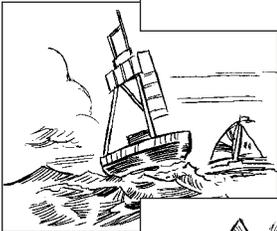
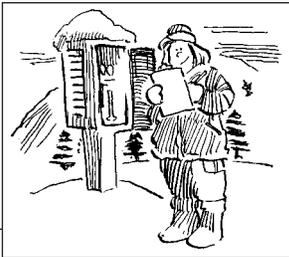


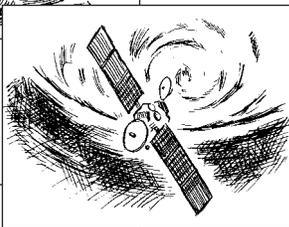
How Do We Take the Earth's Temperature?

A weather station.



An ocean buoy with a weather station.

A weather satellite.



Scientists at the Antarctic carry an ice core.

Tree rings tell a story about changes in temperature and precipitation.



As you might imagine, taking the earth's temperature is a little more complicated than sticking a thermometer into the ground. Over the years, researchers have developed a number of methods for measuring temperature on land and sea, and they have found ways to estimate temperature trends far in the past.

Surface Temperatures

Most of the records on ground temperature come from weather monitoring stations located throughout the world. A weather station can be as simple as a collection of instruments mounted on a pole or tower or as sophisticated as a radar system. In addition to surface temperature, these stations also track things like barometric pressure, wind speed, and precipitation. There are about 275 high-tech weather monitoring stations in the U.S. alone, operated by the National Oceanic and Atmospheric Administration's National Weather Service, in addition to a volunteer observer network.

Determining Temperature at Sea

Like the ground-based temperature network, ships and specially designed ocean buoys provide information on temperature, relative humidity, and precipitation at sea, to name a few weather factors.

Satellite Readings

Studies of temperature changes in the troposphere, or lower atmosphere (from the surface to about 9 miles above the earth), were begun in the late 1940s using weather balloons. Starting in 1979, satellites began to provide more complete coverage.

Earlier studies of the satellite data detected a slight cooling in the troposphere. Yet, as the length of the satellite record has increased and corrections have been made for changes in satellite altitude, the satellite instruments now find a small global warming trend.

Ice Cores

Scientists drill into massive ice sheets in Greenland and Antarctica to create "ice cores," or samples of ice that can tell us about the history of the earth's climate. Trapped air bubbles found in the ice cores reveal that in the past, the climate has changed significantly within a relatively short period of time. The ice cores from Greenland show that in some cases, the climate has shifted within decades or even less. This finding is important because it suggests that our climate also can change rapidly.

Tree Rings

You probably know that a tree's rings reveal its age. But tree rings also can provide insight into past trends in temperature and precipitation. Changes in the rings' width are related to annual variations in temperature and precipitation. Today, scientists use computers and other advanced methods to reconstruct regional patterns of past drought and other climatic changes through the study of tree rings.

What Do These Methods Tell Us?

Using data collected from land- and marine-based monitoring stations, scientists have determined that the world has warmed about 1 degree Fahrenheit over the past 100 years. The northern hemisphere is now warmer than it has been at any time since at least the year 1400.

