

Activity 2
DRAWING ISOTHERMS
Level 2

<http://www.uni.edu/storm/activities/level2/index.shtml>

Concept: Analysis of temperatures using isotherms reveals air temperature patterns.

Objectives:

1. Students will be able to define and draw isotherms to analyze temperature variations.
2. Students will be able to compare and contrast temperature variations on a weather map.

National Science Standards: As a result of activities in grades 5-8, all students should develop an understanding of: structure of earth system, science and technology, risks and benefits, and science and technology in society.

Engage:

Ask your students to discuss where they think warm and cold temperatures might be found around the country at the present time. How does this temperature distribution change from season to season?

Explore:

Access the activity website: <http://www.uni.edu/storm/activities/level2/act2.shtml>. Click on the Temperature Maps button. Carefully observe each of the temperature maps that are available. Write down similarities and differences that you detect between the maps. Have students share their individual observations with others in the class. You may choose to do small groups or the class as a whole or stages of those (first small groups then the class).

Explain:

Tell students that Temperature Map 2 at the activity website shows bands of temperatures within 10-degree intervals. Isotherm is the name given to the lines on the map. “Iso” means same, and “therm” can be interpreted as air temperature. Therefore isotherm means same air temperature. Isotherms drawn on surface pressure maps connect equal temperatures. Here are some helpful hints for drawing isotherms on a surface temperature map:

1. Isotherms are drawn in ten-degree intervals.
2. Always label the isotherm value.
3. Temperatures lower than the isotherm value are always on one side of the isotherm and higher temperatures are consistently on the other side.
4. Draw an isotherm until it reaches the end of the plotted data or closes off a loop as it encircles data. (The map shows students an example of a closed-loop isotherm)
5. Neighboring isotherms tend to take similar paths.
6. Isotherms never cross and never split or fork.
7. Do not skip isotherm values if they fall within the temperature range on the map.

8. When the highest or lowest temperature value reported on the map equals an isotherm value, do not draw that isotherm. If a temperature value appears abnormally out of place, just circle that value.

Tell students they will draw isotherms to analyze temperature distributions around the United States on a surface temperature map from October 23, 2004. Help your students understand how the sample isotherms were drawn and assist them as needed with the rest of the process.

1. The attached image is a plot of Surface Temperature for 03Z, October 23, 2004. You are going to do an analysis of the temperatures on this map. The first step in this analysis is to find the lowest and highest reported temperature values. Lightly place a circle around each highest and lowest temperature values. The lowest temperature value shown on the map is _____°F and the highest is _____°F.

2. Using a 10° F interval for the analysis, complete the sequence of isotherms (line of equal temperature) that would appear at least once on the temperature plot: 30, 40, _____, _____, _____, _____.

3. Two examples of isotherms appear on the map. In the Southwestern United States, a 40-degree isotherm shows an example of a closed loop isotherm. The second example is the 50°F isotherm, which starts off the Atlantic Coast of New Jersey and continues looping northwestward through the Great Lakes area and then turns south into New Mexico. From there it then continues northwestward into California and Oregon, exiting off the coast of Washington.

4. Draw more isotherms to show the temperature pattern across the U.S. at map time. Work through the following steps to complete a temperature analysis on the surface temperature plot. Start by drawing the 60°F isotherm. Starting in Florida, scan northward along the Atlantic coastline until you find the location where the temperature is probably 60°F. Begin the isotherm at that location and draw slowly to the west making sure that values less than 60°F remain on one side of the line and values greater than 60°F lie on the other side.

5. The 40-degree isotherm will begin in eastern Maine. More than one isotherm with the same value can appear on the same map. For example, the example shows an additional 40°F isotherm in the Nevada, Utah and Arizona region. Complete the analysis by drawing the remaining isotherms that you listed.

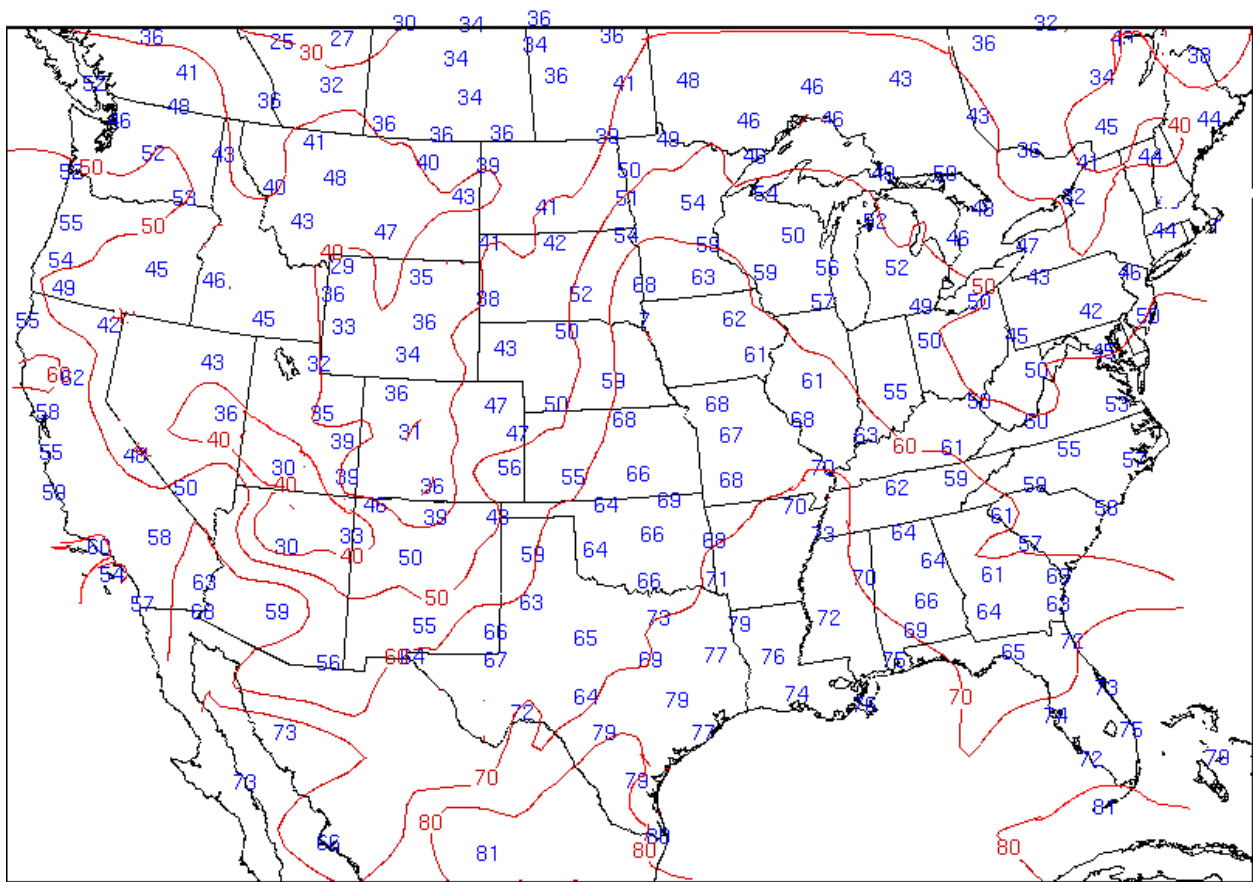
6. The analysis of a Surface Temperature plot by drawing isotherms reveals temperature patterns. What do the isotherms in your analysis indicate about temperatures in the central United States compared to the western and eastern portions of the country? Why do you think these patterns exist?

7. Using similar procedures draw isotherms on a map provided by your teacher.

Extend:

Use colored pencils or crayons to color in the areas between isotherms. What colors will you use to show cooler temperatures? What colors will you use to show warmer temperatures? How does your selection compare to Temperature Maps 3 and 4 on the activity website?

The following map is a suggested isotherm analysis for the Surface Temperature plot for October 23, 2004. Have your students compare their analysis to this example



0300Z OCT 23 2004 Temperatures & Isotherms

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Isotherms-Red (10F)

Evaluate:

Collect student sheets and monitor discussions.

For Further Inquiry:

Ask your students how they think isotherms might look close to cold fronts and warm fronts. Challenge them to design an investigation to answer this or any other question they might have about isotherms and temperature distribution.

Activity 2
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Student Pages

Engage:

Where do you think warm and cold temperatures might be found around the country at the present time? How does this temperature distribution change from season to season? How do you know this happens?

Explore:

Access the activity website: <http://www.uni.edu/storm/activities/level2/act2.shtml>. Click on the Temperature Maps button. Carefully observe each of the temperature maps that are available. Write down similarities and differences that you detect between the maps. Share your observations as directed by your teacher.

Explain:

Temperature Map 2 at the activity website shows bands of temperatures within 10-degree intervals. Isotherms is the name given to the lines on the map. “Iso” means same, and “therm” can be interpreted as temperature. Therefore Isotherm means same temperature. Isotherms drawn on temperature maps connect equal temperatures. . Here are some helpful hints for drawing isotherms on a surface temperature map:

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2. Always label the isotherm value.
3. Temperatures lower than the isotherm value are always on one side of the isotherm and higher temperatures are consistently on the other side.
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Follow these instructions:

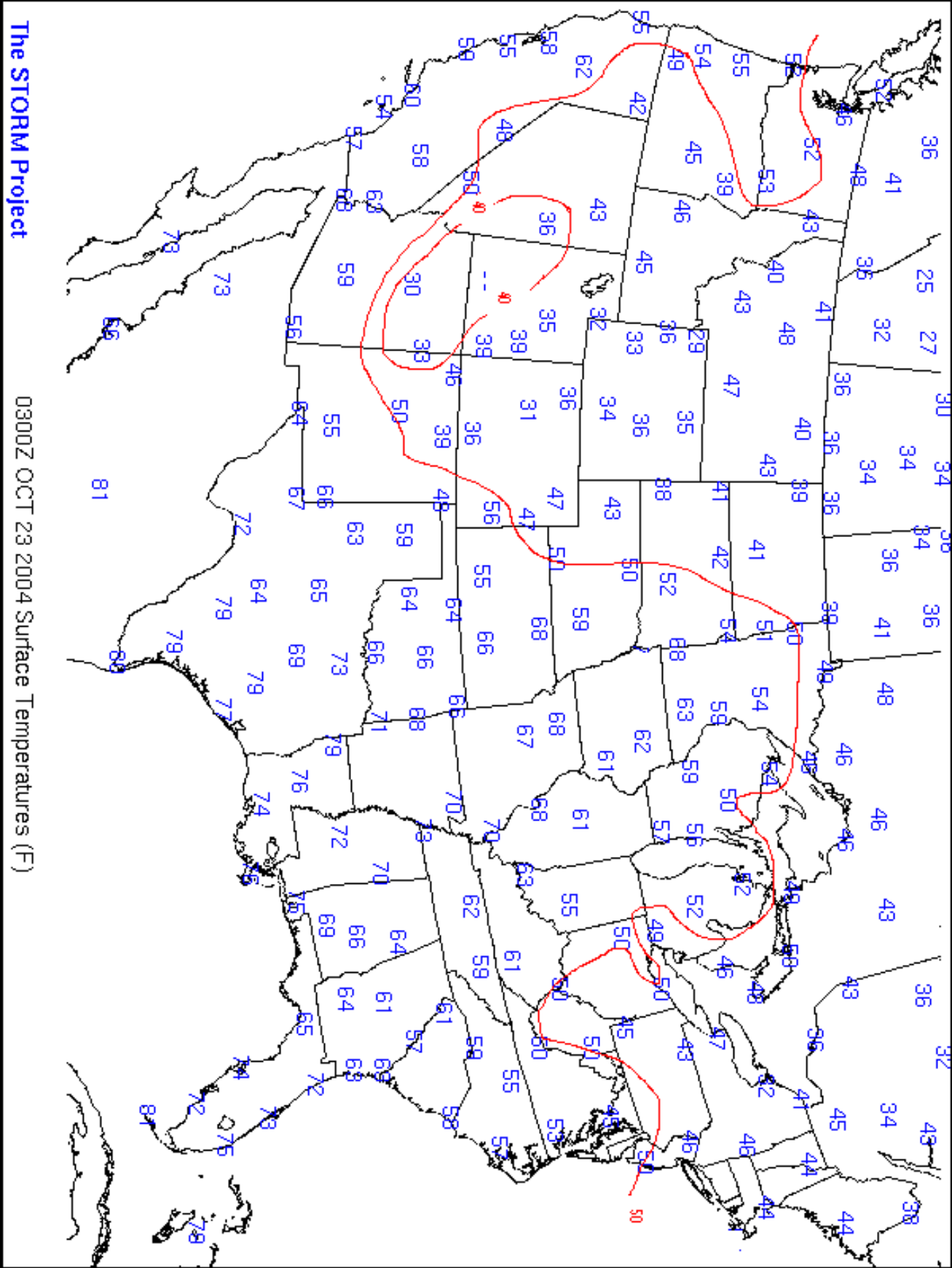
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0300Z OCT 23 2004 Surface Temperatures (F)