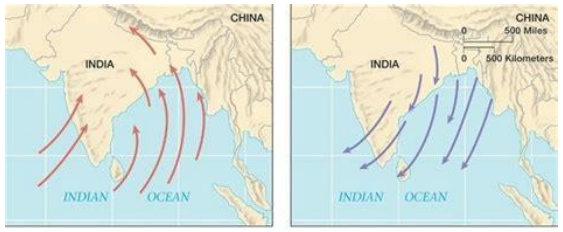
Global Winds and Ocean Currents Vary by Season in India-as shown in diagram below.



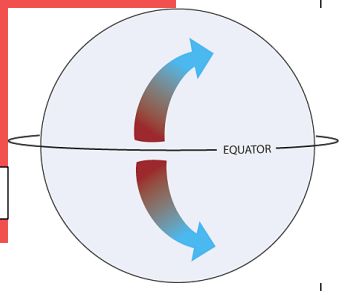
Summer Winter

How Global Winds Affect Climate

- In India, the global winds vary by season In summer they come from the southwest. This causes the monsoon season in summer when over 30 inches of precipitation can fall each month.
- When global winds come from either the north or south pole, they bring **cooler temperatures**.
- When global winds come from the equator, they bring **warmer temperatures**
- When global winds form over land (continental), they are **dry**.
- When global winds form over water (maritime), they are **wet**.

The Coriolis Effect & Earth's Rotation

Because the Earth is rotating, large masses of air and water move in curved paths. This is known as the Coriolis Effect. In the northern hemisphere winds move in a clockwise direction. In the southern hemisphere winds move in a counterclockwise direction.



Coriolis Effect

Ocean Surface Currents

When global winds blow across the water near the surface of the ocean, they create surface currents. Ocean surface currents flow in the same direction as the global winds and deflect when they hit a continent. Ocean surface currents also flow in curved paths due to the Coriolis force.

How Surface Currents Affect Climate

- **Warm** ocean surface currents cause locations to have **warmer, wetter climates**.
- **Cold** ocean surface currents cause locations to have **cooler, drier climates**.
- In India, the warm Somali Current is driven by seasonal monsoon winds and is stronger in the summer than the winter.
- The Somali Current weakens and *reverses direction* during the northeast (winter) monsoon.

Large Bodies of Water

Land absorbs and releases energy from the sun quicker than water because land is a solid and the molecules in a solid are closer together, which allows them to transfer energy more quickly. The molecules in a liquid are spread out further than in a solid, which means they transfer energy more slowly. (Fun fact: Gases absorb and release energy the slowest because the molecules in a gas are the furthest apart.)

How Large Bodies of Water Affect Climate

- Locations that are NOT near any large bodies of water have higher daytime temperatures and lower nighttime temperatures.
- Locations NEAR large bodies of water have more moderate climates; their daytime temperatures are not as high, and their nighttime temperatures are not as low.
- In India, the warm Arabian Sea temperature ranges from 77-82°F.

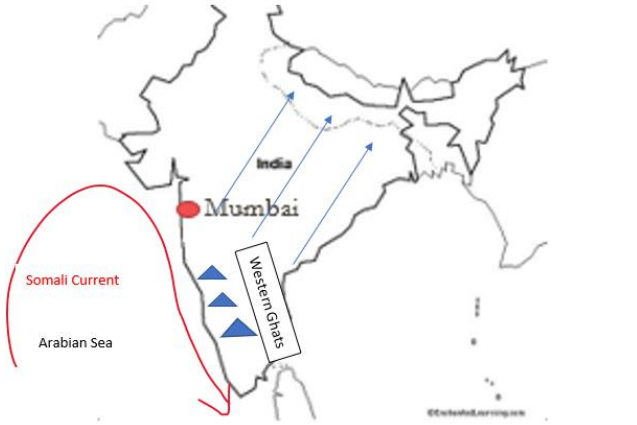
Mumbai, India

Regional Climate Research

By Mrs. Pernsteiner

Mumbai

Ocean Current, Landforms, Global Winds, and Water Bodies



Unequal Heating, Latitude, & Seasons

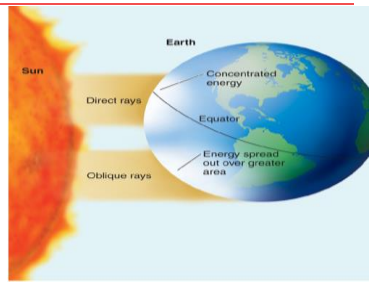
Because the Earth is sphere, the sun's rays do not hit all areas of the earth equally. Places near the equator receive more direct sunlight all year and do not experience seasons. Places near the poles have seasons and experience different amounts of solar energy depending on the time of year.

Unequal Heating

Due to **unequal heating,** the air near the equator is less dense and warmer than it is at the poles. Cooler, denser air flows toward the equator where it pushes up the less dense air. The cycle of moving air due to differences in temperature, pressure, and density produces convection cells of moving air called global winds.

Unequal Heating

Of Earth



How Latitude Affects Climate

- Locations at lower latitudes/near the equator receive **more** direct sunlight and thus have **warmer** climates.
- Locations at higher latitudes/near the poles receive **less** direct sunlight and thus have **colder** climates.
- Locations at higher latitudes also have seasons, which leads to a **larger** range in temperatures.
- Because Mumbai is near the equator it is warm year-round.
- Locations at lower latitudes do NOT have seasons, and so have a **smaller** range in temperature.

Climate of Mumbai, India

Latitude/Longitude: 18.97° N, 72.82° S
Elevation: 10-15 m (average)
Biome: Tropical wet and dry/ savanna

Average Temperatures (Degrees F)

Month	High	Low
January	86	64
February	88	64
March	90	70
April	91	75
May	91	81
June	90	79
July	86	77
August	86	77
September	88	77
October	91	75
November	91	72
December	90	66

Average Precipitation (Inches)

Month	Precipitation (In.)
Jan.	.6
Feb.	-
March	-
April	-
May	.8
June	19.9
July	32.3
August	21.5
Sept.	12.8
Oct.	3.2
Nov.	4.5
Dec.	.2

Land Use in Mumbai

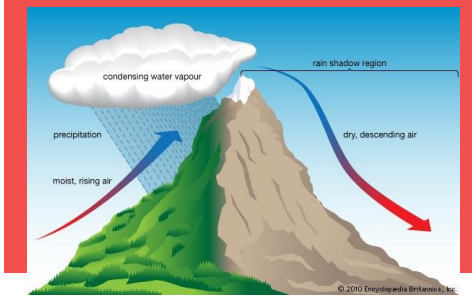
In Mumbai, India most of the land is for residential or commercial use. In the east, some of the land is a natural area.

Native Plants & Animals in Mumbai

Mango, Jasmine, and Lotus are native Indian plants.

Wildlife in India is at risk. A census of wildlife preserves show that leopards are at risk and the civet cat is going extinct. Spotted deer, monkeys, and langurs are the common prey of the leopards. The number of herbivores is increasing.

How Landforms Such as Mountains Affect Climate

- Locations at higher elevations have cooler temperatures than locations near sea level.
- Locations on different sides of a mountain can have very different climates. One side might be wet and lush while the other side is dry and arid. This is due to the rain shadow effect.
- In India, the Ghat Mountains to the east of Mumbai. During the monsoon season between June and September, the Western Ghats chain acts as a barrier to the rain clouds. The eastward moving rain clouds are forced to rise and in the process deposit most of their rain on the windward side.

Rain Shadow Effect