

Weather

Weather Forecasts

.....Read to Learn

Measuring the Weather

The first step in making a weather forecast is to measure the conditions of the atmosphere. You learned in Lesson 1 that a variety of instruments is used to measure weather variables. A thermometer measures temperature. A barometer measures air pressure. A psychrometer measures relative humidity, and an anemometer measures wind speed. Meteorologists use the data from these instruments to make weather forecasts.

Surface and Upper-Air Reports

A **surface report** describes a set of weather measurements made on Earth's surface. Weather variables are measured by a weather station. A weather station is a collection of instruments that report temperature, air pressure, humidity, precipitation, and wind speed and direction. Cloud amounts and visibility are often measured by human observers.

An **upper-air report** describes wind, temperature, and humidity conditions above Earth's surface. These atmospheric conditions are measured by a radiosonde (RAY dee oh sahnd). A radiosonde is a package of weather instruments carried high above ground by a weather balloon. Radiosonde reports are made twice daily, all at the same time, at hundreds of locations around the world.

Satellite and Radar Images

Images taken from satellites orbiting at 35,000 km above Earth provide information about weather conditions on Earth. A visible light image shows white clouds over Earth. An infrared satellite image shows infrared energy in a false color. The infrared energy comes from Earth. It is stored in the atmosphere as latent heat. Monitoring infrared energy provides information about cloud height and atmospheric temperature. Meteorologists use these satellite images to identify fronts and air masses.

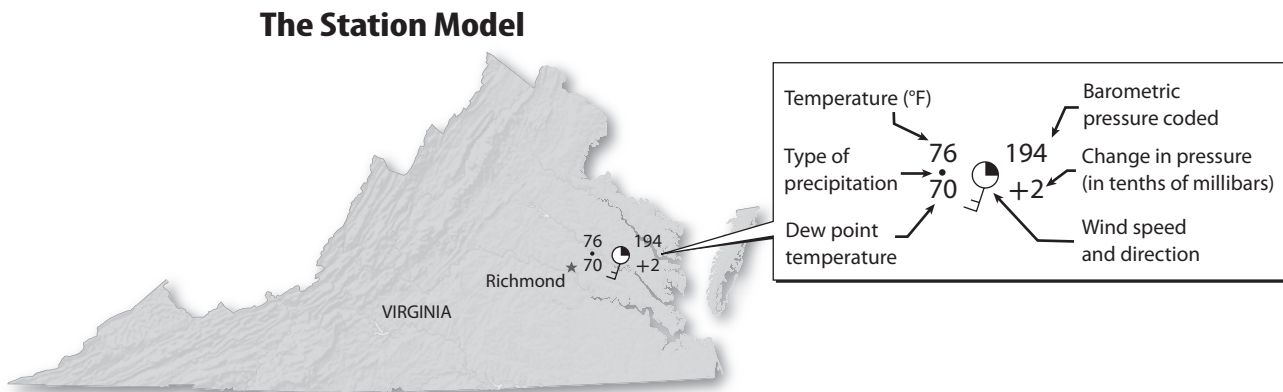
Radar measures precipitation when radio waves bounce off raindrops and snowflakes. **Doppler radar** is a specialized type of radar that can detect precipitation as well as the movement of small particles, which can be used to approximate wind speed. Wind causes the movement of precipitation. Thus, Doppler radar can be used to estimate wind speed. Measuring wind speed is especially important during severe weather, such as tornadoes or thunderstorms.

Weather Maps

Every day, thousands of surface reports, upper-air reports, and satellite and radar observations are made around the world. Meteorologists have tools that help them understand the large amount of weather data collected.

The Station Model

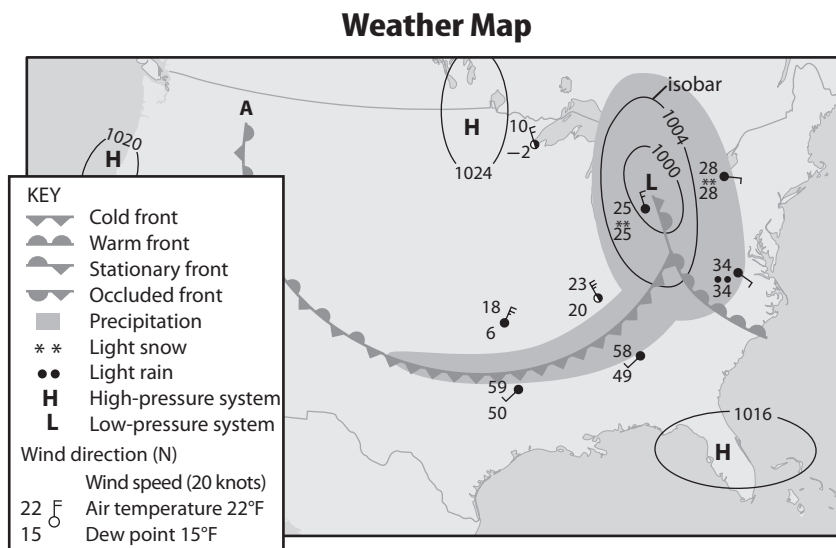
The figure below shows the station model. The station model diagram displays data from many different weather measurements for one location. It uses numbers and symbols, and it displays all observations from surface reports and upper-air reports.



Mapping Temperature and Pressure

Weather maps use more symbols than the station model. For example, weather maps show isobars. **Isobars** are lines that connect all places on a map where pressure has the same value. Find an isobar on the map below. Isobars show the location of high-pressure and low-pressure systems. Isobars also give information about wind speed. Winds are strong when isobars are close together. Winds are weaker when isobars are farther apart.

In a similar way, isotherms (not shown on the map below) are lines that connect places with the same temperature. Isotherms show which areas are warm and which are cold. Lines with symbols on them show fronts. Look at the map below to see the symbols used for different types of fronts.



Predicting the Weather

Meteorologists use computer models to help them forecast the weather. **Computer models** are detailed computer programs that solve a set of complex mathematical formulas. The formulas predict what temperatures and winds might occur, when and where it will rain or snow, and what types of clouds will form.

Government meteorological offices use computers and the Internet to share weather measurements throughout the day. Weather maps are drawn and forecasts are made using computer models. The maps and forecasts are made available to the public through television, radio, newspapers, and the Internet.