# Weather and Climate

# What is weather?

**Weather** is the state of the atmosphere at any given place at any given time.

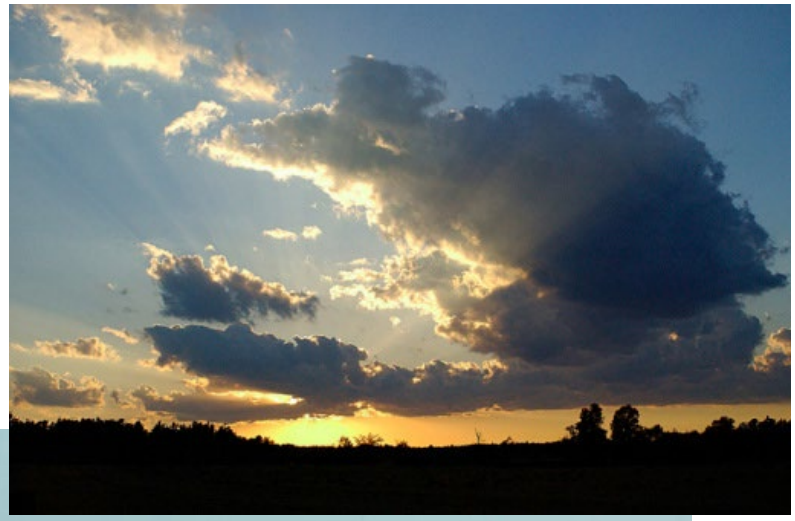
Elements of weather include:

Temperature

Precipitation

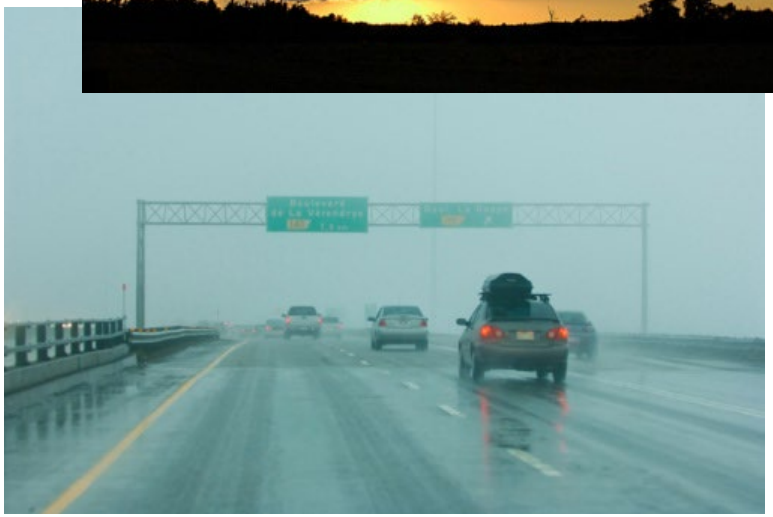
Humidity

Air pressure



Wind speed

Cloud cover



Wind direction

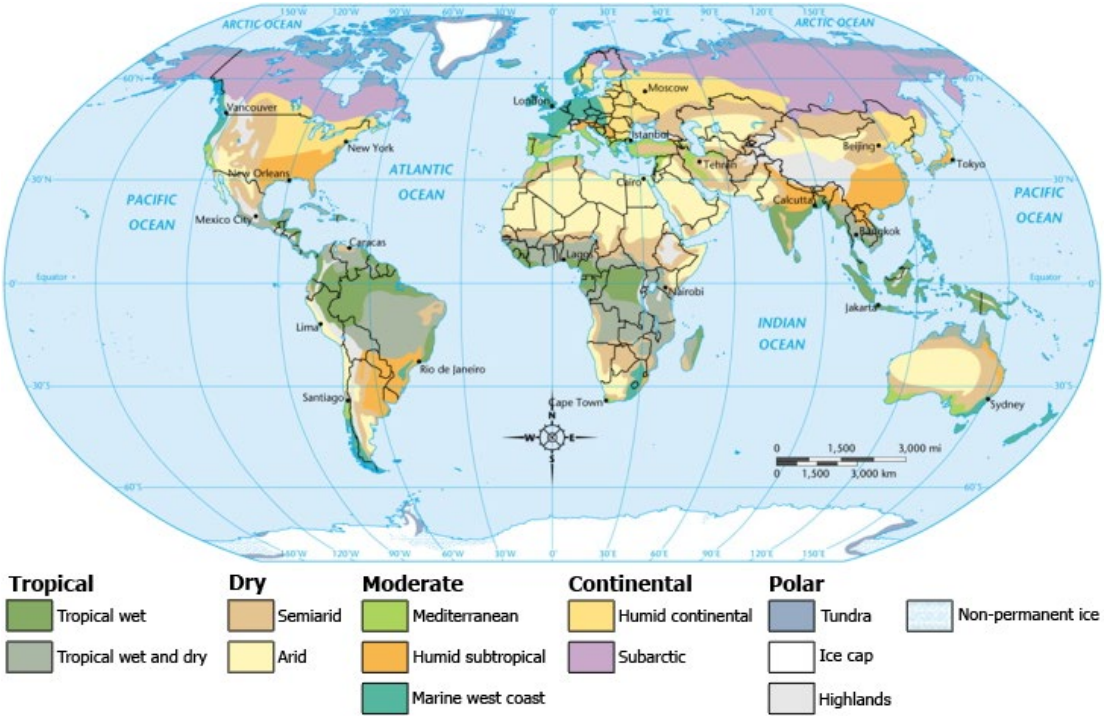
# Weather review

# What is climate?

**Climate** is typically defined as the average weather over a period of 30 years.

Two major indicators of an area's climate are average **temperature** and average **precipitation**.

There are many factors that influence these averages.




By studying these factors, scientists can classify different regions of the world based on climate.

# Climate graphs

# Plot your own climate graph

# Factors affecting climate

Factors affecting climate include:

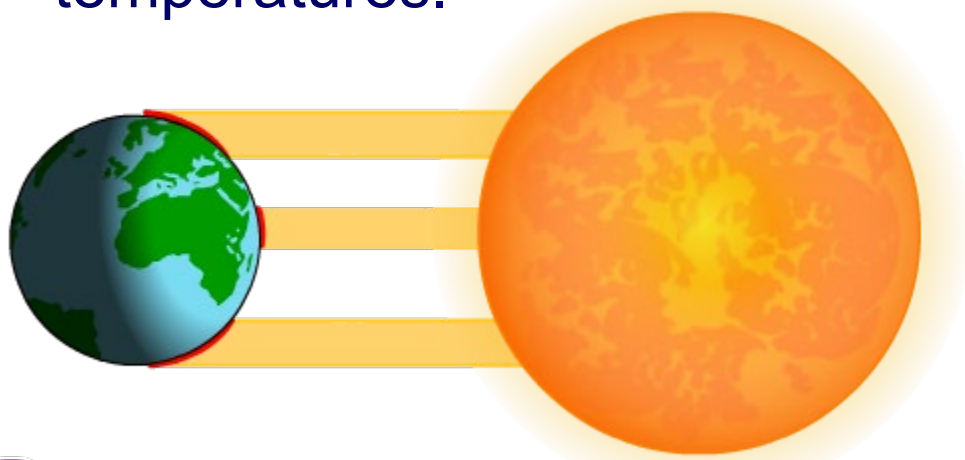
- Latitude
- Elevation
- Nearby water
- Ocean currents
- Topography
- Prevailing winds
- Vegetative cover

No one factor single-handedly determines the climate of a particular area. Instead, each factor plays an integral part in influencing climate.

# Latitude

**Latitude** measures the distance of a location from the equator. Lines of latitude are imaginary horizontal lines that increase from 0° at the equator to 90° at the poles.

A location's latitude determines how much solar energy it receives from the Sun. Earth's angle in relation to the Sun means that regions near the equator receive direct rays from the Sun, resulting in more intense solar energy and higher temperatures.



Regions nearer to the poles receive sunlight at an angle. This results in less intense solar energy and lower temperatures.

# Elevation

**Elevation** describes the distance of a location from sea level.

As elevation increases, air molecules become less densely packed and air pressure decreases. Because less dense air cannot hold as much heat energy as dense air, temperatures are lower at higher elevations.

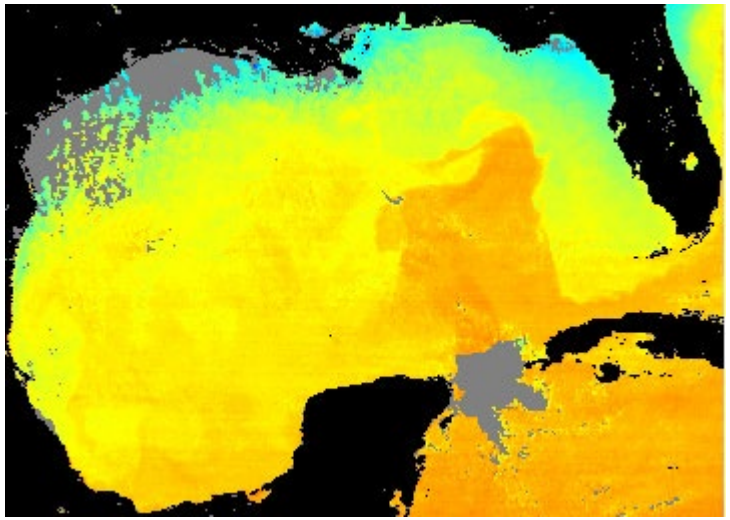
A good example of this phenomenon is **Mount Kilimanjaro** in Africa. The base of the 19,340 ft. mountain is covered by rainforests, while the peak is glacial, despite the mountain's location near the equator.

# Nearby water

Coastal regions tend to have milder temperatures than areas further inland.

During the summer, large bodies of water act as **heat sinks**, absorbing some of the Sun's heat energy.

Deeper, colder water keeps the overall temperature of the water low, cooling the air above it. This cool air then moves ashore, lowering the land temperature.



In winter months, water holds its heat better than land, releasing energy into the air. This warm air heats coastal regions, keeping them warmer than areas further inland.

# Ocean currents

The movements of **ocean currents** are another major way that water affects climate.

Ocean currents can move streams of warm or cool water thousands of miles, warming or cooling the air above it.


For example, the **Gulf Stream** moves warm water from the Gulf of Mexico to the northern Atlantic around Western Europe. This means that the average temperature of London, England is not much colder than that of San Francisco, CA despite being much farther from the equator.

# Topography

A region's **topography**, or surface features, can impact the amount of precipitation it receives.

As air is blown toward a mountain range, it is forced to rise. The rising air becomes less dense and therefore less able to hold moisture. The moisture condenses and falls in the form of rain or snow.

On the **leeward** (downwind) side of the mountains, the air descends, becoming more dense and retaining moisture.

This dry area is in the **rainshadow** of the mountain range.

# Prevailing winds

**Prevailing winds** are winds that blow more often from one direction than any other.

Winds that blow inland from the ocean bring moist air to the surrounding land, increasing precipitation, while winds that come from landlocked areas carry drier air.

Therefore, if a region's prevailing winds come from the ocean, the region will most likely be mild and damp. If a region's prevailing winds come from a body of land, that region will likely be dry, and might be colder or warmer based on the temperature at the wind's origin.

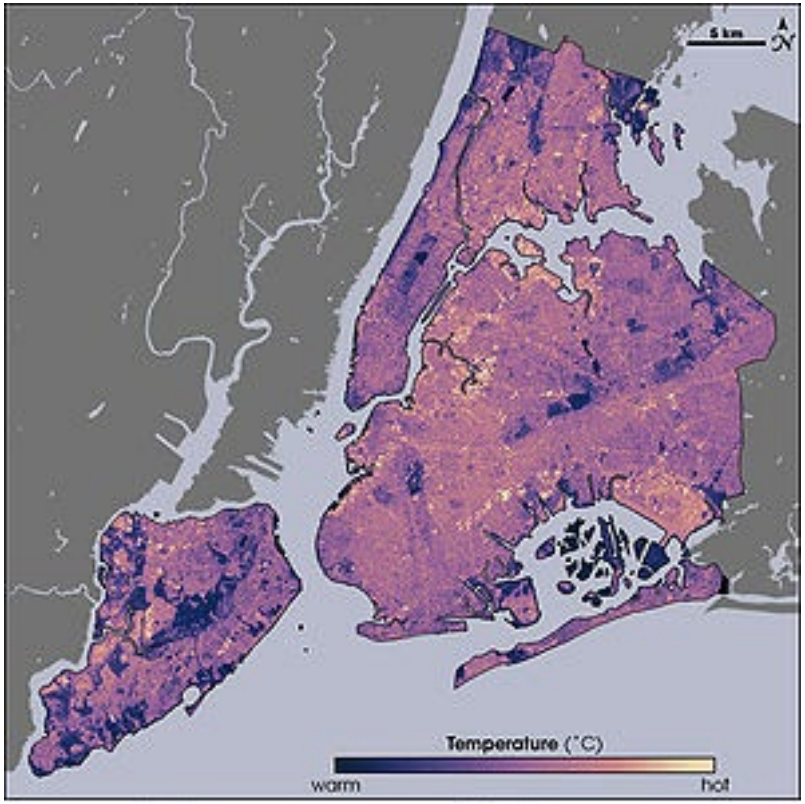
# Vegetative cover

**Vegetative cover** lowers an area's average temperature by means of **evaporative cooling**.

The transpiration of water vapor, a natural process of all green plants, cools the surrounding air. High concentrations of vegetation can have a significant overall cooling effect.

This phenomenon has become an important consideration in urban planning. **Green roofs** and other forms of vegetative cover counter the heating effects of asphalt in large cities.

# Vegetation and temperature





Look at these two maps of New York City. The map on the left is a thermal map, while the map on the right shows vegetative cover.

Is there a correlation between the two maps?

# Fill in the blanks

# Map quiz