Earth Science & Society

Weather Forecasting-Precision from Chaos

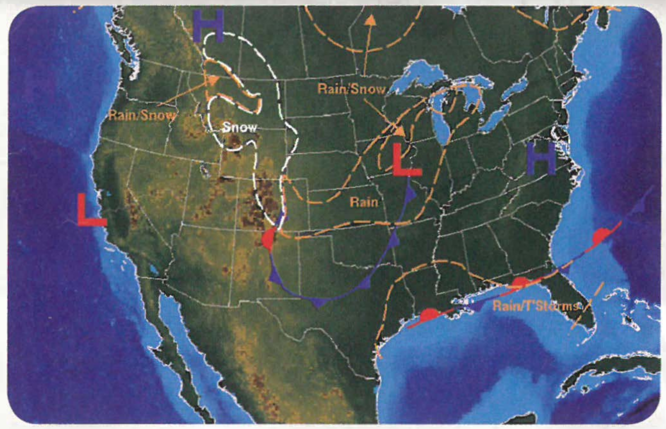
On a rainy evening in New Jersey, four teens went out to play soccer. They began to play, expecting the rain to clear before the game got into full swing. However, as the game progressed, the clouds darkened to a charcoal grey and thickened. When the thunder and lightning began, the teens decided to leave the field. As they walked from the field, they were struck by lightning. Two of the teens died in the hospital a few hours later. The deaths rocked the community. The storm had not been predicted in the weather forecast. Why isn't weather forecasting more predictable?

Chaos and weather systems In 1963, a meteorologist named Edward Lorenz first presented chaos theory, which states that formulated systems are dependent on initial conditions and that the precision of initial measurements has an exponential impact on the expected outcome.

Years after Lorenz published his findings in meteorology journals, other scientists recognized the importance of his work. The simplified equations Lorenz created through his studies helped form the basis of modern weather forecasting.

The beginning of a forecast Weather forecasting begins with observations. Data are collected from various sources and fed into supercomputers, which create mathematical models of the atmosphere. In the United States, the National Weather Service operates these computers and releases their data to local and regional forecasters.

Meteorologists generally agree that useful day-to-day broadcasts are limited to only five days. Most meteorologists also agree that reliable forecasts of day-to-day weather for up to six or seven days ahead are not now possible.



Weather forecasts are created from data collected from the atmosphere.

Meteorologists hope that improved measurements, computer technology, and weather models rriight someday predict day-to-day weather up to three weeks in advance.

Limitations of long-range forecasting Meteorologists generally find that day-to-day forecasts for more than a week in the future are unreliable. Their approach to long-range forecasting is based instead on comparisons of current and past weather patterns, as well as global ocean temperatures, to determine the probability that temperature and precipitation values will be above or below normal ranges. The National Weather Service's Climate Prediction Center, as well as other organizations, offers monthly and seasonal predictions for these values.

WR.ITINy in, Earth Science

Evaluate Use a newspaper or other local news source to obtain a weather report for the next seven days. Record the temperature and weather conditions for your city during the next week and compare the forecasted weather with the observed weather. Write a summary to share your observations with your class.

GEOLAB

MAPPING: INTERPRET A WEATHER MAP

Background: **The surface weather map on the following page shows actual weather data for the United States. In this activity, you will use the station models, isobars, and pressure systems on the map to forecast the weather.**

Question: How can you use a surface weather map to interpret information about current weather and to forecast future weather?

Materials

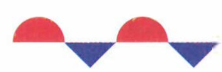
ruler
Reference Handbook, Weather Map Symbols, p. 959

Procedure

1. Read and complete the lab safety form.
2. The map scale is given in nautical miles. Refer to the scale when calculating distances.
3. The unit for isobars is millibars (mb). In station models, pressure readings are abbreviated. For example, 1021.9 mb is plotted on a station model as 219 but read as 1021.9.
4. Wind shafts point in the direction from which the wind is blowing. Refer to Weather Map Symbols in the table on the right and the *Reference Handbook* to learn about the symbols that indicate wind speed.
5. Each number around a city represents a different atmospheric measure. By convention, the same atmospheric measure is always in the same relative location in a station model. Refer to **Figure 12.17** and Weather Map Symbols in the *Reference Handbook* to learn what numbers represent in a station model.

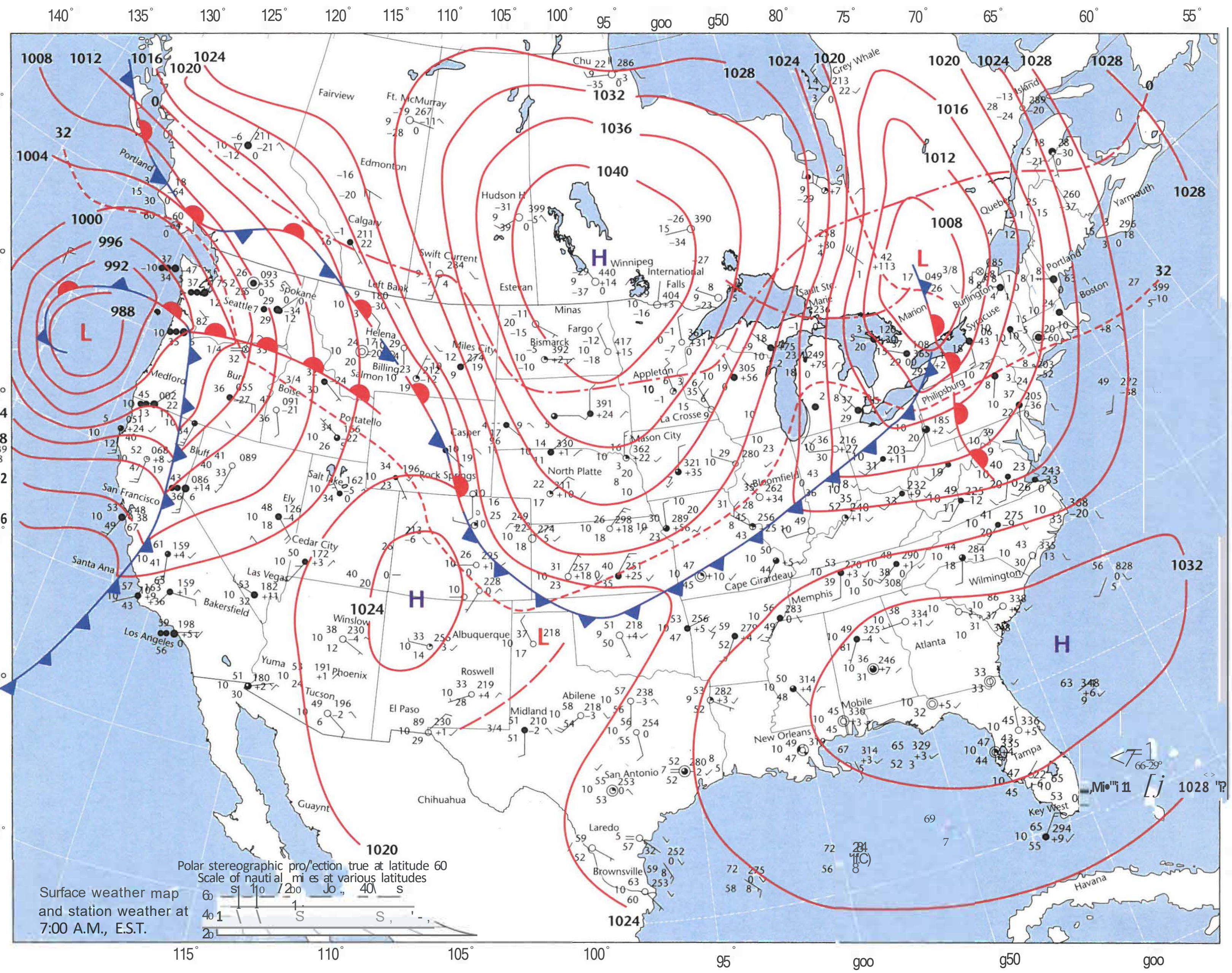
Analyze and Conclude

1. **Identify** the contour interval of the isobars.
2. **Find** the highest and lowest isobars and where they are located.
3. **Describe** the winds across Texas and Louisiana.
4. **Determine** and record with their locations the coldest and warmest temperatures on the map.
5. **Infer** whether the weather in Georgia and Florida is clear or rainy. Explain.
6. **Predict** Low-pressure systems in eastern Canada and off the Oregon coast are moving east at about 24 km/h. Predict short-term weather forecasts for northern New York and Oregon.

Symbols Used in Plotting Report	
Fronts and Pressure Systems	
(H) or High **(L) or Low**	Center of high- or low-pressure systems
	Cold front
	Warm front
	Occluded front
	Stationary front

APPLY YOUR SKILL

Forecasting Find your area on the map. Based on the data shown in the map, use the extrapolation method to forecast the next day's weather for your location.



Surface weather map and station weather at 7:00 A.M., E.S.T.