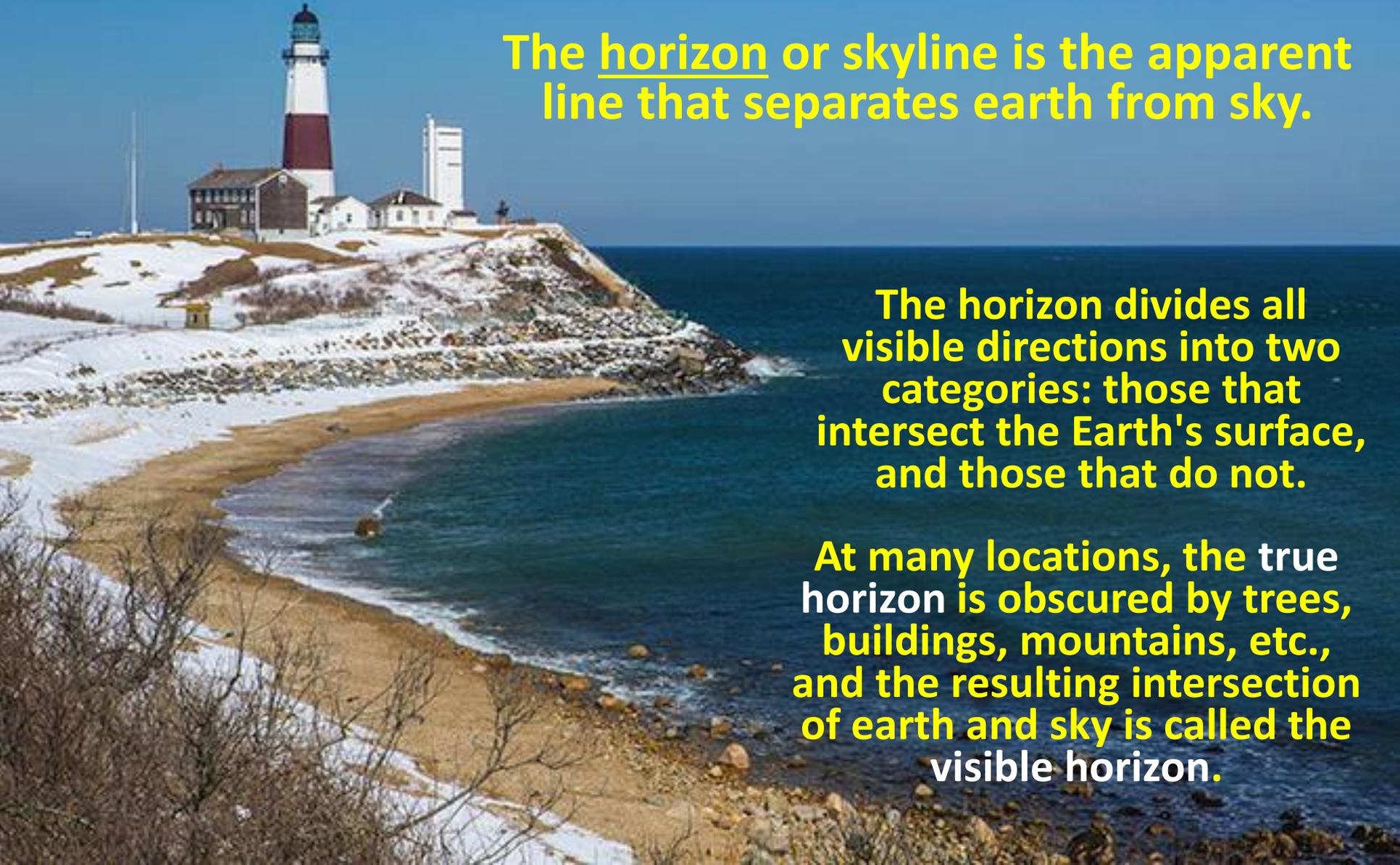


Horizon

The horizon or skyline is the apparent line that separates earth from sky.

The horizon divides all visible directions into two categories: those that intersect the Earth's surface, and those that do not.

At many locations, the true horizon is obscured by trees, buildings, mountains, etc., and the resulting intersection of earth and sky is called the visible horizon.

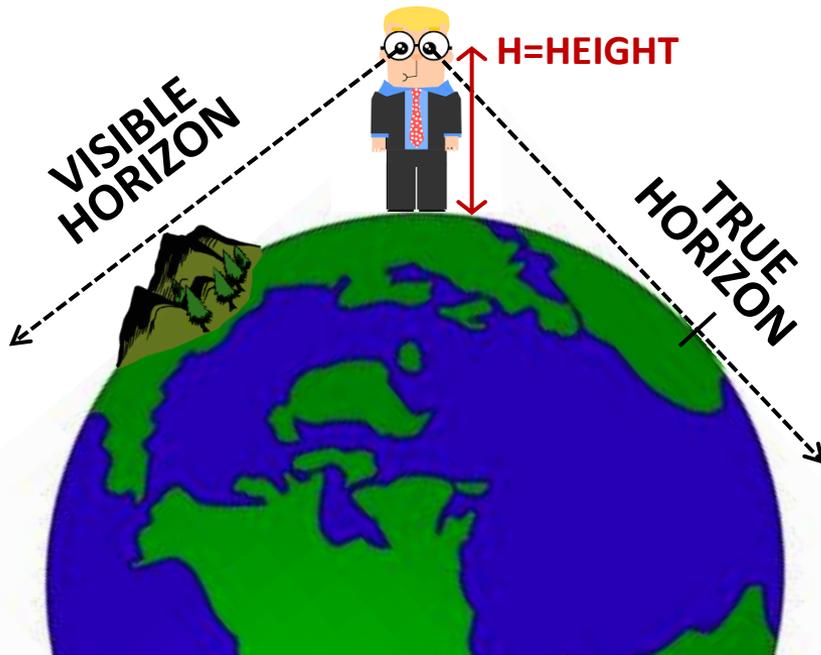


Ships disappearing beyond the horizon



How Far is the Horizon?

Historically, the distance to the horizon has long been vital to survival and successful navigation, especially at sea.

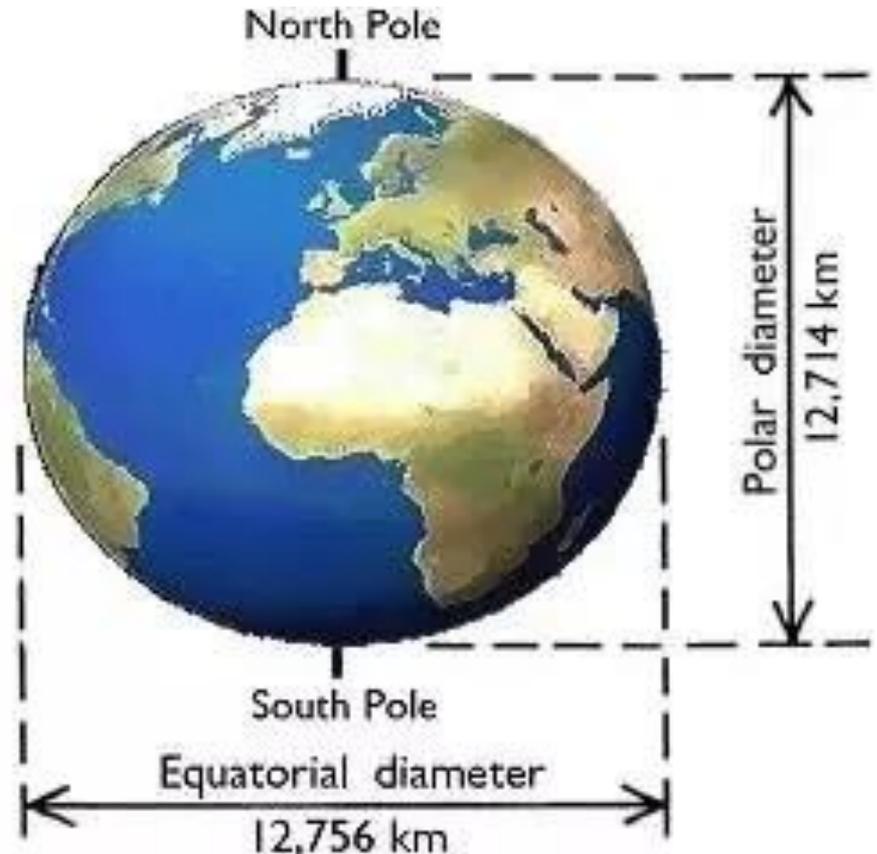


OBSERVER	HEIGHT	DISTANCE to TRUE HORIZON
On the ground	1.7 m (5 ft 7 in)	4.7 km (2.9 mi)
At the Eiffel Tower observation deck	276 m (906 ft)	58.7 km (37 mi)
Atop Mount Everest	8,848 m (29,029 ft)	336 km (209 mi)

In reality, one typically sees further along the Earth's curved surface than a simple geometric calculation allows for because of downward light refraction in the atmosphere. With standard atmospheric conditions, the difference is about 8%.

Earth Shape and Size

- Earth shape can be described as an *oblate spheroid* which is a sphere slightly flattened along the axis from pole to pole such that there is a bulge around the middle resulting from the planet's rotation.
- The Earth's diameter at the equator is just about **0.33%** (42 km or 27 mi) larger than its pole-to-pole diameter.
- Still, Earth is so close to a spherical shape that from any point in space it looks exactly like a perfect sphere with a **mean radius of 6371.0 km (3959 miles)**!



Can YOU see the Curve?

All aboard the **International Space Station!**



254 miles orbit height

<https://apod.nasa.gov/apod/ap130331.html>

View of the Earth from the Moon **(distance: 238,900 miles)**

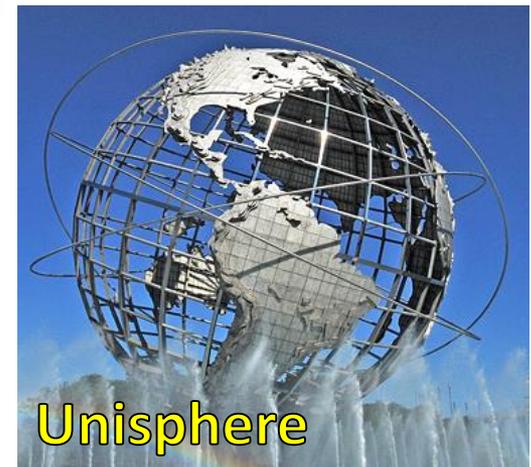
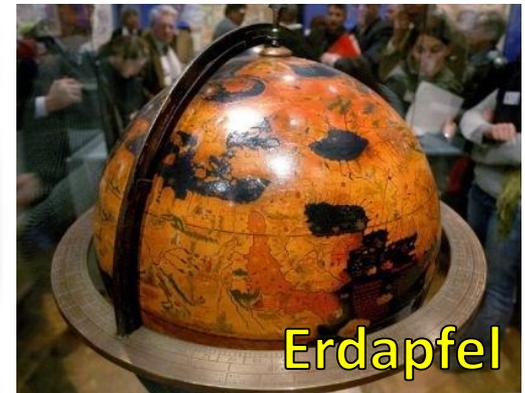


View from the Apollo 11 spacecraft, captured on July 20, 1969

The Globe

The Globe is a three-dimensional scale model of Earth (also called **geographical globe** or **terrestrial globe**).

- The earliest known example of the terrestrial globe was constructed by **Crates of Mallus** (who lived on the territory of modern-day Turkey) in the **mid-2nd century BC**.
- The oldest surviving terrestrial globe is the **Erdapfel** (“earth apple”), created in **1492** by Martin Behaim in Nuremberg, Germany. Overlaid with a meticulously painted map, it shows an enlarged Eurasian continent, an oversized Japan and an empty ocean between Europe and Asia.
- The world’s largest geographical globe is the **Unisphere** in Queens, New York (12-story high!).

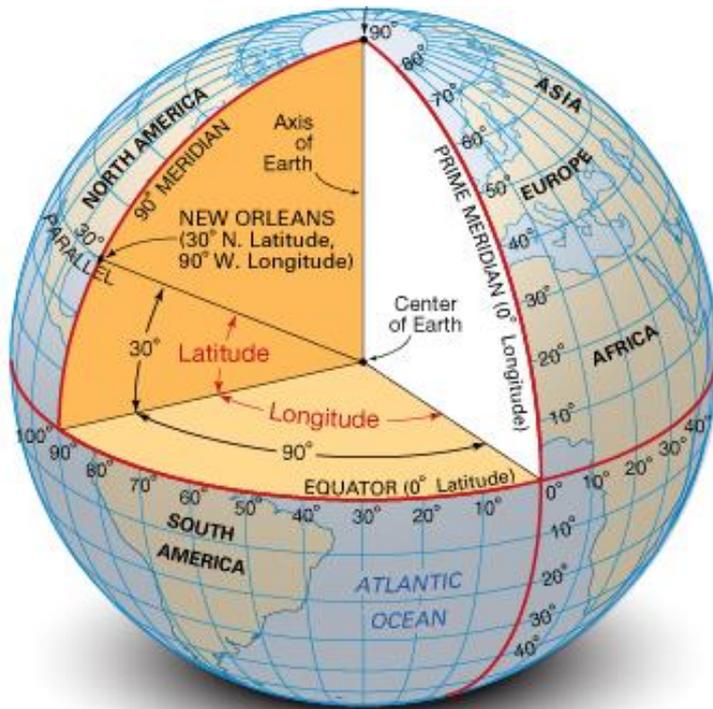


Ferdinand Magellan (1480-1521)
led the 1st expedition around the world that **proved** that Earth is round.



Coordinates on the Globe

- Every location on Earth's surface can be specified by a set of numbers and letters using a geographic coordinate system.
- A common choice of coordinates is **latitude** and **longitude**, forming the *grid system*, and **elevation**.



New Orleans, N30° W90°



Washington DC, N39° W77°



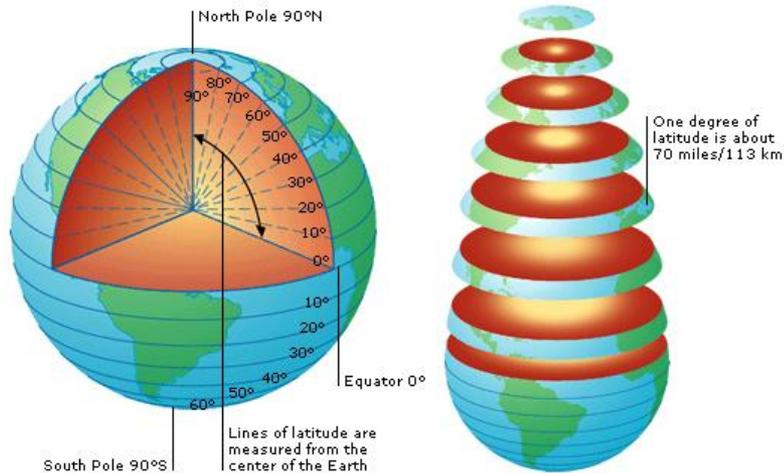
The **elevation** of a geographic location is its height above (or below) a fixed reference point, most commonly the Earth's sea level.

- The term “**elevation**” is mainly used when referring to points on the Earth's surface.
- “Altitude” is used for points above the surface (an aircraft in flight or a spacecraft in orbit).
- “**Depth**” is used for points below the surface.

Latitude and Longitude

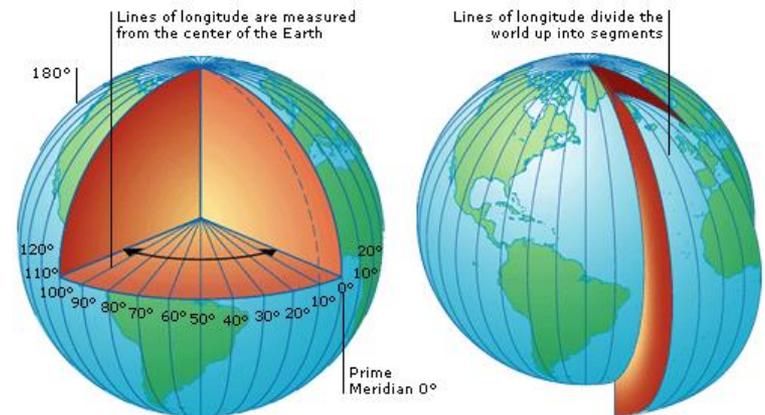
Latitude and longitude are measured in degrees ($^{\circ}$) with submultiples of minutes ($'$) and seconds ($''$).

Latitude lines (**parallels**) run horizontally. They are parallel to and an equal distance from each other.



Zero degrees latitude is at the **Equator**. The latitude directions are **North (+)** and **South (-)**. North Pole is 90°N, South Pole is 90°S. Each degree of latitude corresponds to approximately 70 miles (113 km).

Longitude lines (**meridians**) run vertically, perpendicular to the Equator. They meet at the Poles and are spaced widest at the Equator.



Zero degrees longitude is called the **Prime Meridian** (goes through Royal Observatory, Greenwich, UK). The longitude directions are **East (+)** and **West (-)**.