

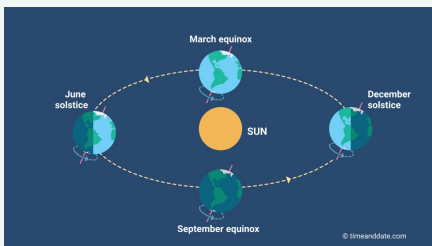
### Weather

The state of the air and atmosphere at a particular time and place i.e. the temperature and other outside conditions (such as rain, cloudiness, etc.)

### Climate

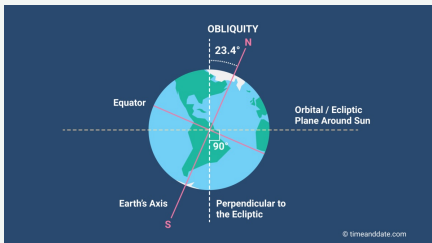
the weather conditions prevailing in an area in general or over a long period

### Seasons



Seasons happen because Earth's axis is tilted at an angle of about 23.4 degrees and different parts of Earth receive more solar energy than others.

### The direction of Earth's tilt doesn't change



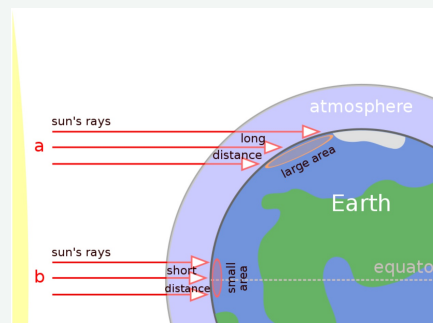
The Southern Hemisphere points away from the Sun, creating winter during the months of June, July and August. Summer in the Southern Hemisphere is in December, January, and February, when the South Pole is tilted toward the Sun and the Northern Hemisphere is tilted away.

### Earth's Energy Balance

*The Earth's atmosphere is heated up unevenly*

1. Sphericity - The nearly spherical shape of the Earth produces uneven insolation.
2. Tilt - The Earth's axis is tilted 23 1/2° from the perpendicular
3. Rotation - Earth turns on its axis once every 24 hours (day/night)
4. Revolution - Earth orbits around the sun once every 365 1/4 days (a year)

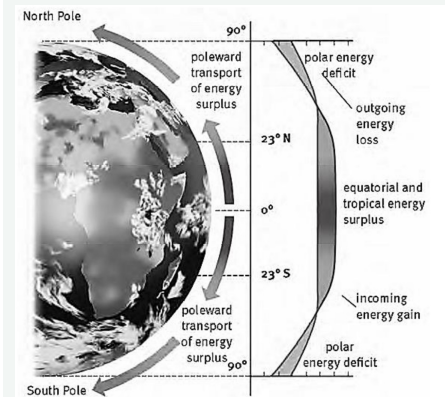
### Surface areas receiving solar insolation



Incoming radiation from the Sun is mainly higher energy, short-wave radiation that heats the Earth's surface.

The incoming solar energy that reaches the Earth's surface is called insolation and is unevenly distributed over the Earth.

### Earth's Heat Engine - Finding balance

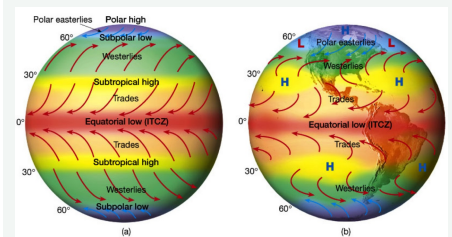


There is a positive heat balance within the tropics, and a negative heat balance in the polar regions.

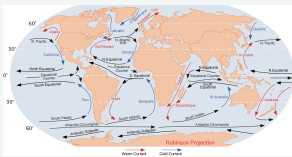
But the Earth does not steadily get hotter at the tropics or colder at the poles. There is a balance between incoming solar radiation and outgoing radiation from the Earth.

This happens through two major transfers of heat: 80% by wind and 20% by water.

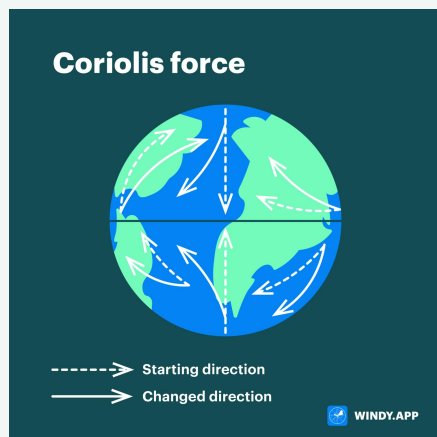
### 80% - Air circulation



### 20% - Ocean currents



### Coriolis Force



#### Coriolis Force deflects wind

The Coriolis force applies to movement on rotating objects. It is determined by the mass of the object and the object's rate of rotation. The Coriolis force is perpendicular to the object's axis. The Earth spins on its axis from west to east.

The Coriolis force, therefore, acts in a north-south direction. The Coriolis force is strongest near the poles, and zero at the Equator.

In the Southern Hemisphere, currents are deflected to the left.

### Wind

Wind is the movement of air caused by the uneven heating of the Earth by the sun. Differences in atmospheric pressure generate winds.

At the Equator, the sun warms the water and land more than it does the rest of the globe. Warm equatorial air rises higher into the atmosphere and migrates toward the poles. This is a low-pressure system.

At the same time, cooler, denser air moves over Earth's surface toward the Equator to replace the heated air. This is a high-pressure system. Winds generally blow from high-pressure areas to low-pressure areas.

The boundary between these two areas is called a front. The complex relationships between fronts cause different types of wind and weather patterns.

### Air movement



### Factors Affecting Climate & Weather

#### Latitude

Affects relative position of sun in the sky. (Think equator vs the poles)

#### Altitude

Temperatures decrease as as height above sea level increases (1 degree per 100m).

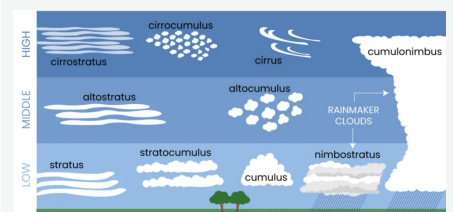
#### Prevailing winds

Winds carry different amounts of moisture and heat depending on where they originate

#### Ocean currents

The sea moderates temperatures.

### Clouds



**Stratus:** Layered clouds that are low, usually look like a blanket.

**Cumulus:** White and fluffy; fast moving, may bring rain showers – especially when the base is grey.

**Cumulonimbus:** These are much deeper clouds that climb high into the atmosphere. They often contain a lot of heavy rain and are associated with thunder and lightning storms.

**Cirrus:** High, wispy clouds, Made up from ice crystals.