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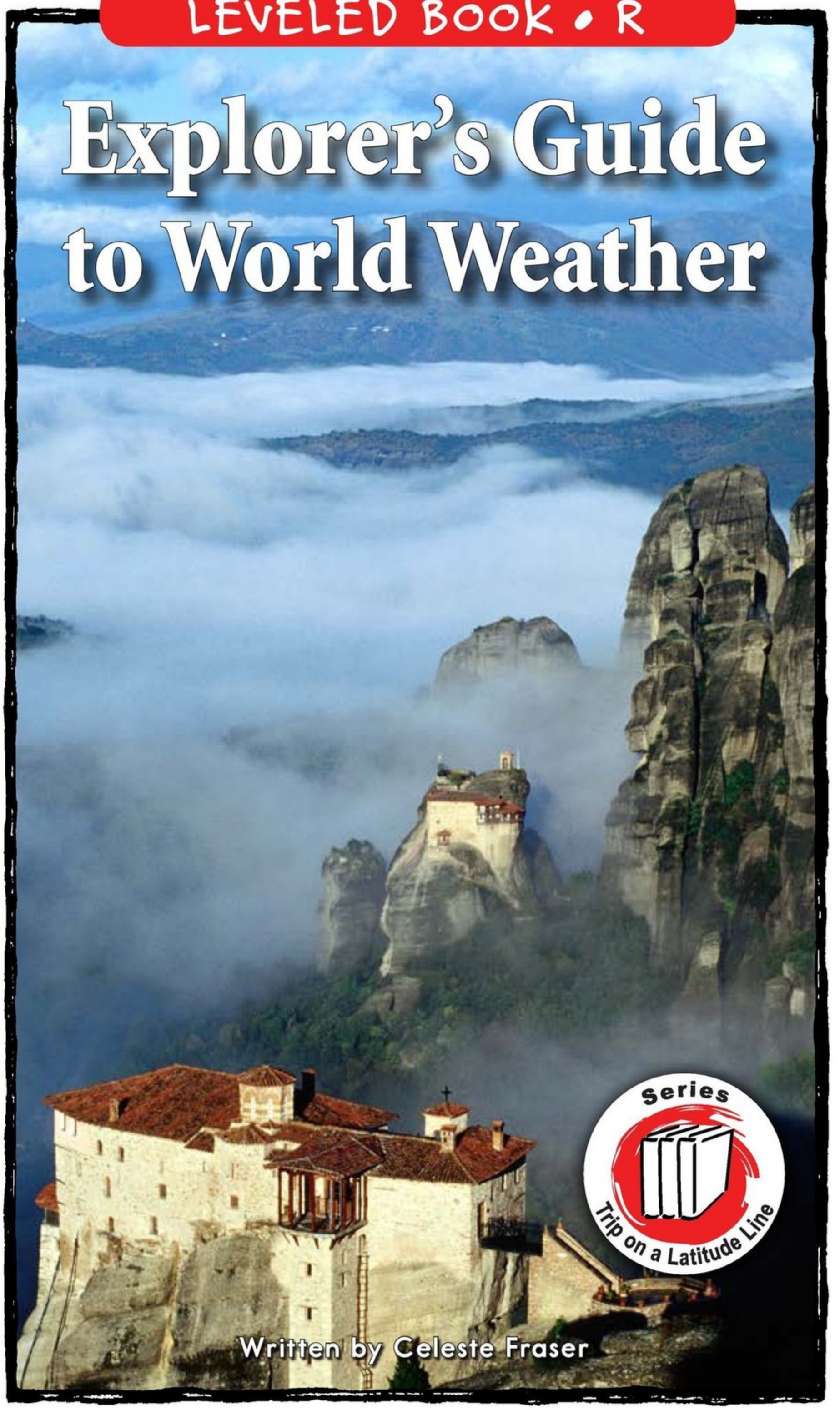
Explorer's Guide to World Weather



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San Francisco, California, is famous for its foggy weather.

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The weather can be very different, depending on where you are in the world.

Introducing Earth

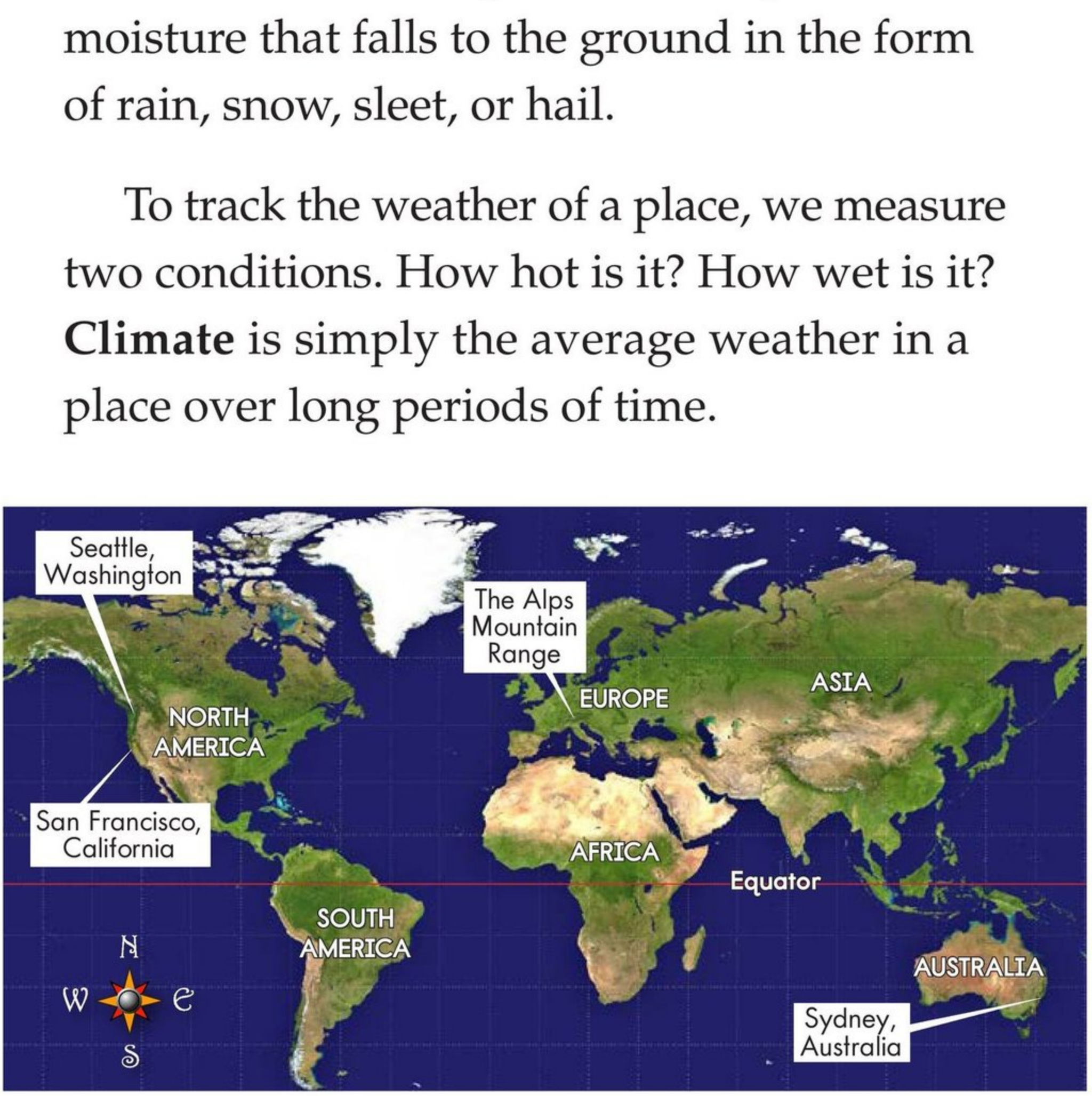
Oceans and air swirl around Earth. Ocean waters that wash the shores of North America also wash the shores of Asia. The breeze that blows curtains in South America rustles leaves in Africa's trees.

Yet **regions** on Earth can be very different from one another. In some places, people never need a heavy coat. In other places, people never go without one. Farmers pray for rain in some places. In other places, rain falls every day. Let's look at why different parts of our planet have such different weather.

How Scientists Measure Weather

How many words can you think of to describe weather? *Hot, cold, warm, chilly, rainy, sunny, snowy, foggy*—the list could go on and on. All these words describe two things: **temperature** and **precipitation**. Temperature is how hot or cold a place is. Precipitation is moisture that falls to the ground in the form of rain, snow, sleet, or hail.

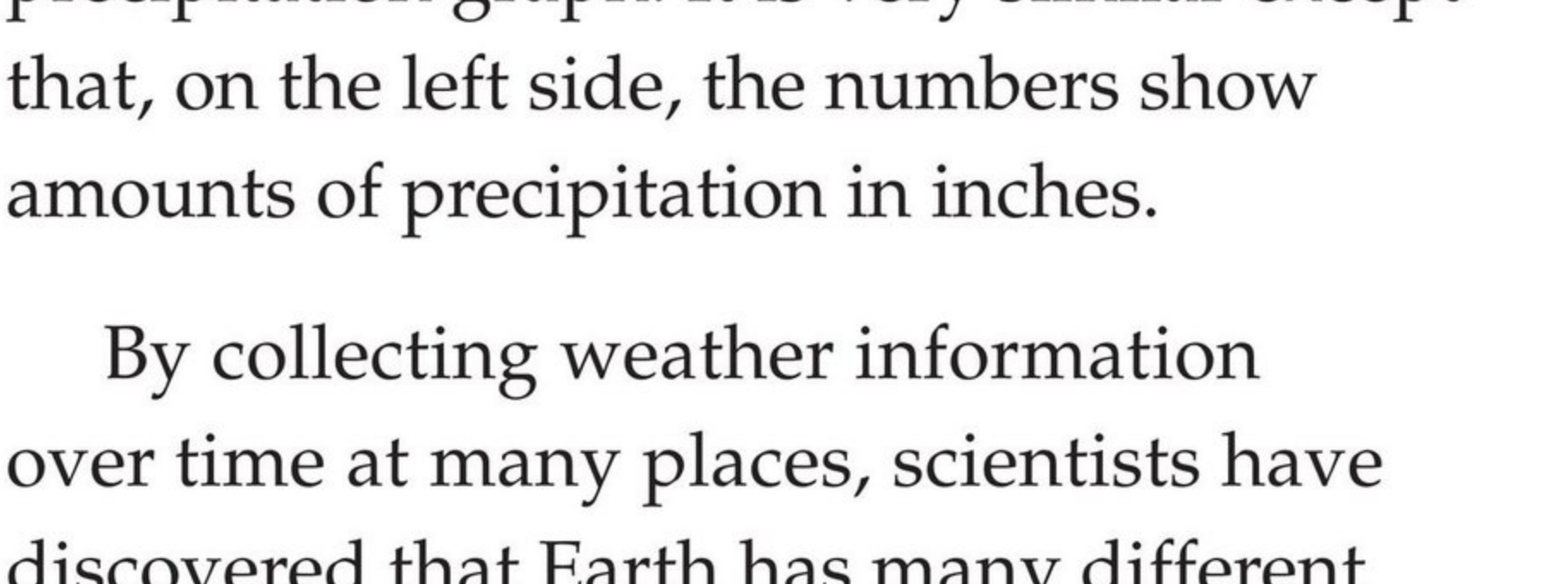
To track the weather of a place, we measure two conditions. How hot is it? How wet is it? **Climate** is simply the average weather in a place over long periods of time.

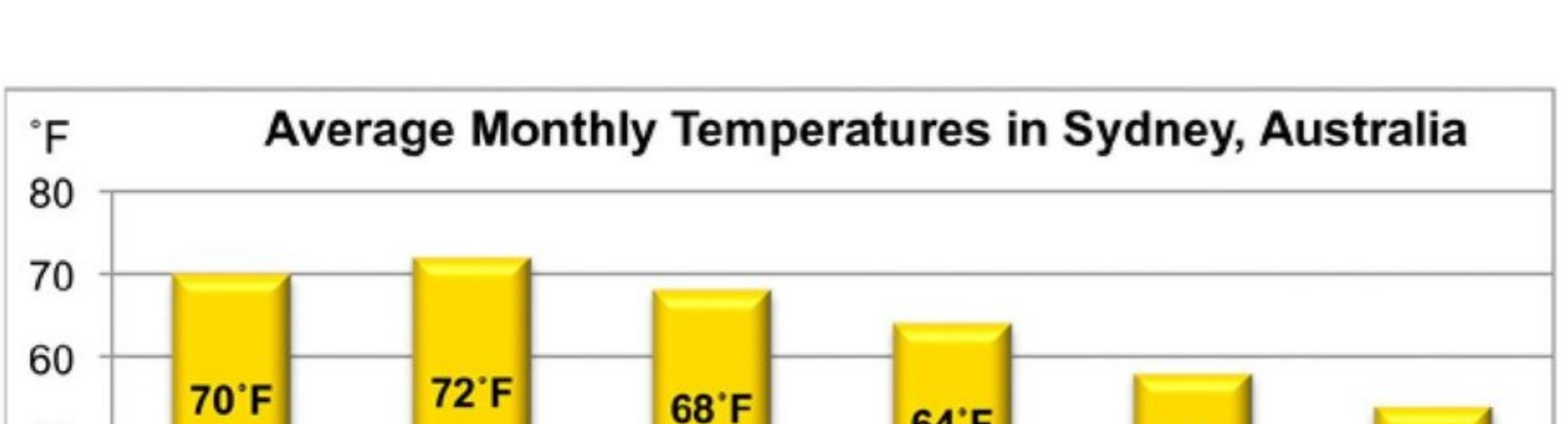


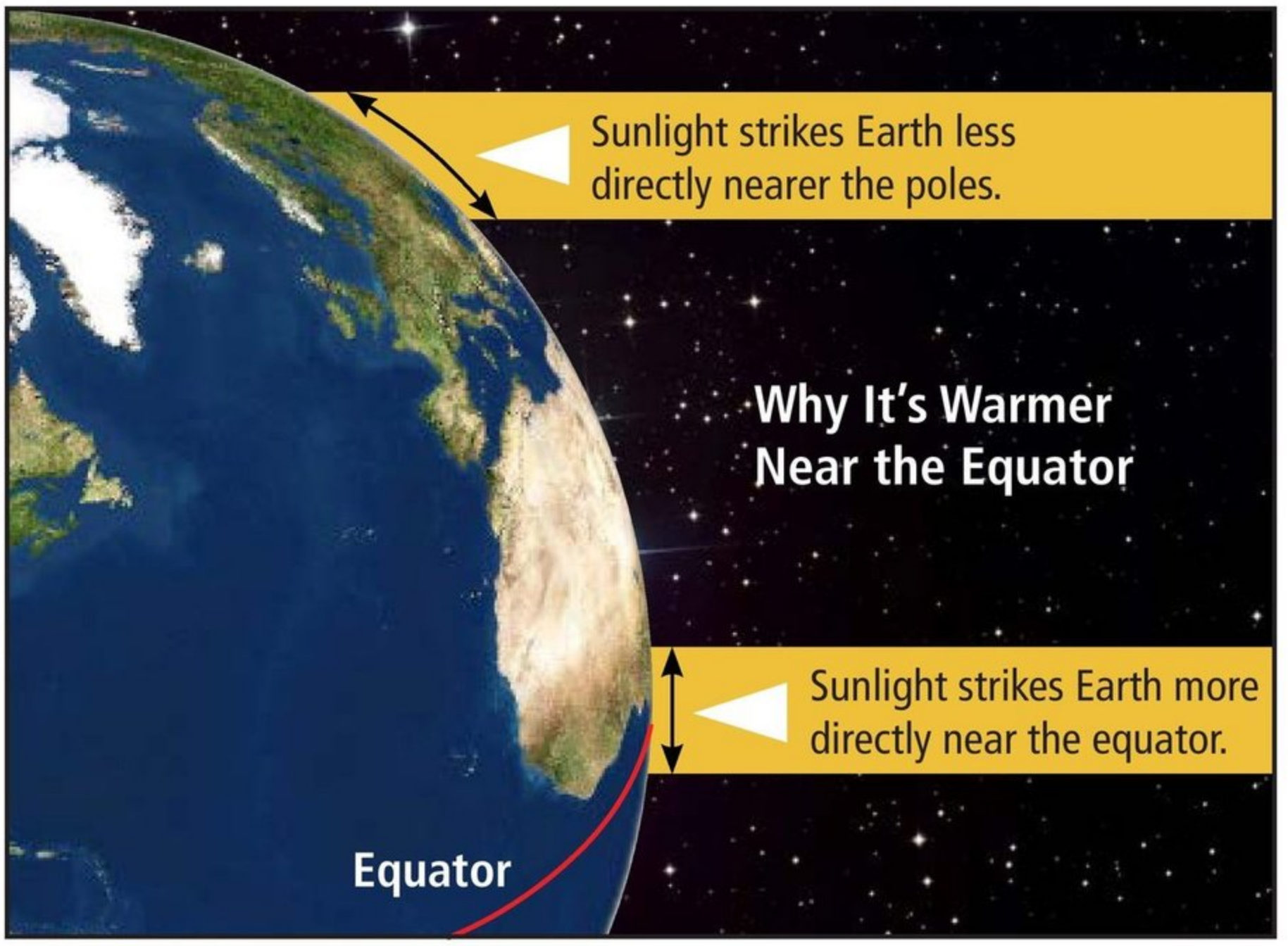
The green areas on this map have wet climates. The brown and white areas have dry climates. Can you find where the labeled locations are mentioned in this book?

Weather information can be recorded on graphs. Look at the temperature graph below. The graph shows information on the weather in Sydney, Australia, for the first six months of the year. The numbers on the left side show the degrees of temperature. Now look at the precipitation graph. It is very similar except that, on the left side, the numbers show amounts of precipitation in inches.

By collecting weather information over time at many places, scientists have discovered that Earth has many different climate patterns.





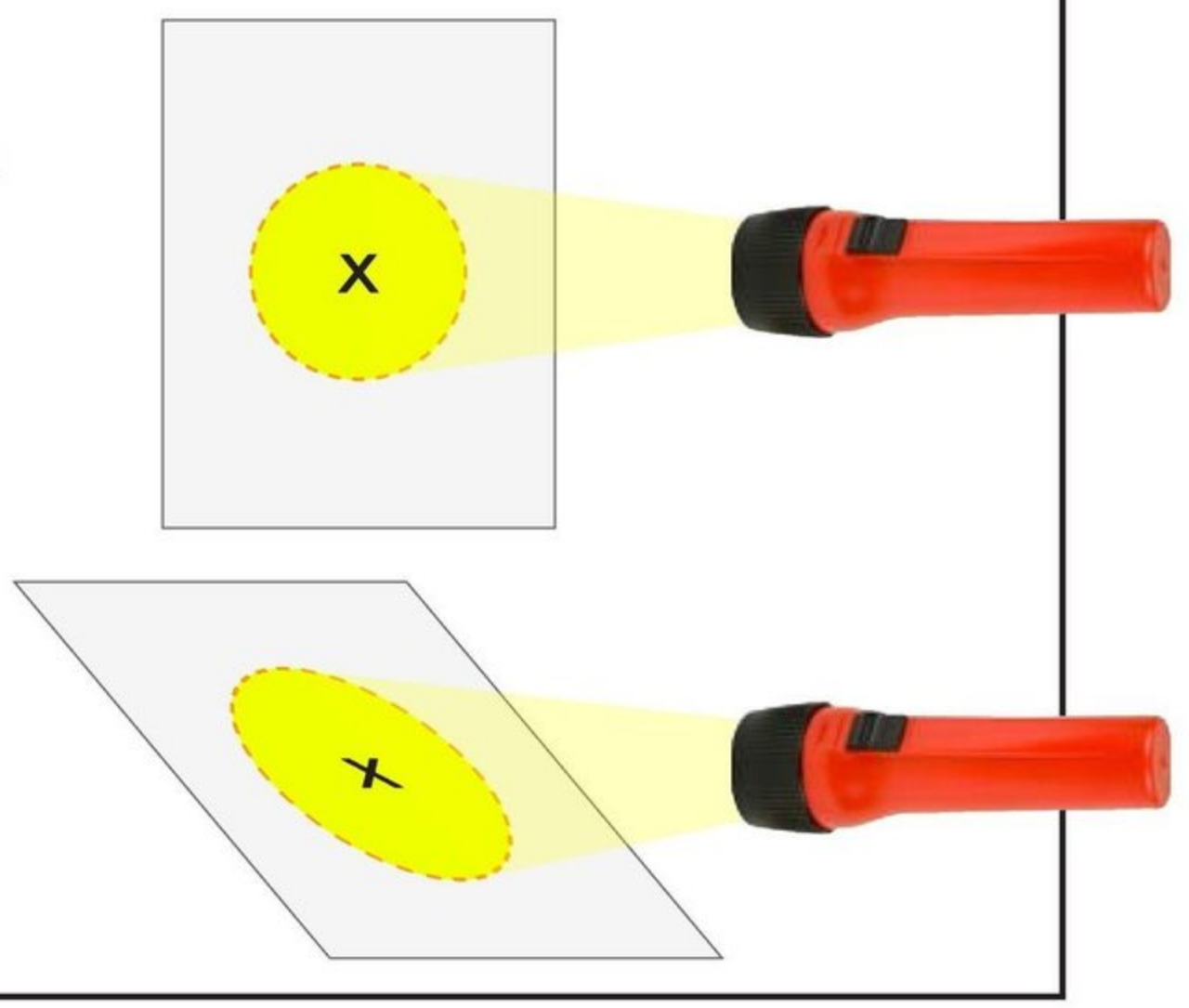


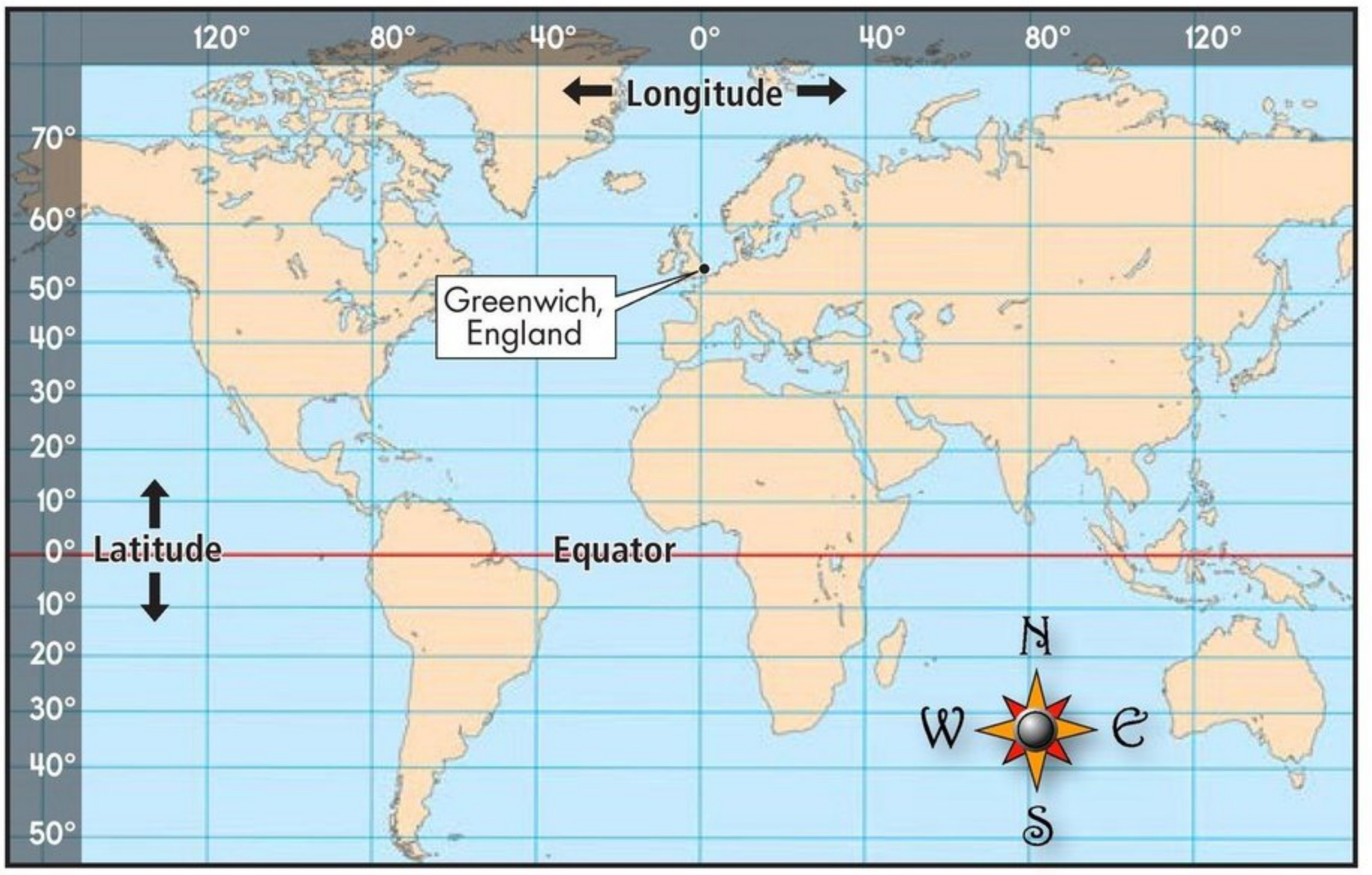
Climate Field Guide

What determines Earth's climate patterns? It all starts with the Sun. The Sun warms our planet, but its warmth is spread unevenly over Earth's surface. The **equator** is an imaginary line that circles the middle of Earth like a belt. Areas near the equator tend to be much warmer than areas far to the north or south. Because Earth is shaped like a ball, the Sun's rays hit Earth at different angles in different places. The Sun's rays are most direct around Earth's middle and least direct at the North and South Poles.

Try This!

Mark an X in the center of a sheet of paper. Have a friend hold the paper so it's facing you. Shine a flashlight at the paper so it makes a circle of light on the paper around the X. Have your friend slowly tilt the paper away from you. As the paper is tilted away, the circle of light will stretch to become an oval. The same amount of light is being spread over more of the paper. As a result, even though the X on the paper is still in the light, it is now getting less light than it was before. In the same way, because Earth is shaped like a ball, as you move north or south away from the equator, Earth curves more and more away from the Sun. Earth's polar regions are cold because they receive less direct sunlight than areas near the equator.





The latitude and longitude system of grid lines makes it possible to describe the location of any spot on Earth. Degrees of latitude measure distance north or south of the equator. Degrees of longitude measure distance east or west of Greenwich, England.

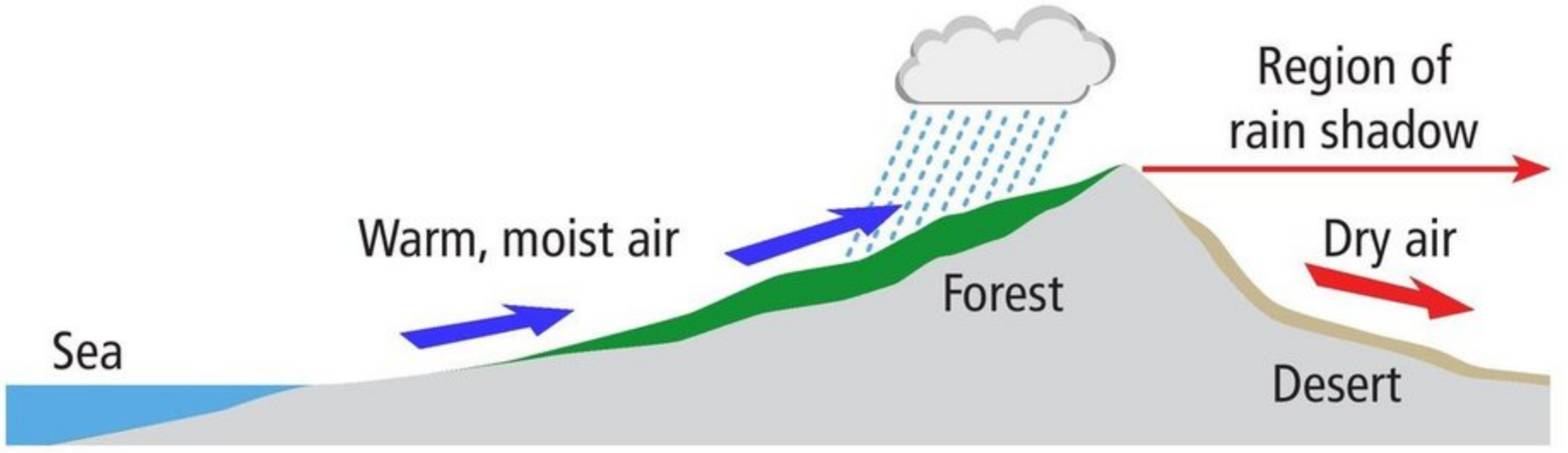
Latitude

Latitude is the system we use for measuring distance north and south of the equator. The equator is 0 degrees (0°) latitude. The North Pole is 90 degrees north latitude; the South Pole is 90 degrees south latitude. The smaller the latitude measurement, the closer a place is to the equator. The greater the latitude measurement, the farther it is from the equator. Climates at or near the equator are generally warm. Climates far from the equator are generally cold.

Elevation

Elevation—the height above or below sea level—can also affect climate. Imagine you were at the equator standing on a high mountaintop. You would be in a cold climate! That's because the temperature of the air drops about three degrees Fahrenheit for every one-thousand-foot increase in elevation.

Mountains can also affect precipitation. Air contains **water vapor**—water in the form of a gas. Air tends to move around the planet in certain directions, called **prevailing winds**. When wind rams into a chain of mountains, the air is forced upward, where it cools. Cool air cannot hold as much moisture as warm air. So air drops its moisture (as rain, snow, sleet, or hail) on the **windward** side of the mountains, leaving the other side, the **leeward** side, very dry. Dry regions caused by mountain "walls" are called **rain shadows**.



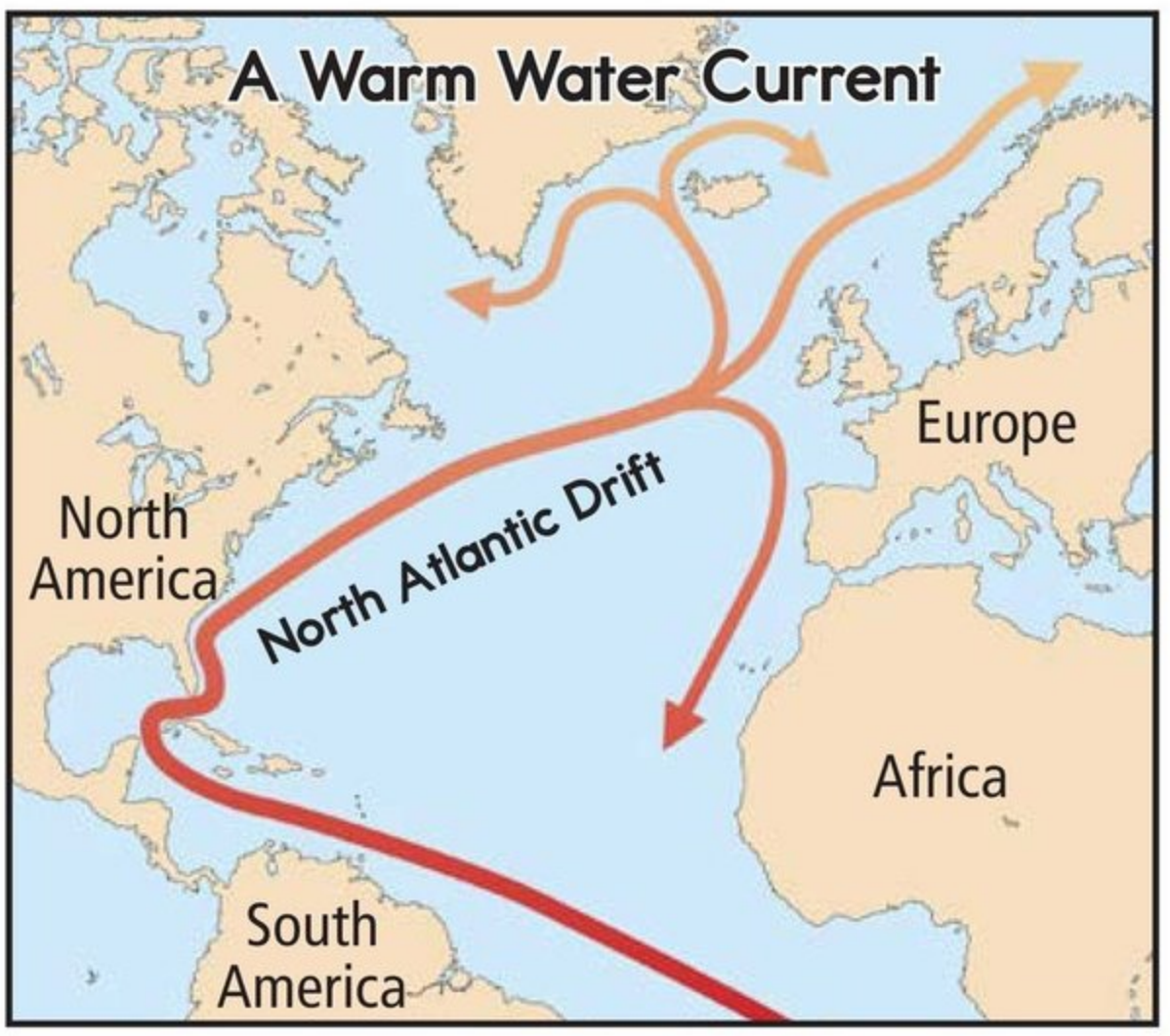
Seattle, Washington, has a relatively mild climate partly because it sits next to Puget Sound, a large body of water.

Large Bodies of Water

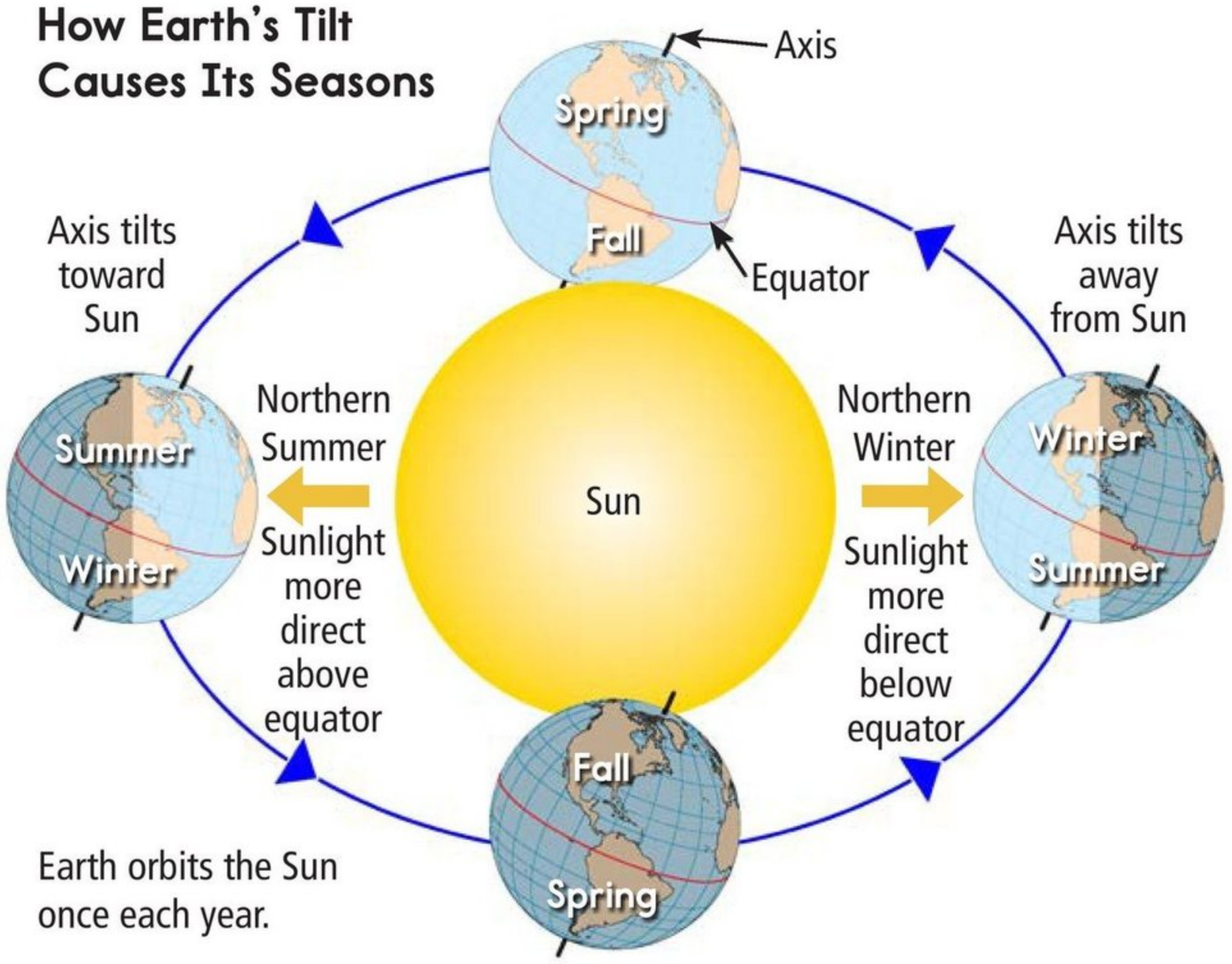
Large bodies of water affect temperature and precipitation, too. Water heats up and cools down more slowly than the surrounding land. As a result, large bodies of water act as a kind of **insulation** on the areas of land next to them, keeping them from heating up or cooling down too quickly. Places near large bodies of water experience mild winters and summers.

By contrast, places located far from large bodies of water often have extreme temperatures—very cold winters and very hot summers. In those places, the air does not hold enough water vapor to insulate against the extremes of temperature.

Ocean currents also play a part in climate. Cold water currents flow from the poles toward the equator. Warm water currents do the opposite, flowing from the equator toward the poles. Air above these currents slowly becomes the same temperature as the water. Consequently, if a prevailing wind blows from water to land, it generally warms or cools those regions.



With its high latitude, Western Europe should have a fairly cold climate. However, a warm water current, the North Atlantic Drift, warms the air above it, giving Western Europe a milder climate. This current also gives the region a wet climate. Because warm air can carry more moisture than cool air, the air that floats over Europe is loaded with water vapor. People in this rainy part of the world need raincoats and umbrellas.



Seasons

Most climates along the equator are hot all year round because of the direct sunlight they receive. Climates in other places on Earth change with the seasons because of Earth's tilt. Look at the diagram above. In January, the Northern Hemisphere is tilted away from the Sun, which causes winter there. In July, it is tilted toward the Sun, which causes summer. The Southern Hemisphere has reversed seasons because it tilts in the opposite direction from the Northern Hemisphere.

A green valley in the Alps mountain range in Central Europe

Exploring Earth's Climate Patterns

You've just had a quick tour of the forces that affect Earth's climates. Pick a place on a globe. Think about the factors that affect its climate. How far is it from the equator? Is its elevation high or low? Are there mountains or large bodies of water nearby? What season is it there right now? If you can answer these questions, you can probably guess what the weather is like there, even without leaving your home!

Glossary

climate *(n.)* the weather conditions in an area over a long period of time (p. 5)

elevation *(n.)* the height of land above sea level (p. 10)

equator *(n.)* an imaginary line that circles Earth halfway between the poles; zero degrees latitude (p. 7)

insulation *(n.)* a material that holds in heat, preventing warmth from escaping or cold from entering (p. 11)

latitude *(n.)* lines that run east and west on a globe (used to measure the distance north or south of the equator) (p. 9)

leeward *(adj.)* the side opposite the direction from which the wind is coming (p. 10)

precipitation *(n.)* water that falls from clouds in the form of rain, snow, sleet, or hail (p. 5)

prevailing winds *(n.)* winds that generally blow in a specific direction (p. 10)

rain shadows *(n.)* areas that have a dry climate because they are on the leeward side of a mountain range (p. 10)

regions *(n.)* places, locations, or areas (p. 4)

temperature *(n.)* the measurement of how hot or cold a place is (p. 5)

water vapor *(n.)* water in the form of a gas (p. 10)

windward *(adj.)* the side on the direction from which the wind is coming (p. 10)

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Teacher's note:
This book is part of the Trip on a Latitude Line series of books on geography and exploration.

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Level R Leveled Book

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