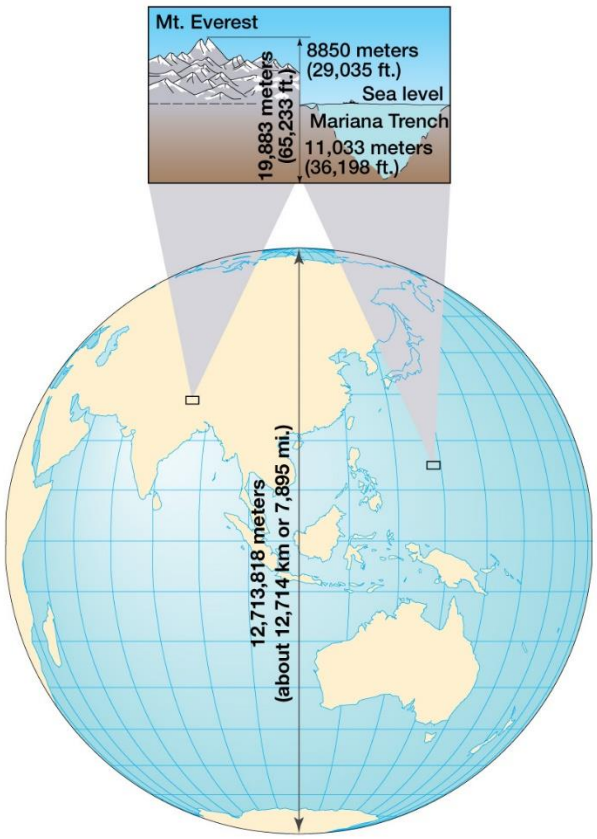
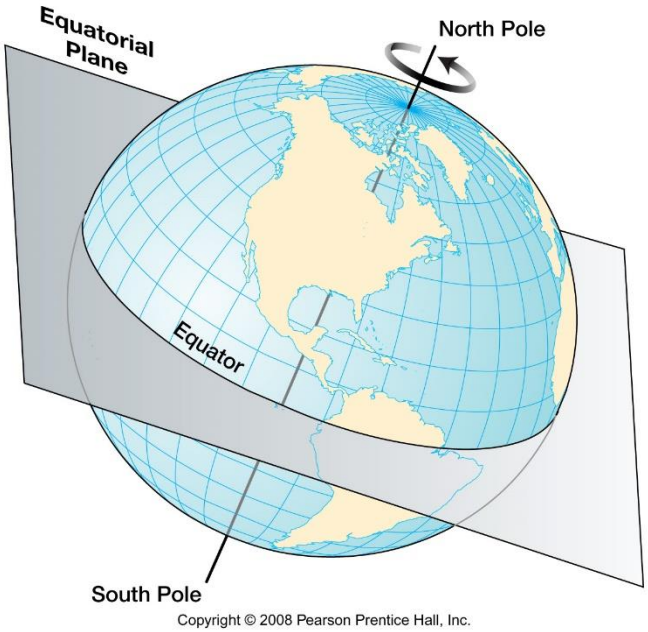
Dimensions and features of the earth



The earth has about 12.5 miles of relief with Mt. Everest over 29,000 feet (8850 meters) above sea level and the Mariana trench about 36,000 feet (11,053 meters) below sea level.

The earth's circumference is about 25 thousand miles or about 40 thousand kilometers.

Note: In Egypt, Eratosthenes (~2200 years ago) calculated circumference using the sun angles during the summer solstice (longest day of summer in northern hemisphere) and measuring the distance between two locations.

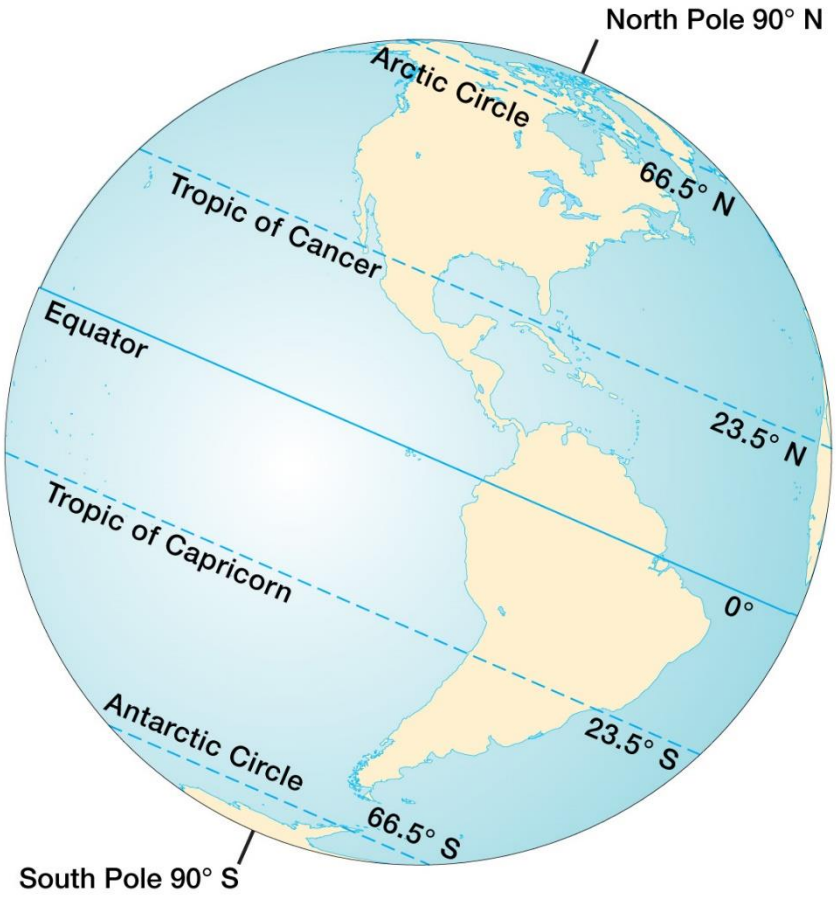


Geographic north and south and the north and south poles are determined by the spin axis of the earth. The velocity in space is over 1000 miles per hour at the equator (~25,000 mi. in 24 hours) and zero miles per hour at the pole. The physical forces exerted by the rotation of the earth includes the Coriolis effect which we'll study more.

Note that the magnetic poles of the earth are generated from the metallic core of the earth and are quite different from the geographic poles. The magnetic poles are also transient which means they migrate over time. The angle difference between true north and magnetic north at a location is called the magnetic declination. In western Washington the magnetic declination is about 20 degrees west of true north.

Latitude and Longitude:

Parallels of Latitude are measured from the Equator: 0-90 degrees north (at pole) and 0-90 degrees south. Parallels of latitude are really based on the physical earth (spin axis) and have been used a long time historically, e.g., for navigation, based on sun angle and time of year. The Equator is a great circle or full circumference and all other parallels are small circles (less than full circumference).



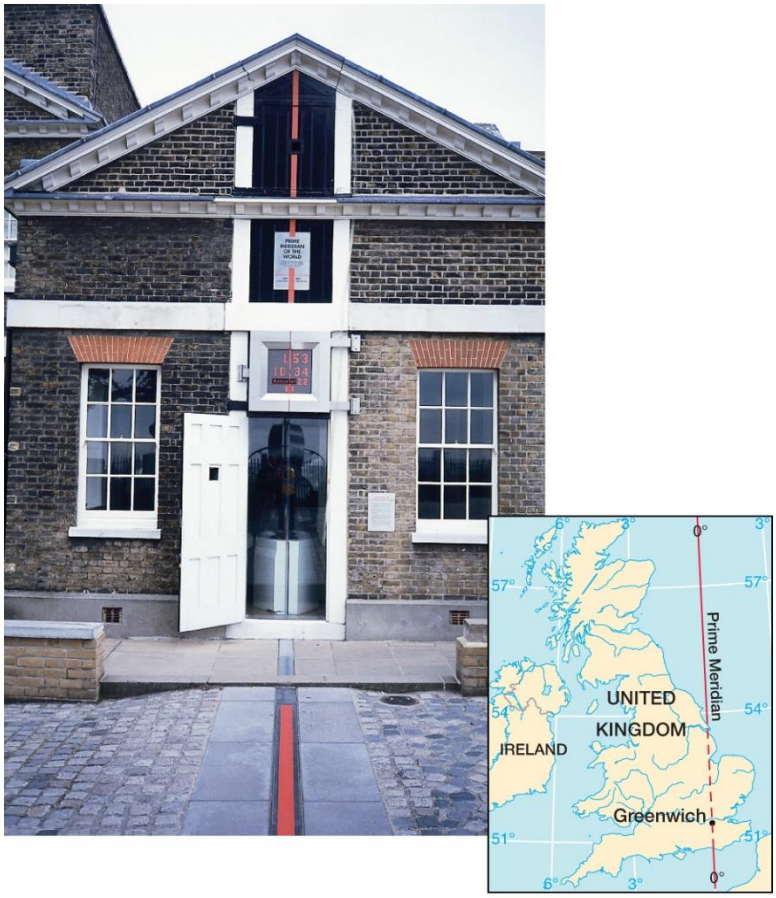
Important parallels include the Tropic of Cancer at 23.5 degrees north and Tropic of Capricorn at 23.5 degrees south, as well as the Arctic circle at 66.5 degrees north and the Antarctic circle at 66.5 degrees south.

The inclination of the earth's spin axis relative to the sun at 23.5 degrees determines the edges of the tropics and polar regions.

Meridians of Longitude are measured from the Prime Meridian (made official in 1884): 0-180 degrees west and 0-180 degrees east. Degrees are divided into minutes.

Meridians of longitude are all great circles. Note that the Prime Meridian is a line set by agreement and really could be anywhere.

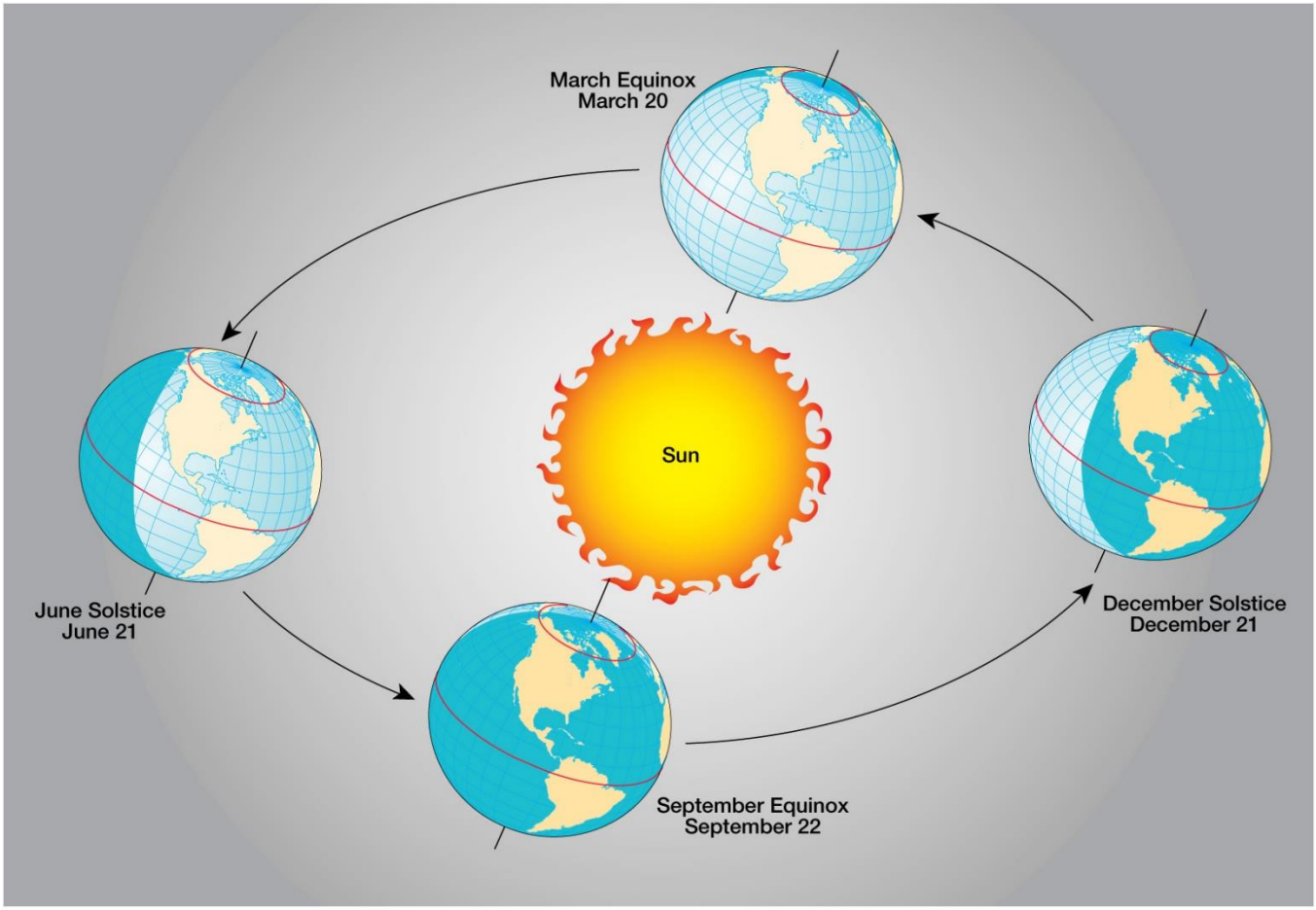
While 0 degrees longitude is indicated at the Greenwich observatory in the U.K.



(in photograph),

a modern adjustment to the prime meridian places it several hundred feet east of this line based on space-based projections to the center of the earth.

Seasons and the earth's position relative to the sun:



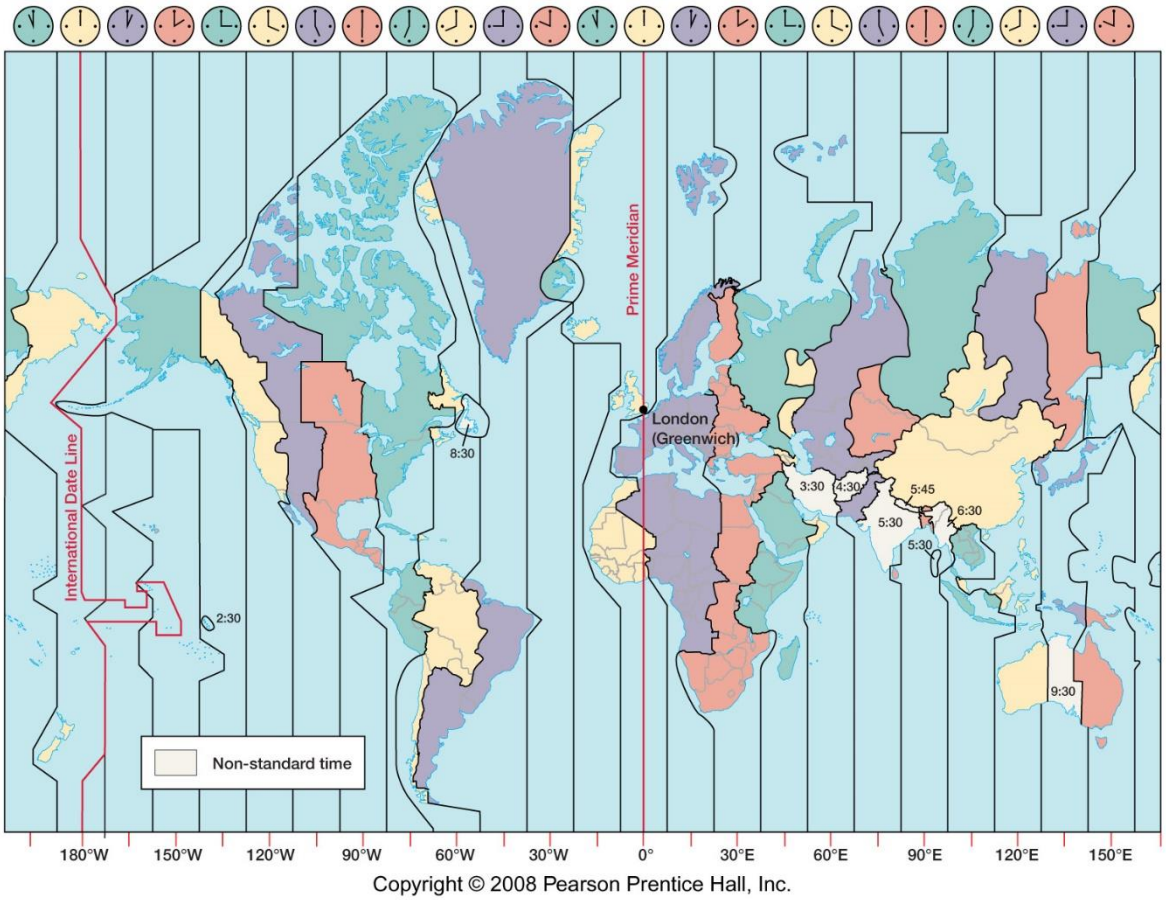
Our seasons progress as we take our year long journey in an elliptical orbit around the sun. The solstices are the longest and shortest days of the year. The equinoxes are days of equal day and night everywhere on earth.

Note that the equator has equal day and night year-round and day length variation increases toward the poles. Remember that the longest day of the year and peak of summer in the northern hemisphere is the shortest day of the year in the southern hemisphere.

TABLE 1-6 Conditions on Equinoxes and Solstices

Day	March Equinox	June Solstice	September Equinox	December Solstice
Latitude of vertical rays of Sun	0°	23.5° N	0°	23.5° S
Day length at Equator	12 hours	12 hours	12 hours	12 hours
Day length in midlatitudes of Northern Hemisphere	12 hours	Day length becomes longer with increasing latitude north of equator.	12 hours	Day length becomes shorter with increasing latitude north of equator.
Day length in midlatitudes of Southern Hemisphere	12 hours	Day length becomes shorter with increasing latitude south of equator.	12 hours	Day length becomes longer with increasing latitude south of equator.
24 hours of daylight	Nowhere	From Arctic Circle to North Pole	Nowhere	From Antarctic Circle to South Pole
24 hours of darkness	Nowhere	From Antarctic Circle to South Pole	Nowhere	From Arctic Circle to North Pole
Season in Northern Hemisphere	Spring	Summer	Autumn	Winter
Season in Southern Hemisphere	Autumn	Winter	Spring	Summer

Time zones roughly conform to meridians with notable adjustments based on



conventions and boundaries in various countries and states. Some countries shift on the half hour or other (note central Asia).