Name:_____ **Date:**_____

Weather vs. Climate

It's true! On January 30, 1966, the thermometer read -27 °F in New Market, Alabama, and on July 10, 1911, the thermometer read 105 °F in North Bridgton, Maine. These are not typical temperatures in these locations, but, thinking back, what were you basing your first guesses on in identifying the locations of the temperature mystery cities. You were probably relying on your knowledge of what you expect from climate of different regions in the United States. Typically, temperatures get very cold in winter months in the Northern states while the South stays milder. In the summer, temperatures get hotter in the South than in the North. After the average temperatures were given to you, your answers probably changed. You had more information to base your answers on. So why are these temperatures occurring?

The answer is that these temperatures represent only the weather on one particular day. Despite what many believe, weather and climate are not interchangeable, and it is important to understand the difference. Weather is what is going on in the atmosphere at a particular place and time. The current temperature, precipitation, humidity, air pressure, wind speed, are all properties of the current weather. In most places, weather changes from hour-to-hour, day-to-day, and season-to-season. The word climate describes the average pattern of weather as well as these natural variations in a region over roughly a 30 year period. In other words, climate is what we expect, and weather is what we get. While the one daily temperature reading gave you a snapshot of the weather of the cities, the average temperature is a trend, and is more reliable in making conclusions.

Name:_____ **Date:**_____

Watching the Weather

Over the course of the next several days you will keep track of the temperatures outside your school and at the Amundsen-Scott South Pole Station in Antarctica. Your teacher will tell you where to find this information. Be sure to take notice of the other weather properties like wind speed, cloud cover, or precipitation events, etc., along with the temperature.

Day	Home	South Pole
1	__°F	__°F
2	__°F	__°F
3	__°F	__°F
4	__°F	__°F
5	__°F	__°F
6	__°F	__°F
7	__°F	__°F
8	__°F	__°F
9	__°F	__°F

Name:_____ **Date:_____**

Answer the following questions using the weather data that you recorded.

1.) Did the weather report in both locations change every day? Describe what you noticed.

3.) In both locations, which day had the highest temperature? The lowest?

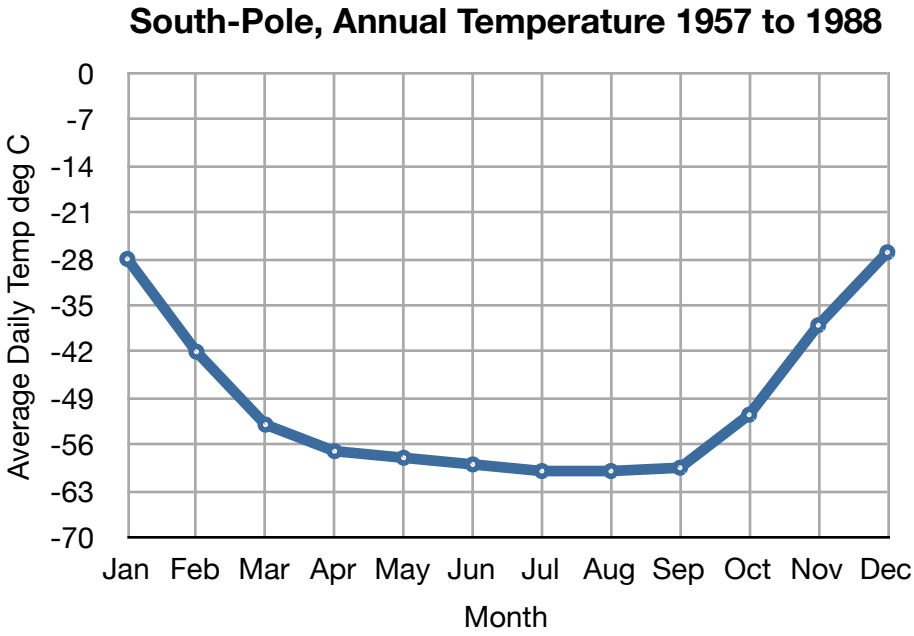
Go to http://www.climate-zone.com/climate/united-states/.
Select one of the climate reports for the state in which your city is located and read the information.

4.)What kind of information is given in the climate description?

Name:_____ **Date:**_____

Antarctica is a land of extremes. Low temperatures, high winds, and little precipitation, much like a cold desert. During the southern hemisphere winter, which occurs between March and September, the South Pole is in an extended "night", and receives no sunlight at all. In the summer, the South Pole is in an extended "day". High temperatures at the South Pole in January average at -26 °C (-15 °F). As the sun gets lower, temperatures drop as well. Around sunset (late March) temperatures reach -45 °C (-49 °F) and sunrise (late September). In winter, the average temperature remains at about -58 °C (-72 °F).[1]

The LC-130 Hercules is a plane operated by the New York Air National Guard that brings scientists and supplies to and from Antarctica. It is specially equipped with retractable skis to land on icy runways, and is able to withstand some of the harsh weather in Antarctica, but even it has its limits. For a safe trip, the temperature at the landing site has to be above -50 °C (-58 °F) because extreme cold prevents proper fuel flow, and can even cause the skis to freeze to the runway.



[1] Source: http://www.wunderground.com/global/stations/89009.html

Name:_____ **Date:_____**

Given these numbers, on the graph below, draw a line that indicates the minimum temperature requirements for LC-130 Hercules operation.

During which months is Antarctica accessible by plane?

Scientists are in Antarctica conducting research year-round. In the event of an emergency, many times scientists are forced to rely on the resources they have at the station until temperatures rise enough so that these planes can return to the area. In March 1999, Dr. Jerri Nielsen, a doctor at the U.S. Amundsen-Scott South Pole Station found out that she had cancer. Other than a risky mission in July, when the National Science Foundation decided to have the Air Force drop medicines and equipment she needed, Dr. Nielsen was forced to deal with her condition on her own until October 15, 1999, when she was rescued. For more on her story, click here.

Final Thoughts:

5.)Compare and Contrast the climates of Antarctica and your hometown.

6.) When we look out the classroom window, are we looking at climate or weather? Why?

Name:_____ **Date:**_____

Making Connections: *Climate Change*

Going back to a familiar example, climate in Alabama is characterized as humid subtropical, with very hot summers and mild winters, while the climate in Maine is humid continental, with warm (although generally not hot), humid summers. Winters are cold and snowy throughout the state. Keeping in mind the last activity, you have probably noticed that weather is constantly changing and may or may not fall within the guidelines of the climate description of a region. Climate is the average pattern of weather taking into account these natural variations in a region, knowing that extreme weather events *do* occur. But, scientists are now discovering that climate changes as well, just not on the same time scale.

Climate is the result of a fragile balance and a complex interplay of a number of factors and processes that ultimately determine the distribution of heat within the Earth system. Significant changes in some of these factors, like latitude, altitude, proportion of land to water, and proximity to oceans and mountains, is highly unlikely within the context of your lifetime. In the past, changes in these factors have occurred as a result of geologic processes like the breaking up and movement of the continents which occur over periods of thousands of years. Continental collisions caused the formation of mountains, and separation caused the formation of vast oceans.

Other factors that contribute to climate are more susceptible to change. These include the shape of the landscape, the density and type of vegetation cover, and the concentration of different chemicals in the air, which all have an impact on the heating and distribution of air masses and ocean currents that move around the Earth and determine the rainfall and temperatures of a given area.

Humans have been changing the landscape and vegetation for thousands of years to make life for us a little bit easier. For years we have cleared the land, tearing down forests and changing the flow of rivers and streams to irrigate. This has dramatic effect on the distribution of air masses over the land. Bare farmlands where dense rain forests once stood absorb much less heat.

On a much larger scale, human activity is causing significant changes in the chemistry of the atmosphere. Recent findings suggest that the climate is warming. This means there is more heat around in the atmosphere. This may be caused by more heat reaching the Earth from the Sun which is a naturally occurring process that scientists are well aware of. The distribution of heat changes naturally as the Earth's orbit changes over thousands of years and changes the intensity of the Sun's heat. Yet, this may also be caused by a decrease in heat being let out of the atmosphere. Certain gases in our atmosphere, called greenhouse gases, allow the lower atmosphere to absorb the heat release from the Earth's surface, trapping heat within the Earth system. "Greenhouse gases, such as water vapor, carbon dioxide, methane and nitrous oxide, are an important part of our atmosphere because they keep Earth from becoming an icy sphere with surface temperatures of about 0°F." However, over the past century or so the amounts of greenhouse gases within our atmosphere, and thus global temperatures, have been increasing

rapidly, mainly due to the burning of fossil fuels in cars and factories, which releases carbon dioxide into the atmosphere."[2]

As you learned in the previous activities, the more information we know about trends in the area, the more we can make statements about the future. Earth's climate is a dynamic system that is always changing and scientists do not have all the information that we need to accurately assess the changes in climate that have been going on recently. All we can say is that changing even one thing in a complex system can have huge effects, and we are unsure about the level of change that the fragile climate system can withstand. Until we fully grasp this information, the less change that we cause, the more unlikely it is that we reach a breaking point.

Scientists have discovered that throughout its history the Earth's climate has gone through several dramatic shifts, going through multiple Ice Ages and warming periods. This knowledge is based on an abundance of data over long time frames. Because reliable weather measurements have only been available for the past 100-200 years, scientists have to look elsewhere for this information. Paleoclimatology, the study of past climates uses information stored in tree rings, corals, fossils, and glaciers to recreate the history of climate change on the Earth. In the Allan Hills region of Antarctica, ice as old as 2.5 million years old is believed to be accessible, and scientists hope to use this information from ice collected there to reconstruct Earth's climate history farther back than ever before!

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[2] http://eo.ucar.edu/basics/cc_1.html