

A Closer Look at Earth

To begin our study of weather and changing weather patterns, we look at a worldwide, or global, view of Earth. A useful model to provide this view is a globe (Figure 1). The globe is tilted to represent Earth's tilt at an angle to an imaginary line between Earth and the Sun. Like Earth, the globe rotates on its axis, which is a line from the South Pole to the North Pole. A globe shows the oceans, continents, and countries of the world; some show major ocean and wind currents.

The main components of Earth that influence weather are the atmosphere, the land forms, and water in its various forms (solid, liquid, and vapour). If you look at a globe or a world map (Figure 2), you can see that a large portion of Earth's surface, about 70%, is covered by oceans. The remainder forms the continents. The atmosphere above the oceans and continents contains air, water vapour, and particles of dust and chemicals, all of which influence weather, especially when the atmosphere is in motion.



Comparing Weather and Climate

Before starting this unit, we should understand that weather and climate are different. **Weather** is the set of environmental conditions encountered from day to day. **Climate** is the set of environmental conditions averaged over many years. Consider a city located in southern Manitoba: its January *climate* is cold and fairly snowy and windy, with an average daytime high temperature of -12°C . This information is the average of years of data. However, for a week in January, its *weather* could be mild, with daytime high temperatures of 6°C , low winds, and sunny skies.

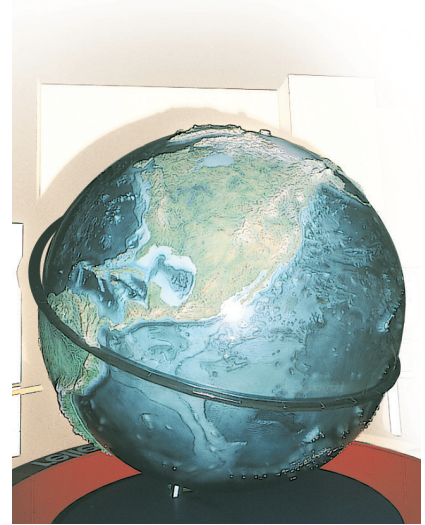


Figure 1

A globe is a three-dimensional model of Earth that is useful to refer to as you study weather dynamics. Globes are often tilted because the Earth itself is at an angle of 23.5° to the plane of its orbit around the Sun.

Figure 2

About 30% of Earth's surface is land; the rest consists of oceans and other bodies of water. The atmosphere extends above the surface to several hundred kilometres.

Work the Web

Visit www.science.nelson.com and follow the links for Science 10, 13.1. Find a site that has climate data for Canadian cities. Choose a city and graph the average monthly temperature and precipitation.

Global Geography

Longitude is the angle measured east or west from the 0° line, which passes through Greenwich, England. For example, the eastern tip of Cape Breton Island, Nova Scotia, is at 60° west longitude. Latitude is the angle measured north or south of the equator. For example, the border between the western Canadian provinces and the United States lies along the 49° north latitude line.

Notice the specially labelled latitudes on the map in **Figure 2**. The Tropic of Cancer, at 23.5° north latitude, is the most northerly location reached by the Sun's vertical rays on the first day of summer, around June 21, each year. The Arctic Circle, at 66.5° north latitude, is the most northerly location reached by any of the Sun's rays on the first day of winter, around December 21. The corresponding lines in the Southern Hemisphere are the Tropic of Capricorn and the Antarctic Circle.

Between the Tropic of Cancer and the Tropic of Capricorn lies the large equatorial region often called the tropics. The polar regions are found north of the Arctic Circle and south of the Antarctic Circle. Between the tropics and the polar regions are the mid-latitude regions. Most of the populated areas of Canada lie in the mid-latitude region.



Challenge

- 1 Start collecting the five-day weather forecasts from a daily newspaper or another source (e.g., a web site). Store the forecasts so that you can analyze them as you learn more about weather forecasting.
- 2 Set up a portfolio of ideas and information so you can develop an understanding of what your weather-wise community will require. For example, which is more important to consider, the weather or the climate? Why?
- 3 Refer to the Nelson Science web site (www.science.nelson.com) to learn how to link your school to other schools where students are studying weather. Keep a record of how you accessed the network site.

Understanding Concepts

1. Describe today's weather conditions for your area.
2. Describe the climate for your area at this time of year.
3. Use two or three adjectives to describe the following climates:
 - (a) winter in Canada's Arctic;
 - (b) winter in Nova Scotia;
 - (c) each of the seasons in your region.
4. List four or five decisions you have made in the past year that have depended on the weather.
5. Consult your atlas and state the latitude of
 - (a) the equator;
 - (b) the South Pole;
 - (c) the southernmost land point in Canada;
 - (d) your own area.
6. As you move from the equator to the poles (on a globe or Earth), what happens to the distance between the longitudinal lines?
7. Compare the following angles: the tilt of Earth's axis, the maximum latitude reached by the Sun's vertical rays on the first day of summer, and the latitudinal angle separating the Arctic Circle from the North Pole. What do you notice?
8. Classify the following locations as being in the tropics, mid-latitude regions, or polar regions:
 - (a) Greenland;
 - (b) Thailand;
 - (c) your own location.
9. Explain why climate should be considered when planning each of the following events:
 - (a) a fireworks display;
 - (b) the Winter Olympics at a mountain resort;
 - (c) a charity run.

Exploring

10. Research what Canada's astronauts have said about our
 - I planet as they viewed it from space. Are there any
 - J themes that emerge from their comments?