

Weather and Climate

Key Concepts:

- Anomaly
- Atmospheric pressure
- Climate
- Precipitation
- Relative humidity
- Temperature
- Weather

WHAT YOU WILL LEARN

1. You will learn the difference between weather and climate.
2. You will learn the names of various weather variables and the instruments used to measure those variables.
3. You will analyze national and local precipitation and temperature data to determine if our climate is changing.

Engage Your Thinking

You may have heard the cliché, ‘Everyone talks about the weather, but no one does anything about it.’ Many viewers think weather forecasters on television never seem to be accurate, especially when they are forecasting weekend weather. Weather not only changes from day to day, but season to season, and it is never the same each year. Some years are warmer and drier than other years. What causes our weather to change? How does climate influence our weather? In this activity you will use instruments to measure weather and compare the day’s weather to past weather data. Before starting this activity, however, answer the following questions based on what you currently know and think.

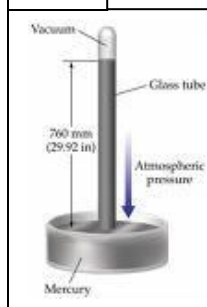
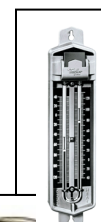
1. What are the variables that determine weather?
2. What is the difference between climate and weather?
3. Which weather variables are most important in identifying climate change?

Explore and Explain

Weather is determined by several constantly-changing variables. Since all of these variables must be considered, weather forecasting is a difficult process. In order to predict weather, data records are needed. Each weather variable can be measured and logged. This data is then used to help make weather forecasts. Below is a brief description of weather variables and the basic weather instruments that have traditionally been used to measure weather.



Temperature – measure of heat energy in the atmosphere
Measured with a thermometer

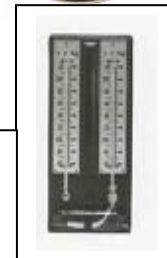


Precipitation – forms of H₂O falling to the surface of the
Measured with a rain gauge

Atmospheric Pressure – the weight of the air
Measured with a barometer



Relative Humidity – amount of moisture in the air compared to the amount the air could hold at a given temperature and pressure
Measured with a hygrometer or psychrometer



Wind Speed & Direction
Measured with an anemometer



In recent years, the measurement of weather variables has changed significantly. Although still in use in some places, the instruments shown above are usually not the type of instruments meteorologists use today to collect and log weather data. Now scientists use digital (computerized) forms of these same instruments to collect weather data. With basic weather instruments, however, you could make your own database of local weather conditions by compiling various measurements, and based on your collected data, perhaps even make weather predictions.

Climate is the average of weather conditions, particularly temperature and precipitation, over time. The standard time length used in the study of climate is at least 30 years. Scientists are always monitoring these data sets, looking for changes from the norm. If change is detected, scientists try to form and test hypotheses to explain the data.

4. Name at least 5 weather variables and the instruments used to measure them.

Extend Your Thinking

Below is an official set of Weather Data compiled by Automated Weather Source (AWS) for April 2007 (Table 1). Following this data set is a blank form with the same weather variable categories (Table 2). Using weather instruments, you can monitor the weather variables for your area and fill out the blank weather chart for one month. You may have access to weather instruments locally, or, if weather instruments are not available, use data recorded in the local newspaper. If you have computer access, you can also obtain these data from a weather website, such as www.weather.com or www.weatherbug.com.

Table 1. Weather Data for Zip Code 47401. Source: AWS

Observation Date	Max Temp °F	Min Temp °F	Rain / Month in	Rain / Year in	Wind Gust mph	Min Pressure "Hg	Max Pressure "Hg	Min Humid %	Max Humid %
04/01/2007	68.55	50.32	0.40	8.01	37.93	29.79	29.90	35.83	100.00
04/03/2007	75.62	53.57	1.39	9.00	36.83	29.77	30.01	39.80	100.00
04/05/2007	35.46	26.01	1.39	9.00	26.31	30.10	30.19	54.56	86.96
04/07/2007	26.30	20.56	1.39	9.00	29.38	29.97	30.05	49.41	65.62
04/09/2007	45.13	23.43	1.39	9.00	19.95	30.02	30.12	35.94	99.70
04/11/2007	56.68	38.39	2.16	9.77	52.61	29.30	29.83	42.63	100.00
04/13/2007	52.49	30.74	2.20	9.81	18.85	30.09	30.28	31.69	85.14
04/17/2007	54.26	33.26	2.63	10.24	7.89	29.99	30.03	39.94	89.82
04/21/2007	79.01	47.08	2.63	10.24	17.76	30.12	30.27	23.02	85.03
04/23/2007	81.67	69.19	2.65	10.26	33.76	29.96	30.03	39.29	83.58
04/25/2007	75.13	65.17	3.39	11.00	27.18	29.75	29.96	60.59	100.00
04/27/2007	59.89	51.45	3.82	11.43	21.92	29.74	29.96	69.28	100.00
04/29/2007	81.77	55.85	3.82	11.43	21.48	30.02	30.12	27.82	73.68
04/30/2007	88.65	62.43	3.82	11.43	24.11	29.92	30.04	28.41	66.64

Table 2. Your Weather Data

Weather Data for Your Zip Code _____

DATE	TIME	PRESENT TEMP	HIGH TEMP	LOW TEMP	BAROMETRIC PRESSURE	RELATIVE HUMIDITY	DAILY PRECIP	WIND SPEED	WIND DIRECTION
1									
2									
3									
4									
5									
6									
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The graph below was generated from the AWS data table (Figure 1). The data was inserted into a Microsoft Excel spreadsheet and the graphing function was used to make the graph. Your teacher has the instructions for making a computer graph of the weather data you have compiled for your zip code area. The same data can be graphed manually, with similar results.

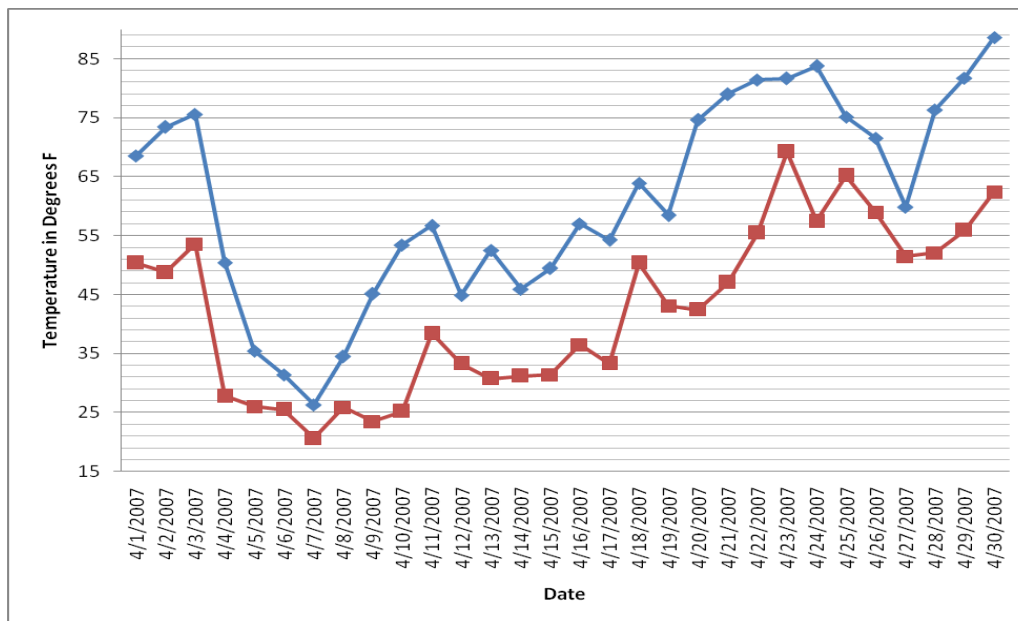


Figure 1. The High and Low Temperatures for Zip Code 47401

5. Where can weather data be obtained?
6. What temperature trend is shown in the graph above (Figure 1)?
7. How can graphs of weather data over a long period of time be used to indicate climate change?

Apply What You Have Learned

Examine the following graphs and maps. Answer the questions following each set.

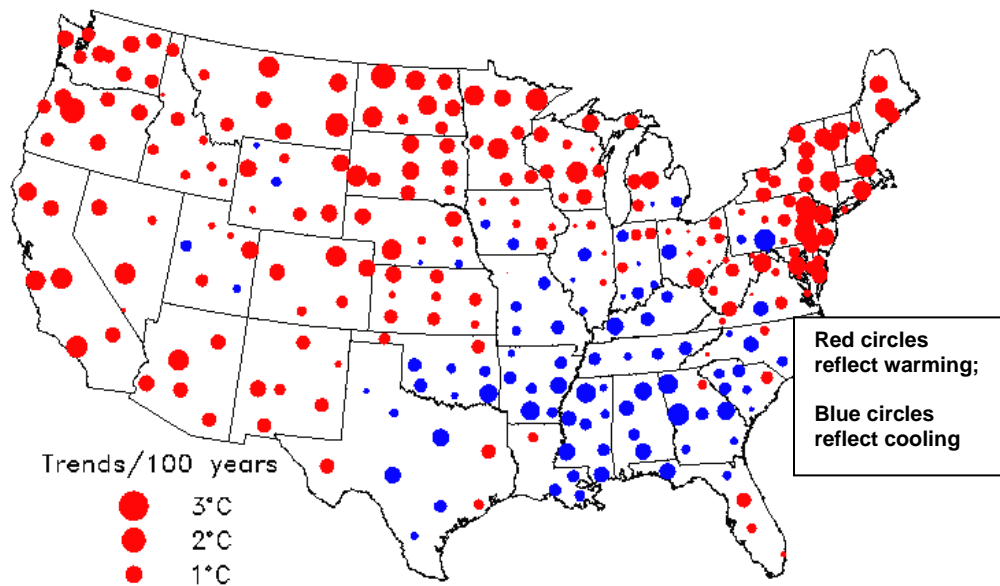
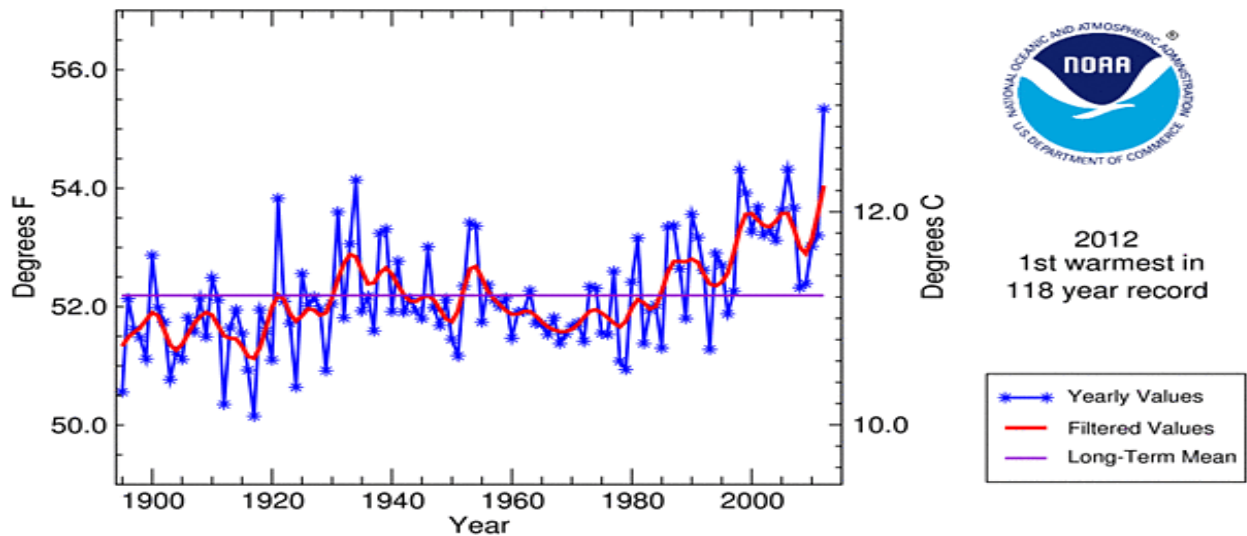


Figure 2. U.S. Temperature Trends: 1900 to Present. Source: NOAA



National Climatic Data Center / NESDIS / NOAA

Figure 3. U.S. Average Temperature, 1895-2012. Source: NOAA

8. What is indicated by the graph and map, Figures 2 and 3 above that could be used as evidence of climate change in the United States?

The graph of U.S. Average Temperature (Figure 3) on the previous page shows temperature change since 1880. The normal (long-term mean) is the 30-year statistical average used to determine climate. Any variation from that long-term mean is called an **anomaly**.

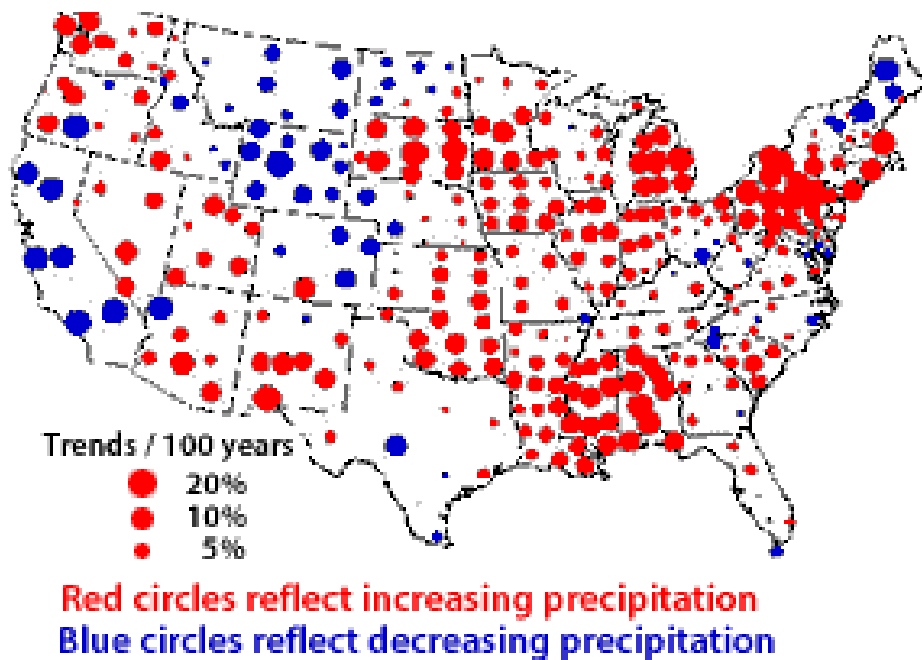


Figure 4. U.S. Precipitation Trends: 1895 to Present. Source: NOAA

9. What is indicated by the map above (Figure 4) that could be used as evidence of climate change in the United States?

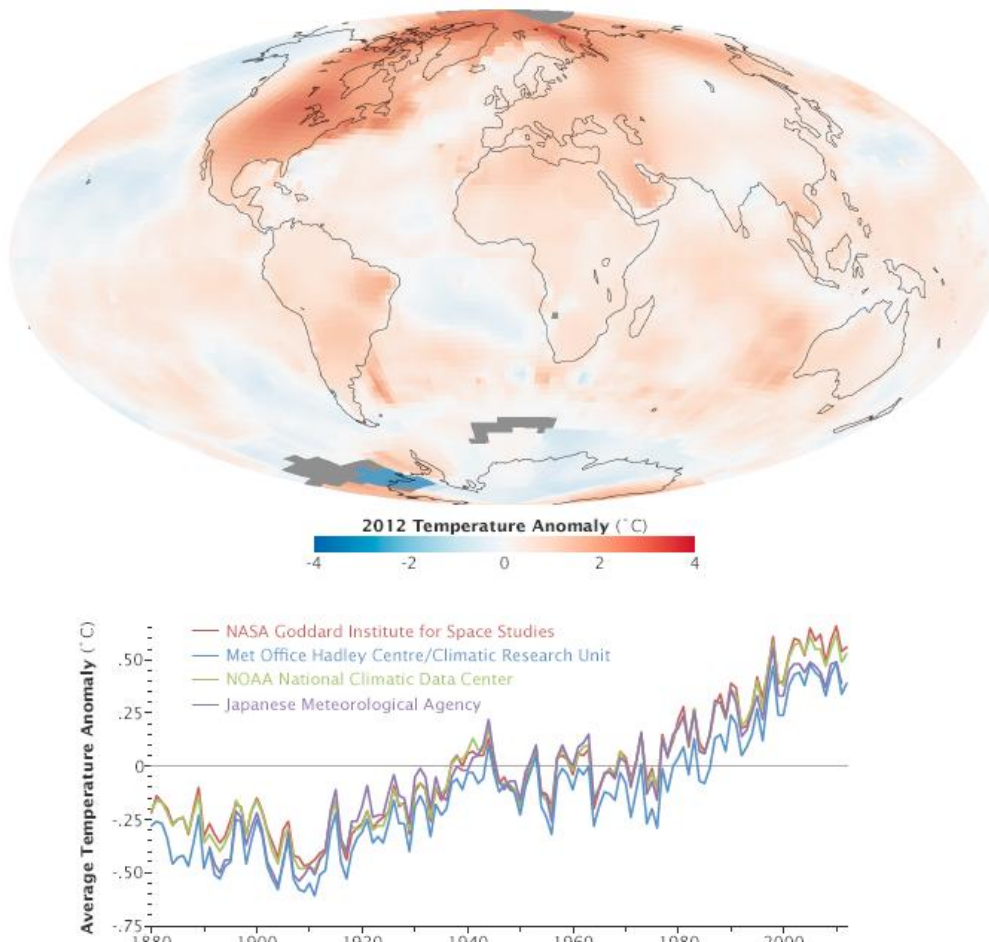


Figure 5. Global Surface Temperature Anomaly. Source: NASA

10. Keeping in mind that anomaly is a change or deviation from normal, look at the world map above (Figure 5). From this map, would you conclude that there is evidence for global warming or for global cooling? Why?

11. Why is one year of data insufficient to prove the occurrence of global climate change?

Reflect on What You Have Learned

12. What variables are involved in determining weather?

13. What is the difference between climate and weather?

14. Which weather variables are most important in identifying climate change?