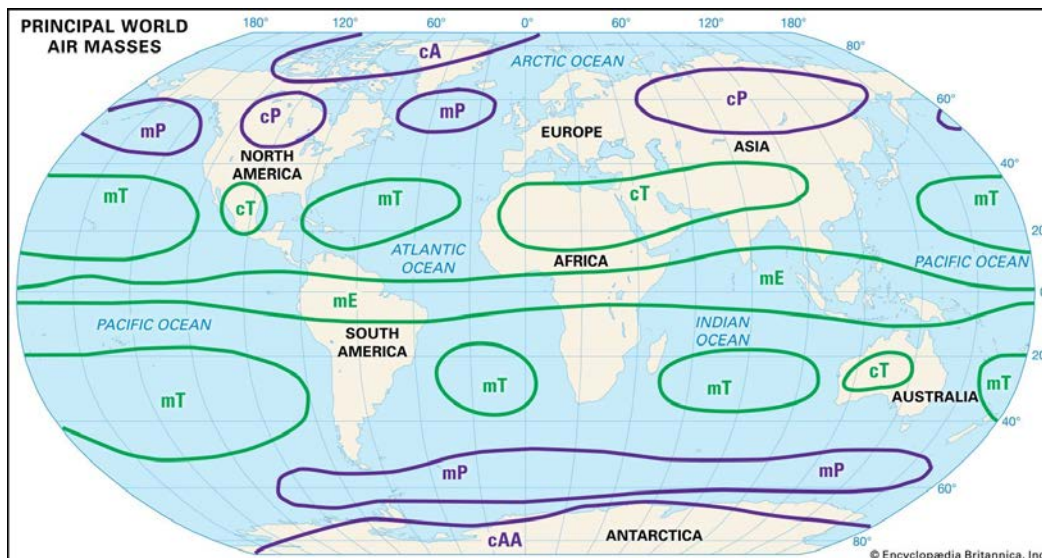


Image courtesy of [Encyclopedia Britannica](#), depicting the major air masses on Earth. Purple air masses are generally colder, and green air masses are generally warmer due to the regions in which they form. The majority of significant weather systems form between air masses, where warm and cool air can mix.

Atmospheric pressure guides most of what happens with the weather. Because colder air is more dense, air masses tend to sink towards the Earth's surface when they cool down. When colder air sinks, it creates a higher atmospheric pressure as more air presses into a smaller region, causing what is known as a "cold front." The higher atmosphere pressure "pushes out" humidity and clouds in favor of the sinking air mass. A high atmospheric pressure therefore usually means the weather is drier, sunnier, and less humid, such as when the sky is blue and sunny on a cold autumn day. Lower atmospheric pressure occurs when a warmer air mass rises through the

¹ "Weather." Encyclopedia Britannica, kids.britannica.com/students/article/weather/277681#210107-toc.

atmosphere, leaving a vacant spot in its wake for humidity and clouds to fill. Lower atmospheric pressure tends to indicate humidity, clouds, and a higher chance for precipitation and storms.²

Because high-pressure regions involve sinking air, and low-pressure regions involve rising air, there are wind currents that occur naturally between them. Air flows from high pressure regions towards lower pressure regions, and the wind direction follows.

Due to the warmer temperature in lower-pressure regions, humidity tends to pool where there is less pressure. Humidity is a measure of the water content in the air, which includes forms such as fog, mist, rain, and other types of precipitation. Water is very good at heat storage, so an increased presence of water in the air causes an increase in the effective temperature. This means that more humid regions both tend to *be* warmer than less humid regions and *feel* warmer than less humid regions at the same actual temperature, as well as often being more cloudy.

Of course, clouds often indicate precipitation and storms, as turbulent air where a hot and cold front meet churn the clouds.

Because clouds are the most visible part of the atmosphere, they are often the easiest way to begin forecasting the weather. Clouds will congregate in lower-pressure areas, and storms will form along the rift between a hot and cold front before settling in a low pressure area.

Weather Vocabulary

Atmospheric Pressure: A measure of the force exerted downward by all the air above a specific point. The average atmospheric pressure at sea level is 1 atm = 760 mmHg = 101.3 kPa.

Forecast: A prediction based on statistical models and physics that gives the weather for the near future.

Front: The edge of an air mass, often bringing a change in air temperature, humidity, or density to a region. Storms form along fronts.

Precipitation: Any form of water falling from clouds to the ground. Common types of precipitation include rain, snow, and hail.

Radar: A system developed around WWII that gave better insight into the structure and location of clouds, which improved meteorological forecasting.

Stationary Front: A place where warm and cold air are next to each other, but neither is moving. Often, a stationary front means “sitting” storm systems.

² American Meteorological Society.

Weather Map Creation Guide

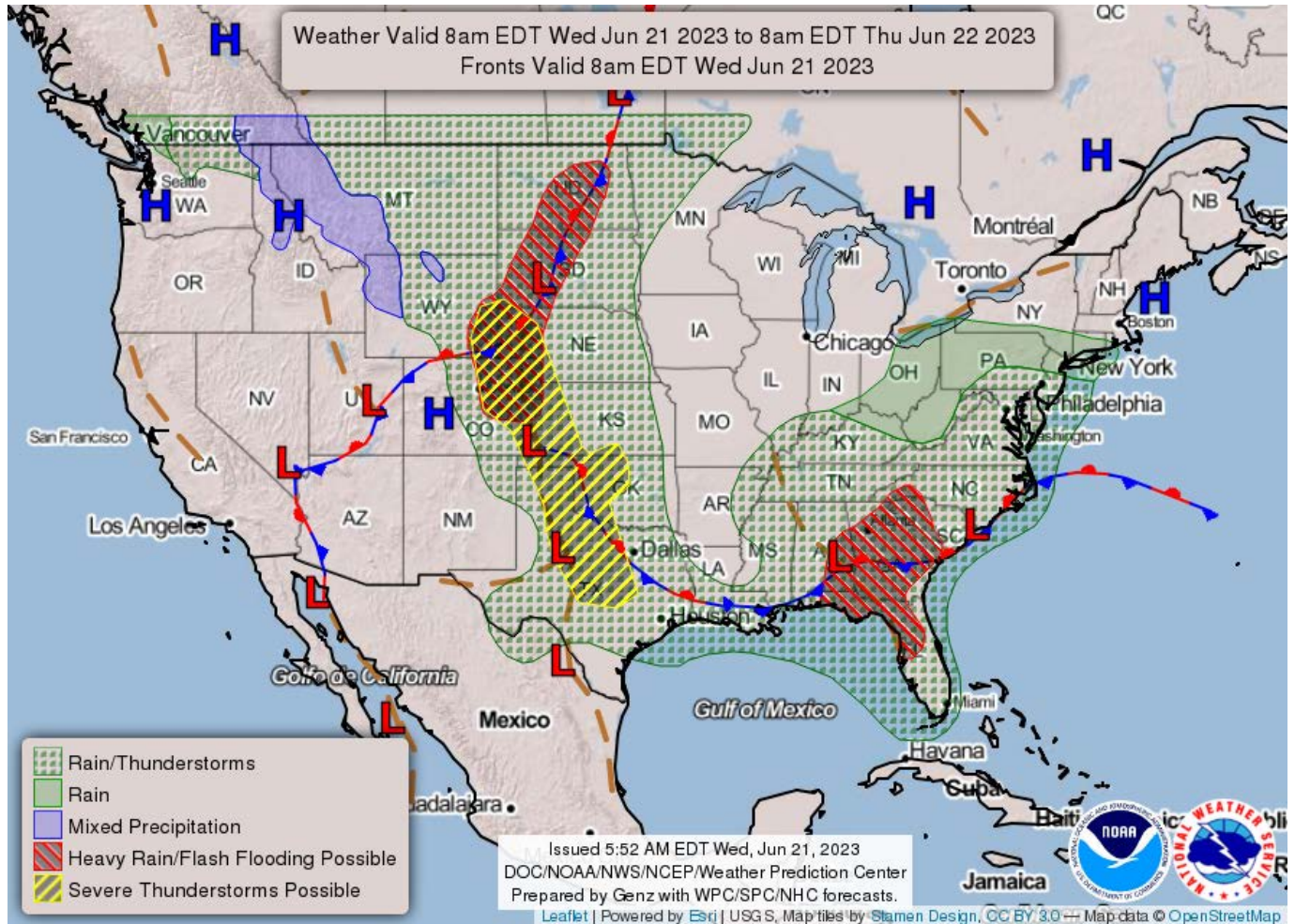
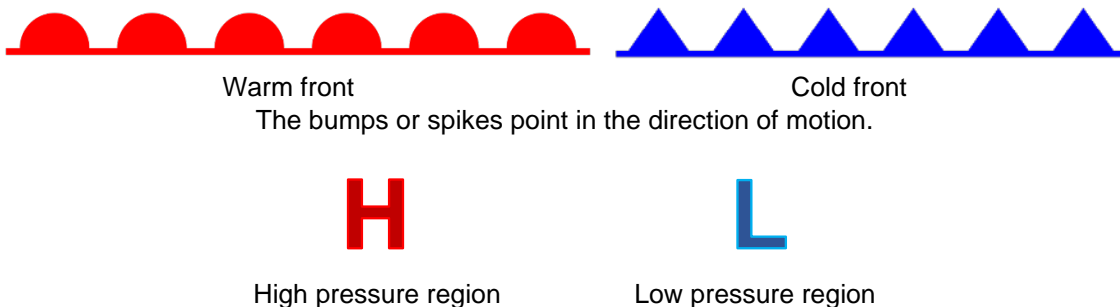


Image [courtesy of NOAA](#). This is the official weather map for June 21, 2023, which you can use to inform how you draw your weather map. Note the high and low pressure regions, as well as the different levels of precipitation and the stationary fronts.

Weather Map Symbols



Precipitation is shown as a shaded region, with either dots or colored slashes indicating the level of severity. On the example map above, general precipitation is shaded green, with thunderstorms shown with one dot and more severe weather shown with slashes. Often, one dot will indicate light rain, with two indicating heavier rain and three indicating thunderstorms. Snow or other forms of precipitation are often shown with a different color.

On the map below, draw your best interpretation of the current weather over the United States. Use the radar animation and satellite images of cloud cover, as well as your new knowledge of atmospheric pressure, to help you make an accurate map.



Image courtesy of [GISGeography](https://www.gisgeography.com/).

After drawing your map and seeing the actual current map, answer the following questions with your classmates.

1. How similar was your drawn map to the real pressure map?
2. How effective was observing the clouds at mapping atmospheric pressure systems?
3. Think about pressure. What are some other examples of things flowing from high to low pressure?