

How does distribution of land and water affect climate?

[Environment](#), [Climate](#)



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Introduction

This report considers why the uneven distribution of land and oceans across the Earth affects climate and vegetation both at global and regional scales. It also looks at atmospheric and ocean circulation.

Because Earth is always at a tilt, there is an uneven latitudinal input of solar radiation. This causes the world's seasons and the force causing heat transport from the equator towards the poles, known as the atmospheric heat balance. The uneven and unequal distribution of Earth's land and oceans causes there to be moisture circulation in order to maintain balance. Their distribution determines large-scale atmospheric and oceanic circulation patterns. Their dissimilar heat capacities, with Oceans having a much greater capacity relative to land, drives continental-scale convective atmosphere transport.

Factual Information

The heating of the warmer equatorial regions and the cooling of the colder polar regions generates the kinetic energy for the motion of air parcels in the

atmosphere and fluid parcels in the ocean. The land and ocean distribution on the Earth's surface provides additional forcing functions for the atmospheric and oceanic motions, in part due to longitudinal asymmetry in heating due to different thermal properties of land and ocean, and in part due to mechanical effects of the mountain barriers. The radiation energy falling over the oceans and the land surfaces evaporates the water which later condenses and releases latent heat of condensation in the atmosphere. Latent heat can cause the rising air to be warmer than surrounding air, so it continues to rise. The greater the moisture content of rising air, the more latent heat is released to drive convective uplift, which contributes to the intense thunderstorms and deep boundary layer in the wet tropics.

Surface air rises most strongly at the equator because of the intense equatorial heating and the large amount of latent heat released as this moist air rises and condenses. This air rises until it reaches the tropopause.

Ocean circulation plays a critical role in Earth's climate system. On average, ocean circulation accounts for 40% of the latitudinal heat transfer from the equator to the poles, with the remaining 60% of heat transfer occurring through the atmosphere. The ocean is the dominant heat transporter in the tropics and the atmosphere plays the stronger role at mid-latitudes. The surface current of the oceans are driven by surface winds and therefore show global patterns.

At the global scale, consistent patterns of air flow can be seen at the Earth's surface and within its upper atmosphere. Global winds develop because of

latitudinal variations in atmospheric pressure. However, these differences in pressure are not just the result of the differential heating of the Earth's surface. At approximately 30 degrees North and South latitude, the subtropical high pressure zone forms because of the presence of descending air from the upper atmosphere. The sub-polar lows, located at about 60 degrees North and South latitude, develop because of the dynamic interaction of cold polar air with warm moist subtropical air masses. This interaction causes frontal lifting and the development of cyclonic storms. Surface winds move from areas of high pressure to low pressure. The course of this movement is also altered by the influence of Coriolis force causing the development of the trade winds (0 to 30 degrees N and S), the westerlies (30 to 60 degrees N and S) and the polar easterlies (60 to 90 degrees N and S). Upper atmosphere winds are generally poleward and westerly direction. Their development is related to the presence of the Hadley, Ferrel and Polar circulation cells in the North and South hemisphere.

Hadley-Ferrel Model.

[http://www.google.co.uk/imgres?imgurl= http://www.lakeeriewx.com/Meteo241/ResearchTopicTwo/Images/HadleyCell.gif&imgrefurl](http://www.google.co.uk/imgres?imgurl=http://www.lakeeriewx.com/Meteo241/ResearchTopicTwo/Images/HadleyCell.gif&imgrefurl)

Because the Earth is a sphere, more solar energy arrives for a given surface area in the tropics than at higher latitudes, where sunlight strikes the atmosphere at a lower angle. Energy is transported from the equatorial areas to higher latitudes via atmospheric and oceanic circulations, including storm systems. Energy is also required to evaporate water from the sea or

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land surface, and this energy, called latent heat, is released when water vapour condenses in clouds.

The atmosphere directly affects life on Earth by supplying the gases for the respiration of vegetation and animals and by moving water from oceanic regions to be deposited in liquid or solid form on land. The atmosphere also shelters life on Earth from the extreme and potentially harmful effects of direct solar radiation. The oceans are most important because of their tremendous heat storage potential and their ability to distribute that heat horizontally. The composition and motion of the water in the hydrosphere sustains a rich and diverse life system. The exchange of gases and heat between oceans and atmosphere determines the physical properties and composition of both these sub-systems and is one of the primary climate processes.

Vegetation covers a considerable portion of the earth and has an effect on weather and climate. Vegetation influences both albedo of the earth and the amount of water vapor and carbon dioxide in the air.

Vegetation includes all plants from tropical forests to grassy meadows and cropland. All types of plants play a role in both the water cycle and the earth's energy balance.

Water is necessary to sustaining life on Earth, and helps tie together the Earth's lands, oceans, and atmosphere into an integrated system.

Precipitation, evaporation, freezing and melting and condensation are all part of the hydrological cycle – a never-ending global process of water

circulation from clouds to land, to the ocean, and back to the clouds. This cycling of water is intimately linked with energy exchanges among the atmosphere, ocean, and land that determine the Earth's climate and cause much of natural climate variability.

Heating determines where the ocean evaporates, and the amount of evaporation.

<http://www.nc-climate.ncsu.edu/edu/k12/>. Vegetation

The biosphere and atmosphere are coupled to one another. Climatic state variables, such as temperature, humidity, wind and precipitation affect the physiological functioning of vegetation, the architecture of plant communities, and soil properties. In return, the functional type and extent of vegetation influences the state of the atmosphere.

The Koppen Climate Classification System is the most widely used for classifying the world's climates. Koppen divided the Earth's surface into climatic regions that generally coincided with world patterns of vegetation and soils.

The Koppen system recognizes five major climate types based on the annual and monthly averages of temperature and precipitation.

A – Moist Tropical Climates are known for their high temperatures year round and for their large amount of year round rain.

B – Dry Climates are characterized by little rain and a huge daily temperature range. Two subgroups, S – semiarid or steppe, and W – arid or desert, are used with the B climates.

C – In Humid Middle Latitude Climates land/water differences play a large part. These climates have warm, dry summers and cool, wet winters.

D – Continental Climates can be found in the interior regions of large land masses. Total precipitation is not very high and seasonal temperatures vary widely.

E – Cold Climates describe this climate type perfectly. These climates are part of areas where permanent ice and tundra are always present. Only about four months of the year have above freezing temperatures.

References

Blij, H. (2000). Geography: realms regions and concepts 2000(9th). New York: John Wiley & Sons, Inc.

Gabler, R. (1993). Essentials of physical geography(4th). New York: Harcourt Brace College Publishers.

Hobbs, J. (2006). Essentials of world regional geography(5th). Canada: Thomson Books/Cole

Matt Rosenberg. (2007). About: Geography [Online]. [http://geography. about. com/od/physicalgeography/a/koppen. htm](http://geography.about.com/od/physicalgeography/a/koppen.htm) [2007, April 14]

The most important plant-related variables, that affect the state of the atmosphere, include albedo, aerodynamic roughness, leaf area, canopy height and surface resistance to trace gas exchange. Vegetation include boreal and temperate forests, tropical forests, chaparral, grasslands, savanna woodlands and wetlands, as they p a spectrum of plant canopy attributes.

Conclusion

From this report of the climate system, we can conclude that we must understand how Earth, with its atmosphere, greenhouse gases, ocean, life, winds, and currents all interact to produce our climate. The ocean is one big part of the earth system. The ocean, atmosphere, land and vegetation are all connected through the climate system.

Changes in various aspects of the climate system, such as the size of ice sheets, the type and distribution of vegetation or the temperature of the atmosphere or ocean will influence the large-scale circulation features of the atmosphere and oceans.

There are many feedback mechanisms in the climate system that can either amplify (' positive feedback') or diminish (' negative feedback') the effects of a change in climate forcing. For example, as rising concentrations of greenhouse gases warm Earth's climate, snowand ice begin to melt. This melting reveals darker land and water surfaces that were beneath the snow and ice, and these darker surfaces absorb more of the Sun's heat, causing more warming, which causes more melting, and so on, in a self-reinforcing

cycle. This feedback loop, known as the 'ice-albedo feedback', amplifies the initial warming caused by rising levels of greenhouse gases.