# Weather Forecasting

## **Teacher Notes**

## PURPOSE

To use a series of daily weather maps to track the movements of weather systems and then make a prediction of future weather conditions for a given location

### INTRODUCTION

Every three hours, the National Weather Service produces a weather map. These maps are compiled from data received from about 800 weather stations located around the world, even from ships and buoys at sea. Daily newspapers often summarize the most recent weather data in the form of a national weather map. The data usually include temperature, precipitation, cloud cover, and barometric pressure. Points of equal barometric pressure are connected by lines called *isobars*. The pattern of the isobars provides meteorologists with a picture of where high-pressure and lowpressure systems are located. Weather fronts can be identified, providing even more information about weather conditions in regions.

## DURATION

One week in winter and one week in spring

## FREQUENCY

Daily

## SUGGESTED SCHEDULE

Students will need two weeks (one in winter and one in spring) to complete this investigation. If you plan to have students share their data and conclusions with the class, this investigation must be completed before you begin the chapter entitled "Weather."

### **SKILLS ACQUIRED**

- Collecting Data
- Organizing and Analyzing Data
- Inferring
- Interpreting
- Predicting

## Name ANSWER KEY

Weather Forecasting continued

#### THE SCIENTIFIC METHOD

In this lab, students will

- Make Observations
- Ask Questions
- Test the Hypothesis
- Analyze the Results
- Draw Conclusions
- Communicate the Results

#### MATERIALS

The materials listed for this project are enough for one student.

## **TIPS AND TRICKS**

#### **Advance Preparation**

- 1. Make a list of local newspapers that contain a useful daily weather map. National newspapers contain weather maps that can also be used by students.
- 2. There are several other sources for daily weather maps, including
  - Local airports have weather-service "facsimile" maps, which are often available to teachers after they have been used.
  - Large daily maps can also be obtained for a fee from:

#### Superintendent of Documents Government Printing Office Washington, DC 20402

• Weather maps are available at a variety of Web sites on the Internet.

#### **Possible Problems**

- 1. Students may have difficulty in locating pressure centers on the weather map. Encourage students to use state borders as guides in locating these centers.
- 2. Some students may encounter problems with the computations of daily rates of movement of pressure centers.
- **3.** Students will be concerned about being "wrong" with their forecasts. Emphasize that there is always a certain percentage of error involved with forecasting weather, especially because interpreting daily maps uses averages. Comparison with the Long-Term Project entitled "Correlating Weather Variables" may be helpful.

## Name\_\_\_\_\_

#### Weather Forecasting continued

#### **Teaching Suggestions**

- 1. In order to make a long-term weather prediction, it is necessary to use student information on the rate of motion and the track of their pressure system. By daily observation of the student's maps, you can help the students determine both the speed and direction of one or more weather systems as they move across the United States.
- 2. Explain that a low-pressure system usually moves across North America with the prevailing westerly winds. The direction of movement of the low-pressure system tends to be across isotherms and parallel to isobars. Strong winds will tend to slow the motion of a low-pressure center. Emphasize that often there can be significant variations from the average velocity when these strong winds exist. This information may help students explain why the movements of the pressure systems they are tracking are not always consistent.
- **3.** Explain that high pressure systems tend to move toward the area where the greatest increase in barometric pressure is occurring. A well-developed high-pressure system, which is east of a low, will tend to slow the low's movement or deflect it to the left or right. Also, two low-pressure centers tend to merge.
- **4.** Groups of students can be assigned different weeks so that a continuous weather record is maintained. **Co-op Learning**

## **Weather Forecasting**

Every three hours, the National Weather Service collects data from about 800 weather stations located around the world. Daily newspapers summarize this weather data in the form of national weather maps. The data include temperature, precipitation, cloud cover, and barometric pressure. The patterns produced by the data allow meteorologists to identify weather fronts and to provide information about weather conditions around the globe.

In this investigation, you will use a series of daily weather maps to track the movements of weather systems in the winter months. Then, you will use these data to predict weather conditions.

### DURATION

1 week

#### **OBJECTIVES**

Using Scientific Methods Observe and record locations of weather fronts.

Predict weather conditions based on data you collected.

Compare the movement of weather fronts in different seasons.

#### MATERIALS

- pencils, colored
- daily weather maps for consecutive days (5)

## PROCEDURE

- 1. Find a local or national newspaper that prints a daily weather map from the National Weather Service. You may also use the Internet to find daily weather maps.
- 2. Cut out or print out the map, and write on it the date that it represents.
- 3. Use the table on the next page to record the information from the weather map.
- 4. On the weather map on the last page of this lab, put an *L* at the locations of any low-pressure centers on the daily weather map you collected in step 1. Circle the *L*s with a colored pencil, and label each circle with the date.
- 5. Put an *H* on your map at the locations of any high-pressure centers. Circle the *H*s with a second colored pencil, and label each circle with the date.
- 6. Repeat steps 1–5 using the four consecutive daily weather maps that follow the first day's map. For each symbol, use the same colors that you used for the first day's map.

#### ANSWER KEY

Weather Forecasting continued

#### LOCAL WEATHER PREDICTIONS

Your hometown weather predictions														
	Week One (winter)							Week Two (spring)						
	1	2	3	4	5	6	1	2	3	4	5	6		
Temperature														
Barometric pressure														
Barometric trend (R = rising F = falling S = Steady														
Wind direction														
Cloud cover														
(C = clear cl = cloudy PC = partly cloudy O = overcast														
Present weather														
(rain, sleet, snow, etc.)														
Prediction														

- 7. Draw arrows to connect the daily positions of each high-pressure center and of each low-pressure center.
- 8. Use the formula below to calculate the average velocity (in kilometers per day) of each high-pressure center and each low-pressure center. The average velocity equals the total distance traveled divided by the number of days traveled, or

 $average \ velocity = \frac{total \ distance \ traveled}{number \ of \ days}$ 

#### ANALYSIS AND CONCLUSION

1. Analyzing Data Generally, in which direction do the pressure centers over the United States move?

The general direction is west to east.

- 2. Analyzing Results From your calculations, what is the the average rate of movement (in kilometers per day) of low- and high-pressure centers in the winter? Answers will depend on students' maps.
- **3. Making Predictions** Predict where the low- and high-pressure centers will be located on the day following the date of the last map in your series.

Locations will depend upon the map sequence for the period of the investigation.

4. Forming a Hypothesis Refer to your series of daily weather maps to predict the weather for your hometown on the sixth day of the series. Write a forecast, and fill in the data table with your predictions of weather conditions.

Predictions will depend upon weather patterns during the course of the investigation.

- 5. Evaluating Predictions Was your prediction about the locations of the lowand high-pressure centers from question 3 accurate? Explain why or why not. Answers may vary.
- **6. Evaluating Hypotheses** Compare your prediction with the daily weather map for the sixth day. Check the accuracy of your prediction. What factors could have caused errors in your prediction?

Factors that can result in errors in predictions are changes in the rate of movement of the highs and lows from the calculated average, a shift in the path of the pressure system, and a shift in the position of the jet stream.

7. Explaining Events Describe the general weather conditions associated with regions of low and high atmospheric pressure.

Low-pressure regions have relatively warm temperatures, increased cloud cover, high humidity, surface winds flowing in a counterclockwise pattern, and high probability of precipitation. High-pressure regions have relatively cool temperatures, clear skies, low humidity, surface winds flowing in a clockwise pattern, and low probability of precipitation.

#### EXTENSION

1. **Designing Experiments** In the spring, repeat the entire investigation. What is the average rate of movement (in kilometers per day) of low- and high-pressure centers in the spring? Compare the rate of movement of pressure systems during spring and winter.

Answers may vary.

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Name

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