ASTRONOMICAL SURVEY

What we are going to discuss today?

- Astronomy
- Astronomical survey
- **Importance of Astronomical survey in Civil Engineering.**
- Earth Sphere and Celestial Sphere.
- **Tropic of Cancer and Tropic of Capricorn.**
- Poles
- Great Circle
- Equator
- Meridian

ASTRONOMY

Astronomy:

- Branch of science which deals with **celestial objects**, **space**, and the **physical universe** as a whole.

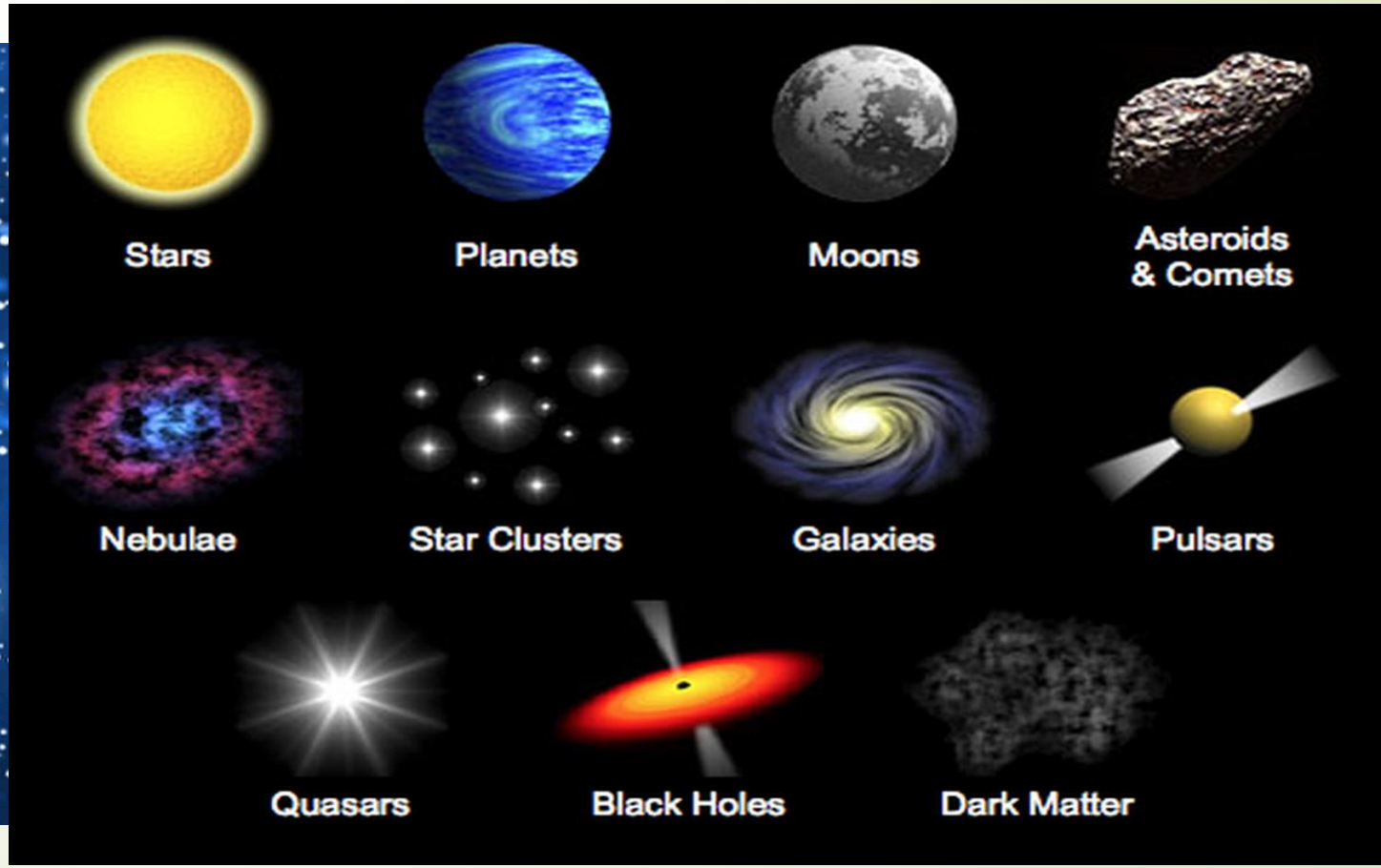
- Scientific **study of celestial objects** (such as stars, planets, comets, and galaxies) and **phenomena that originate outside the Earth's atmosphere.**

Celestial Body

- Defined as any **natural body outside of the Earth's atmosphere**.

- **Celestial bodies** or **heavenly bodies** are **objects in space** such as the sun, moon, planets and stars.





Earth’s Atmosphere?

- Earth is the **only planet** in the solar system with an atmosphere that **can sustain life.**

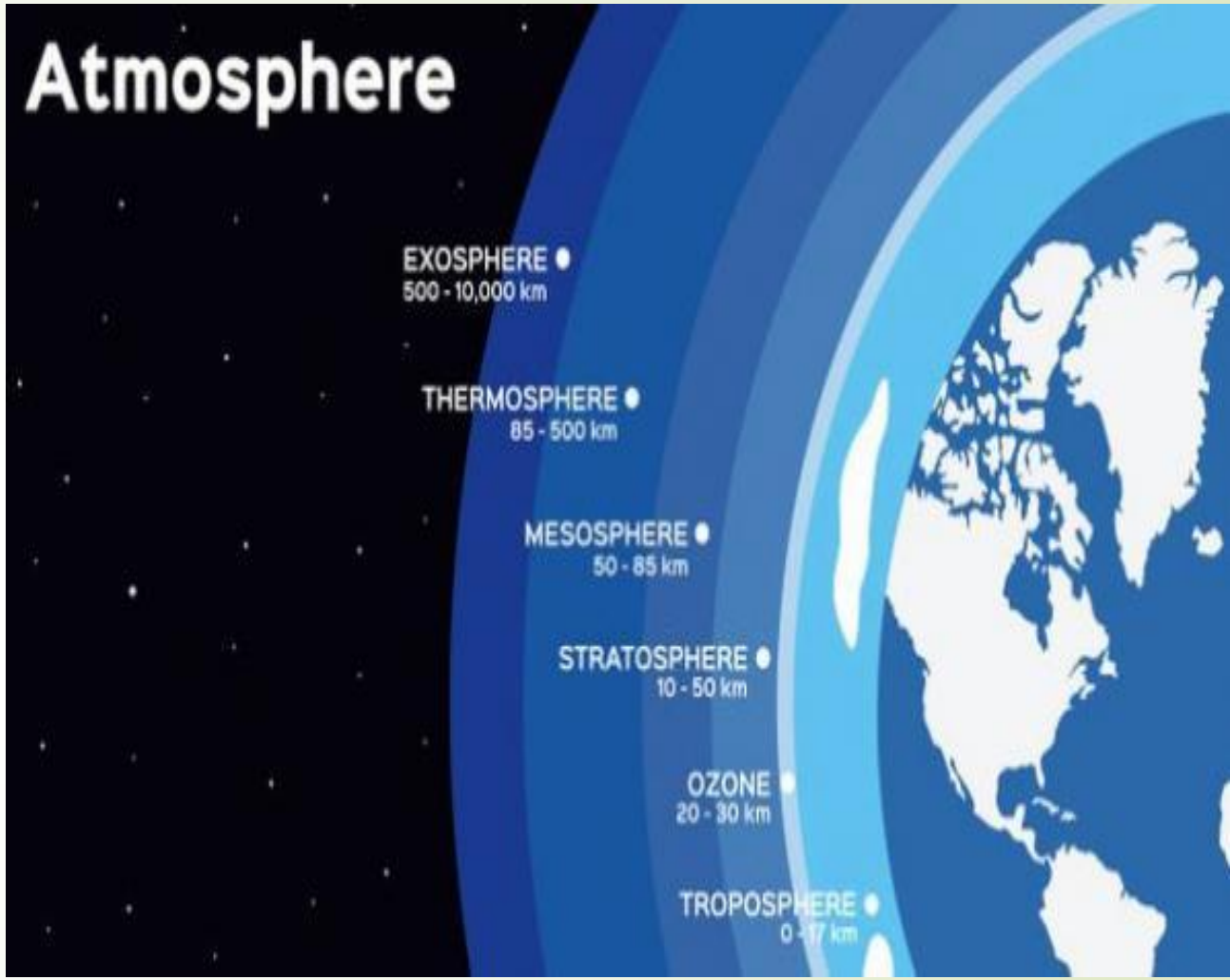
- **Blanket of gases surrounding the earth** not only contains the **air that we breathe** but also **protects us** from the blasts of heat and radiation emanating from the sun.

- It warms the planet by day and cools it at night.



Extent of Earth's Atmosphere.

- Earth's atmosphere is about **300 miles (480 kilometers) thick,** but **most of it is within 10 miles (16 km)** the surface.
- **Air pressure decreases** with altitude.
- At sea level, air pressure is about 14.7 lb/in^2 (1 kg/cm^2).
- At 10,000 feet (3 km), the air pressure is 10 lb/in^2 (0.7 kg/cm^2).
- Less oxygen to breathe.



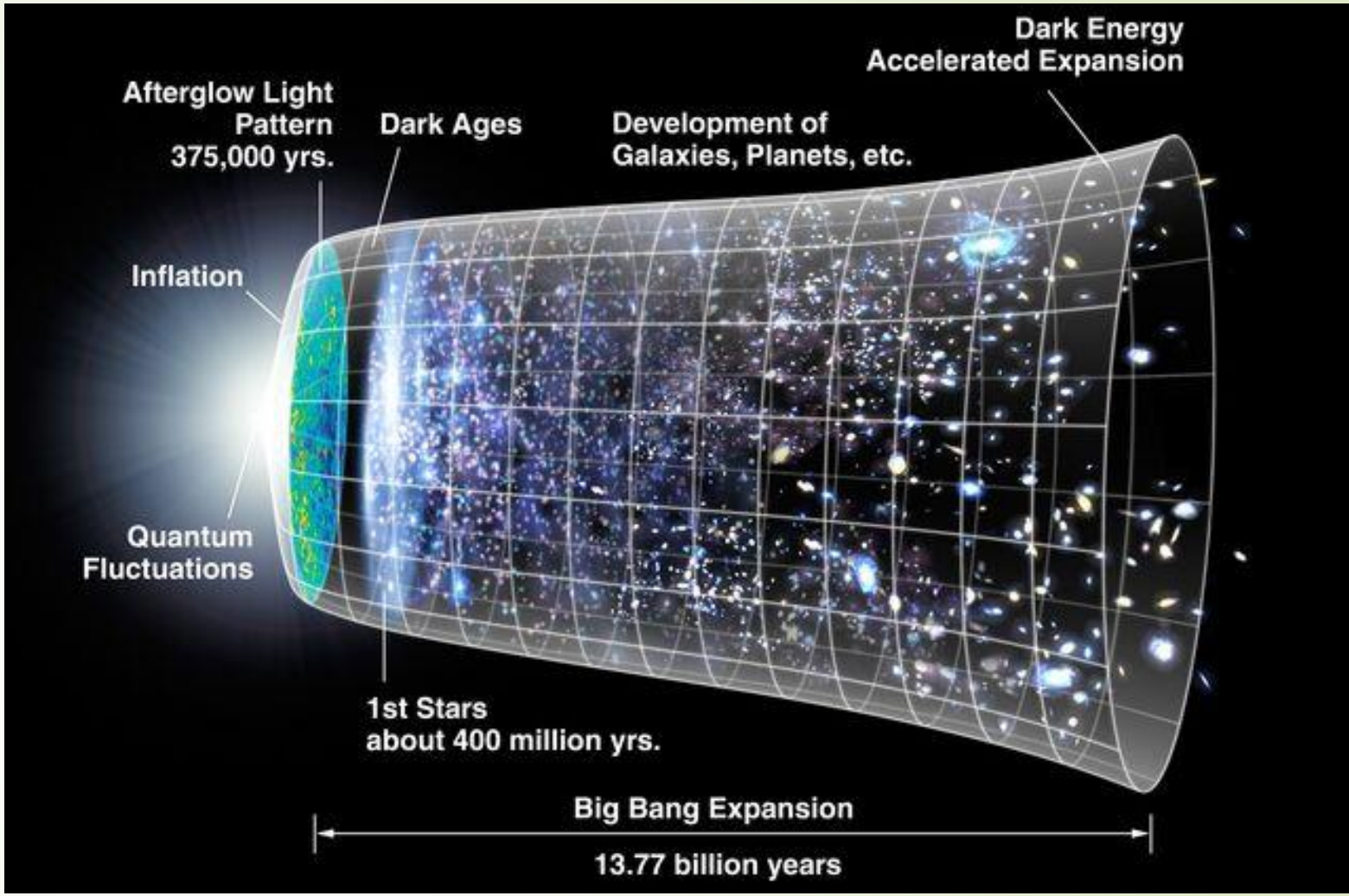
WHAT IS SPACE?

- **Space** is the boundless three-dimensional extent in which objects and events have relative position and direction.



Physical Universe or Universe:

Defined as, and understood to be, **the totality of everything that exists**

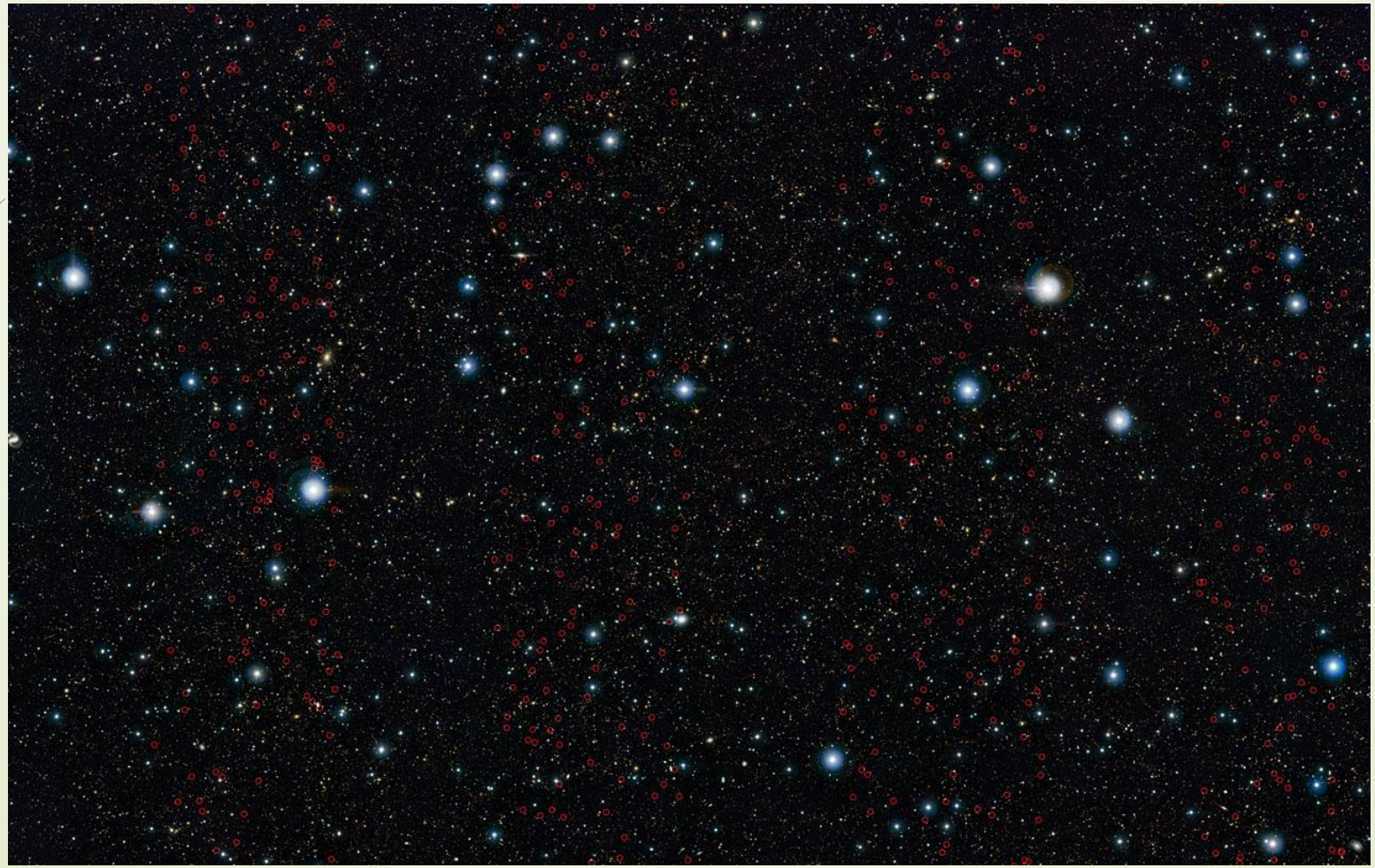


A Purely Physical Universe? “There Must Be Something More.”

ASTRONOMICAL SURVEY

What is astronomical survey?

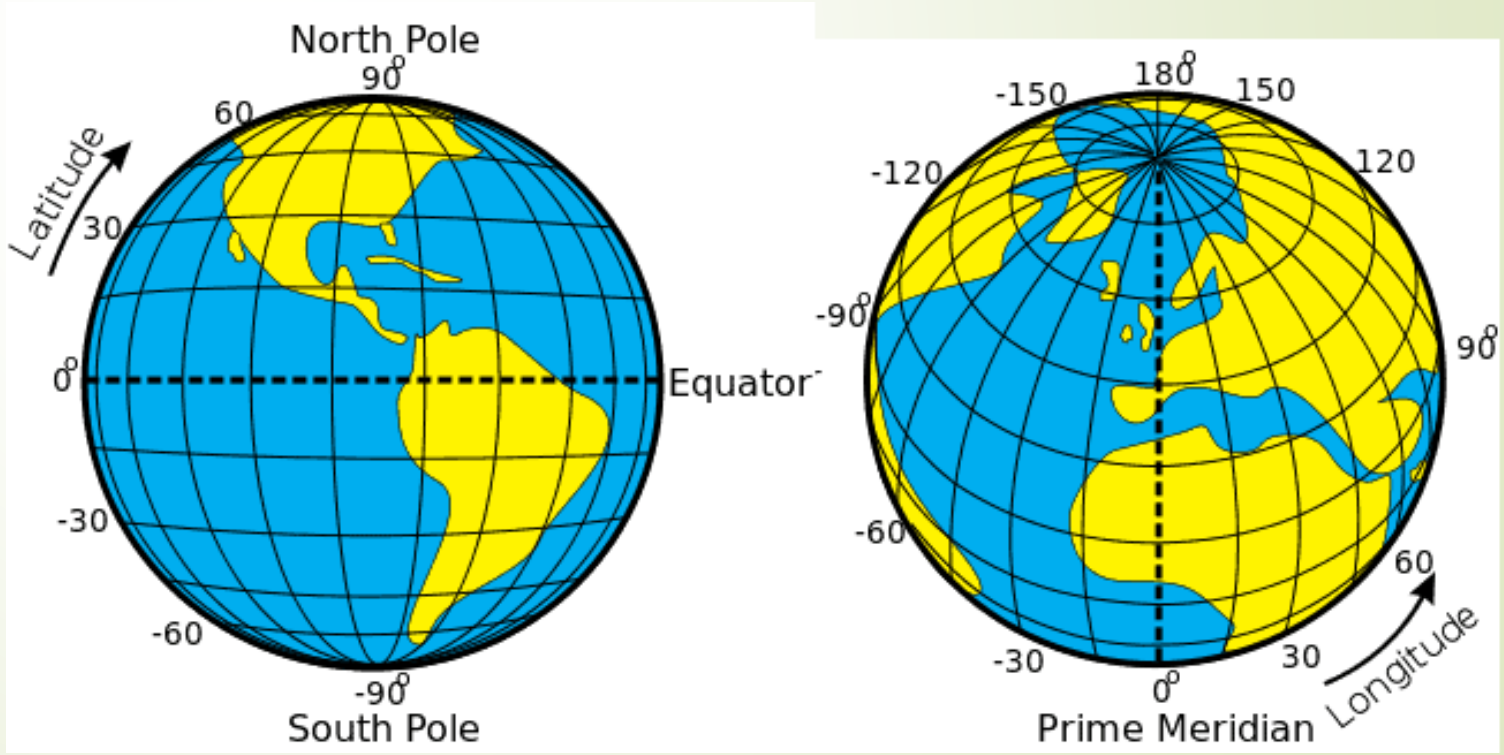
An astronomical survey refers to the fact that it is to **survey a particular area of sky** just the same as an ordinary survey studies a particular tract of land.



Importance of Astronomical survey in Civil Engineering

To determine the followings:

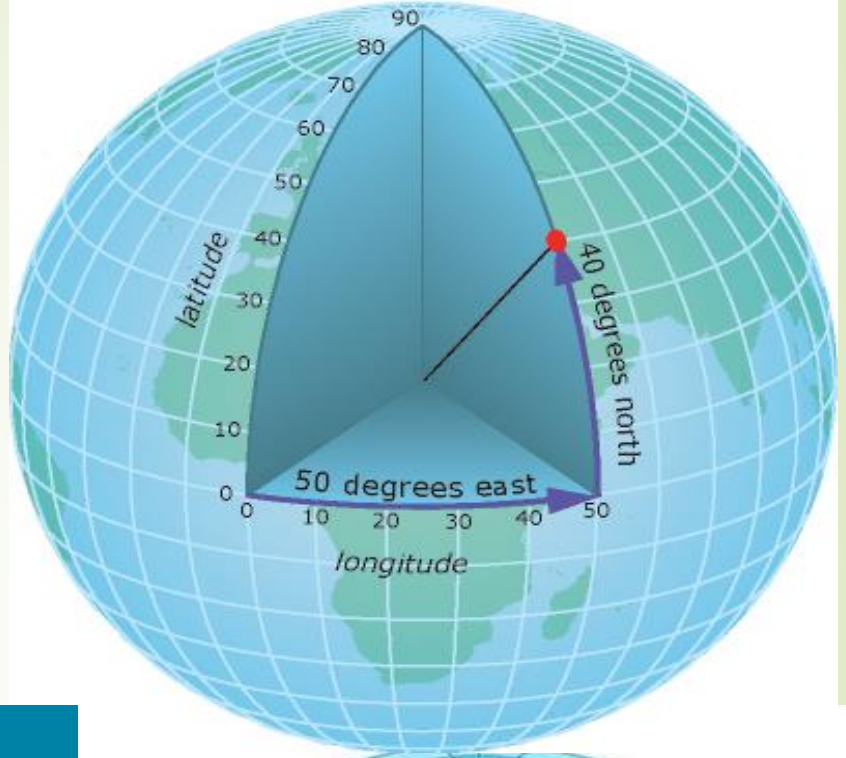
- **Absolute location/ position and direction of any line on the surface of the Earth.**
- **Absolute location of any point/object through the astronomical observation to celestial bodies** such as Moon, Sun, Star and planets.
- **Angular position of Stars.**
- **Orientation.**

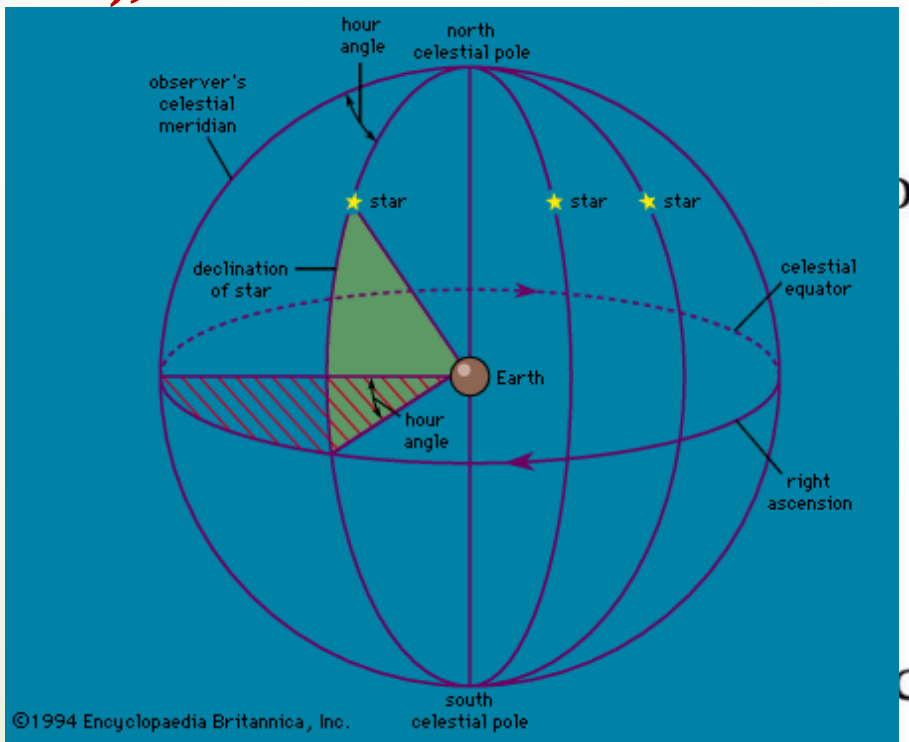


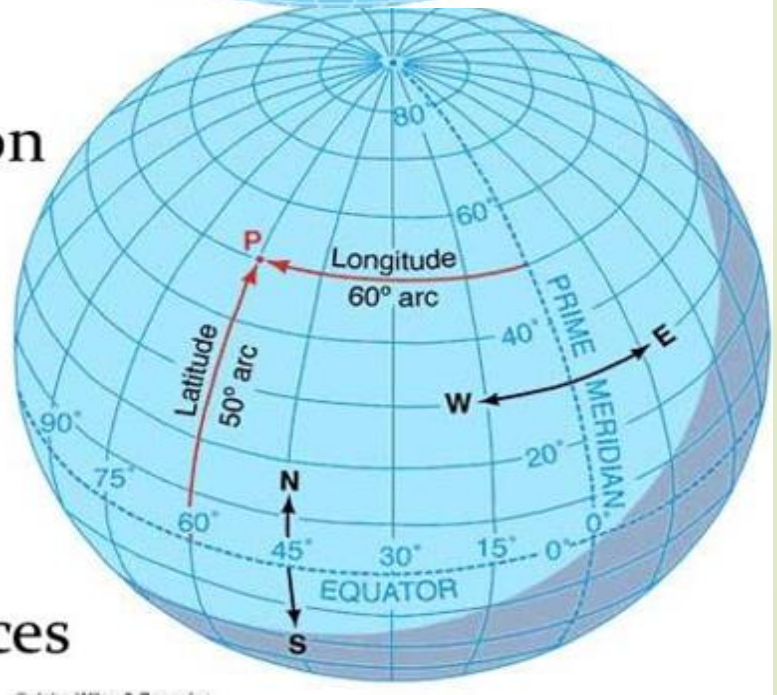
Absolute location

- A **place's absolute location** is **its exact place on Earth**, often given in terms of latitude and longitude.

- For example, the Empire State Building is **located** at **40.7° North (latitude), 74° West (longitude).**



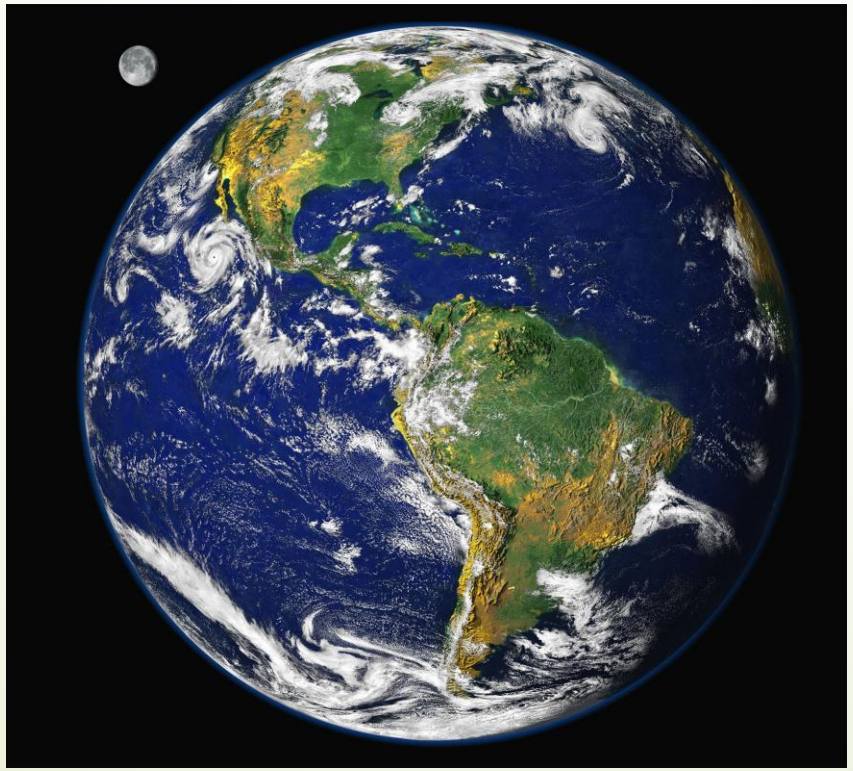


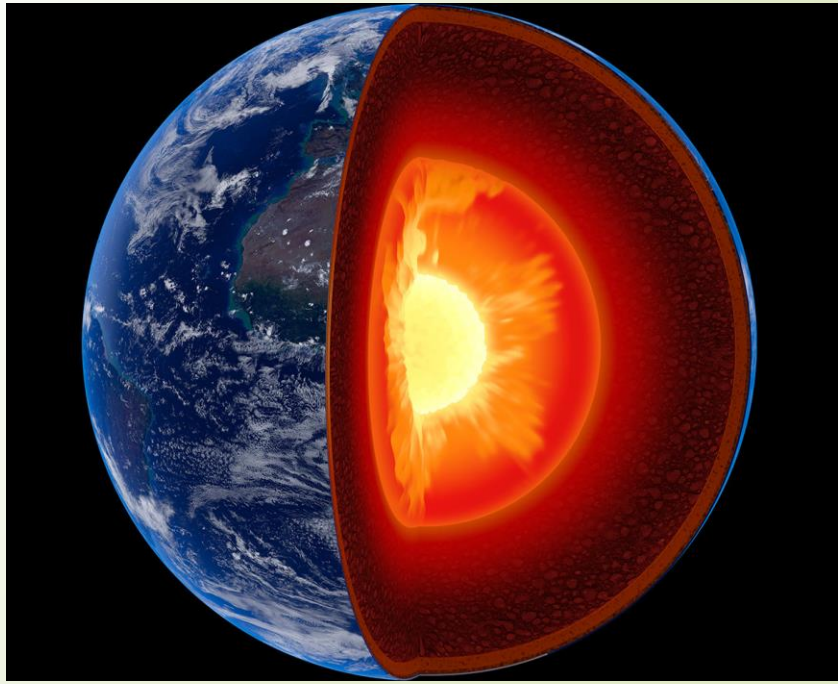


ASTRONOMICAL TERMS

Sphere: A **round solid figure,** with every point on its surface **equidistant** from its center.





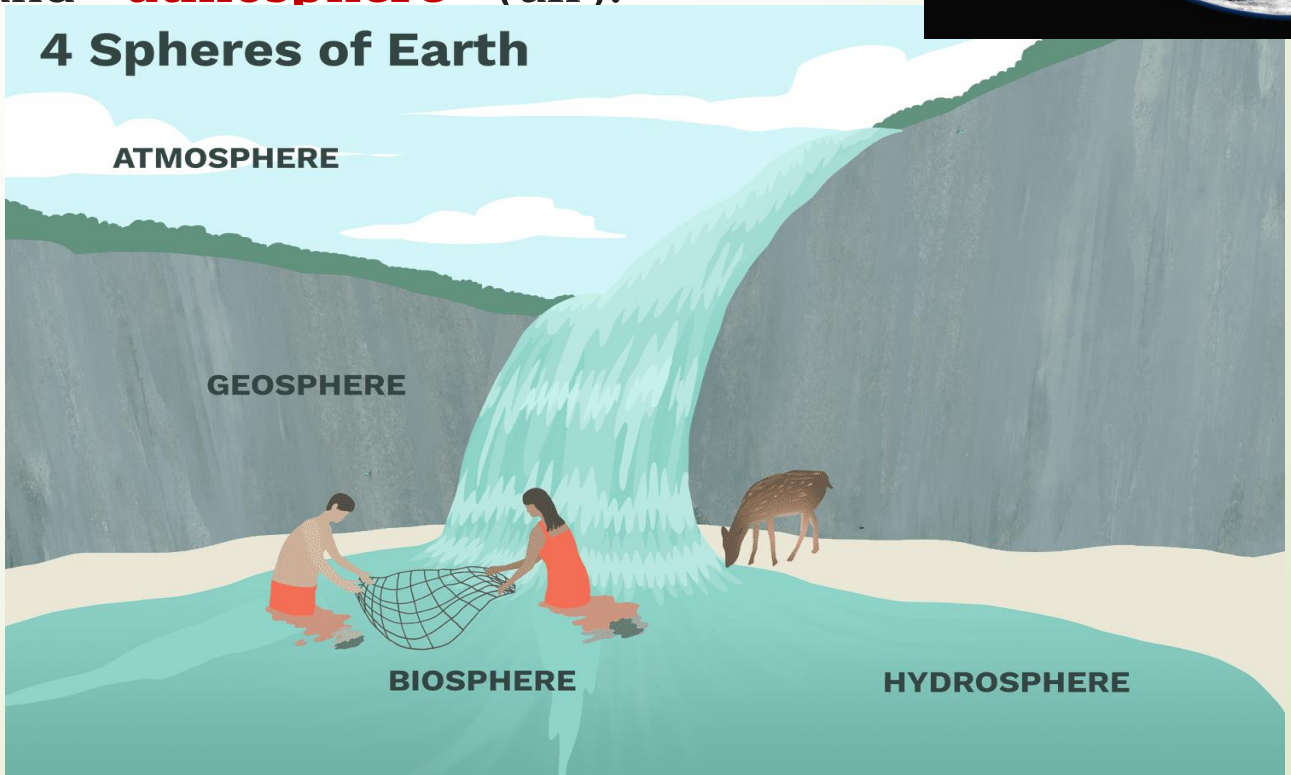


Earth’s Sphere:



- Everything in **Earth's** system can be placed into one of four major subsystems: **land, water**, **living things**, and **air**.

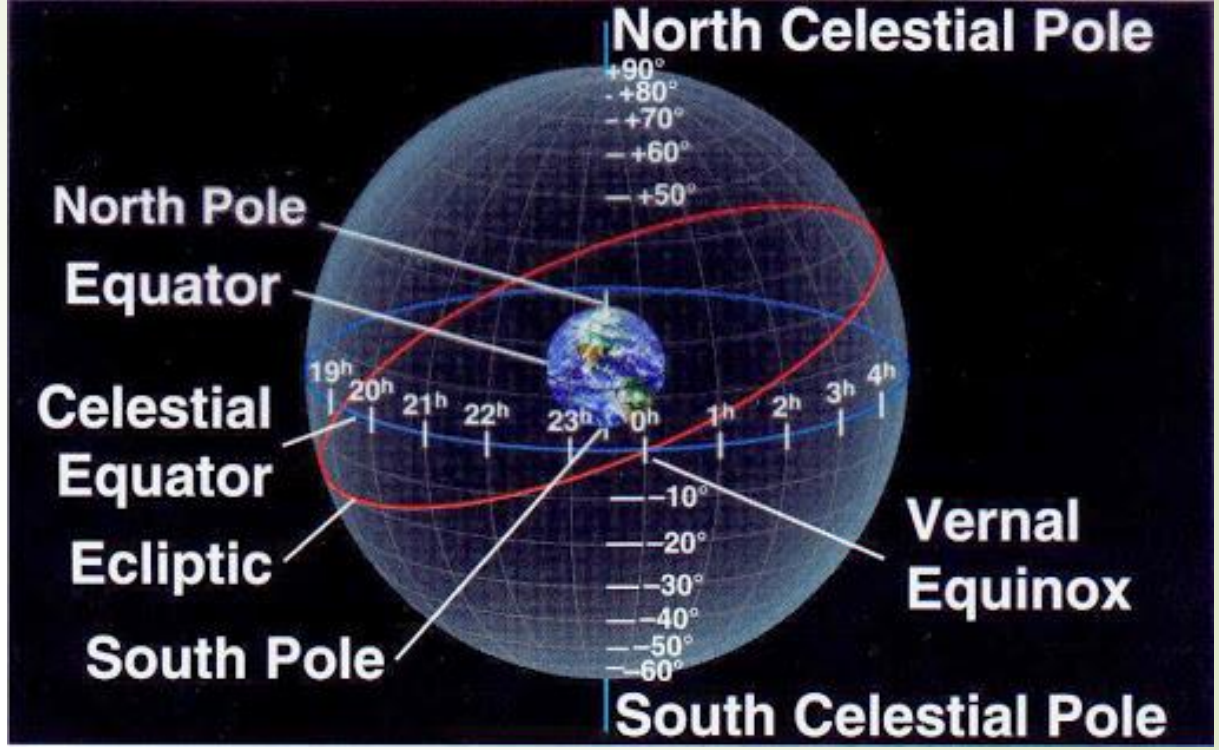
- These four subsystems are called "**spheres**." Specifically, they are the **"lithosphere"** (land), **"hydrosphere"** (water), **"biosphere"** (living things), and **"atmosphere"** (air).

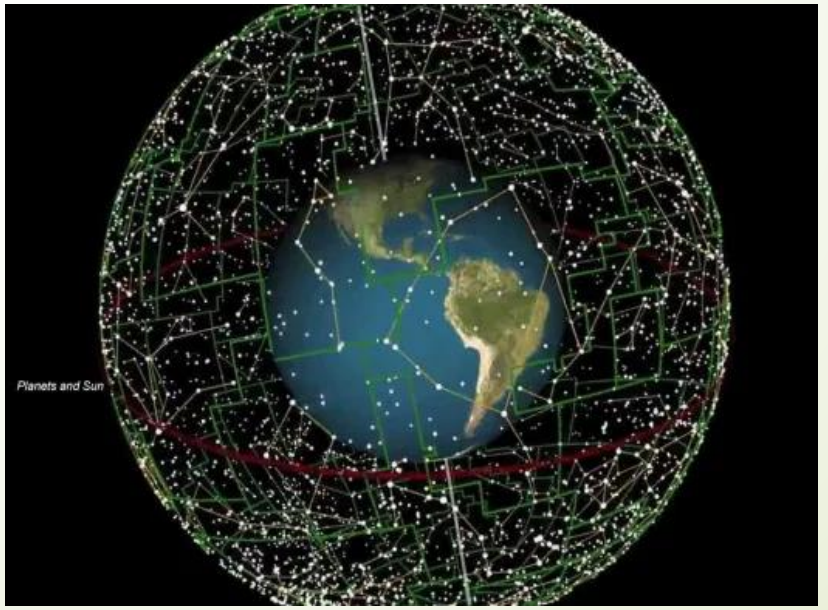


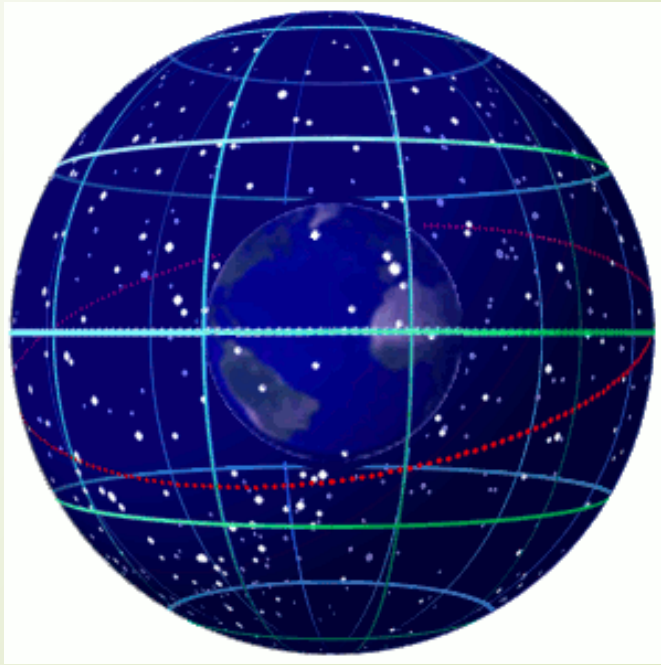
Celestial Sphere

- It is **an abstract** that has an **arbitrarily large radius** and is **concentric to the Earth.**

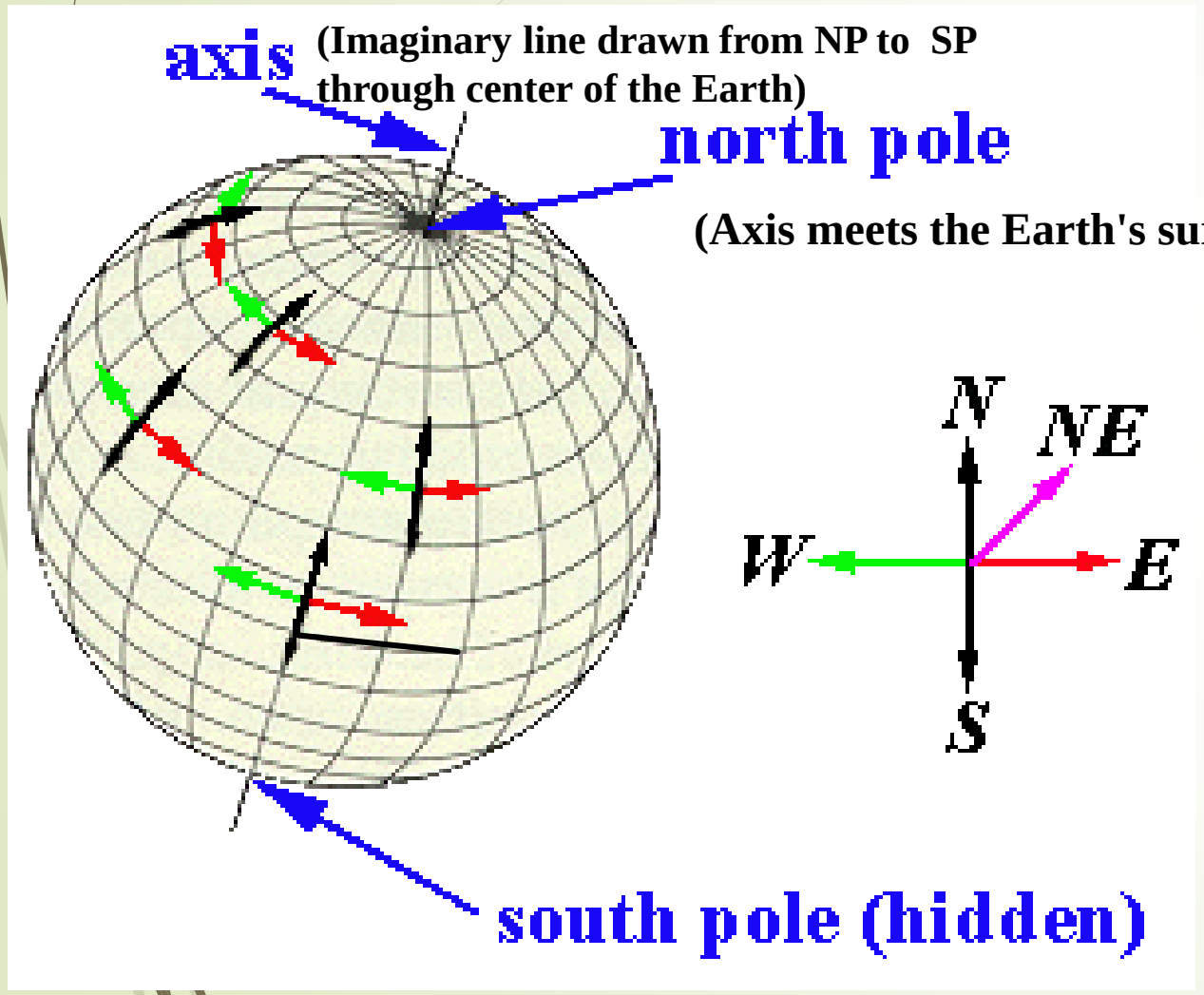
- All objects in the sky can be conceived as being **projected upon the inner surface of the celestial sphere**.

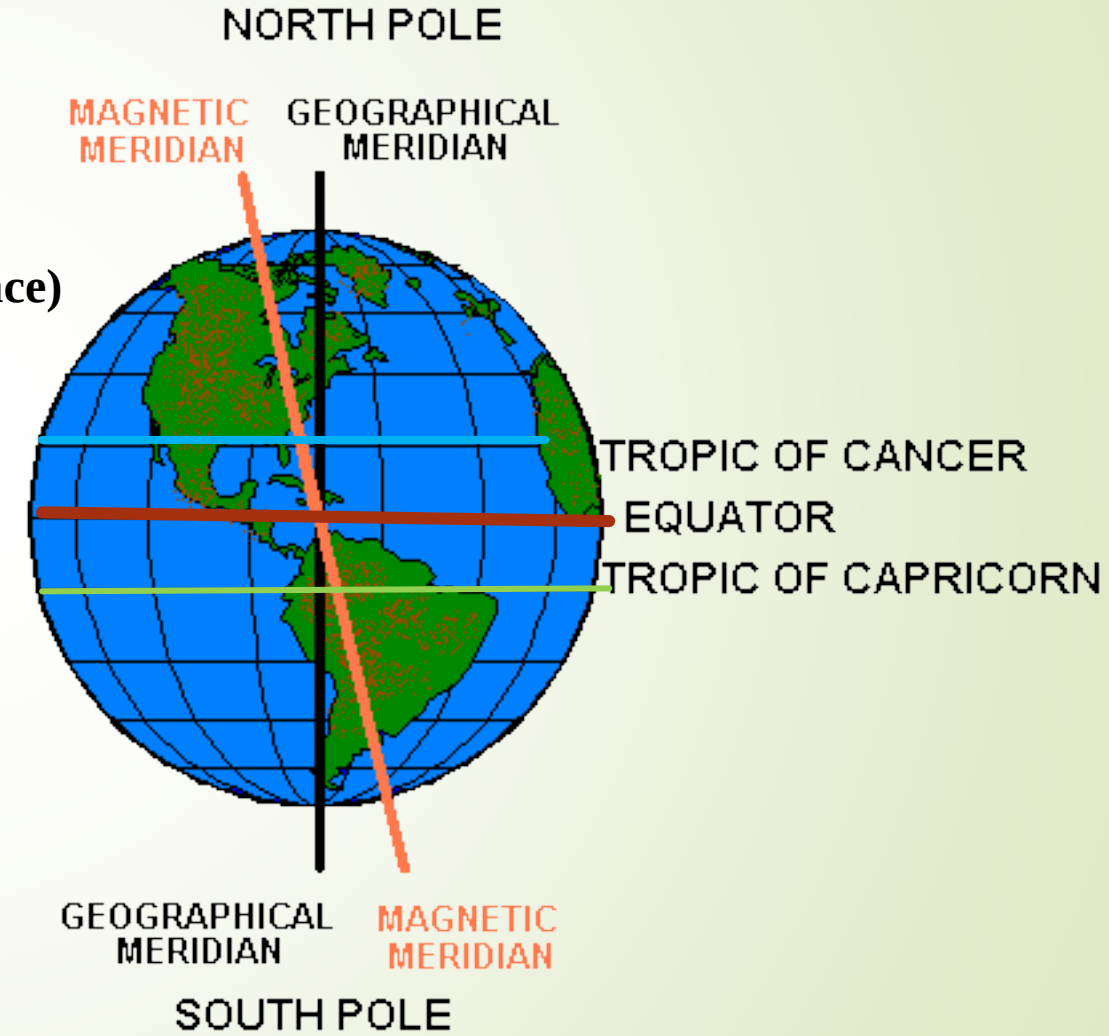






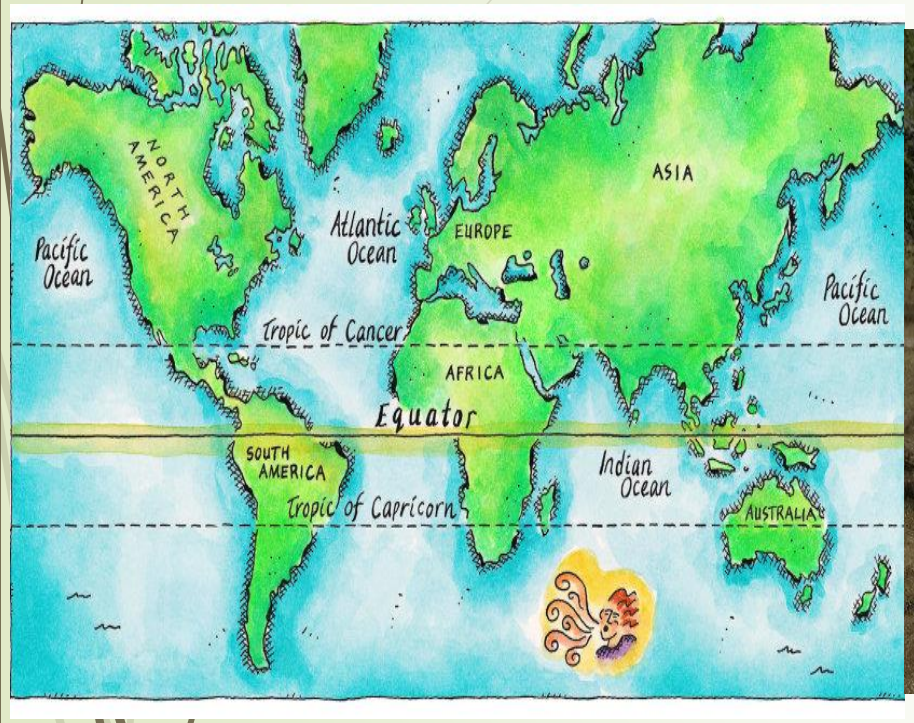
Poles


axis
(Imaginary line drawn from NP to SP through center of the Earth)
north pole
(Axis meets the Earth's surface)
N
NE
W
E
S
south pole (hidden)


NORTH POLE
MAGNETIC MERIDIAN
GEOGRAPHICAL MERIDIAN
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
GEOGRAPHICAL MERIDIAN
MAGNETIC MERIDIAN
SOUTH POLE

Tropic of Cancer:

- **Latitude** approximately 23°27′ N of the **terrestrial equator**.
- Corresponds to the **northernmost declination** of the Sun's ecliptic to the celestial equator





Bhupal, India



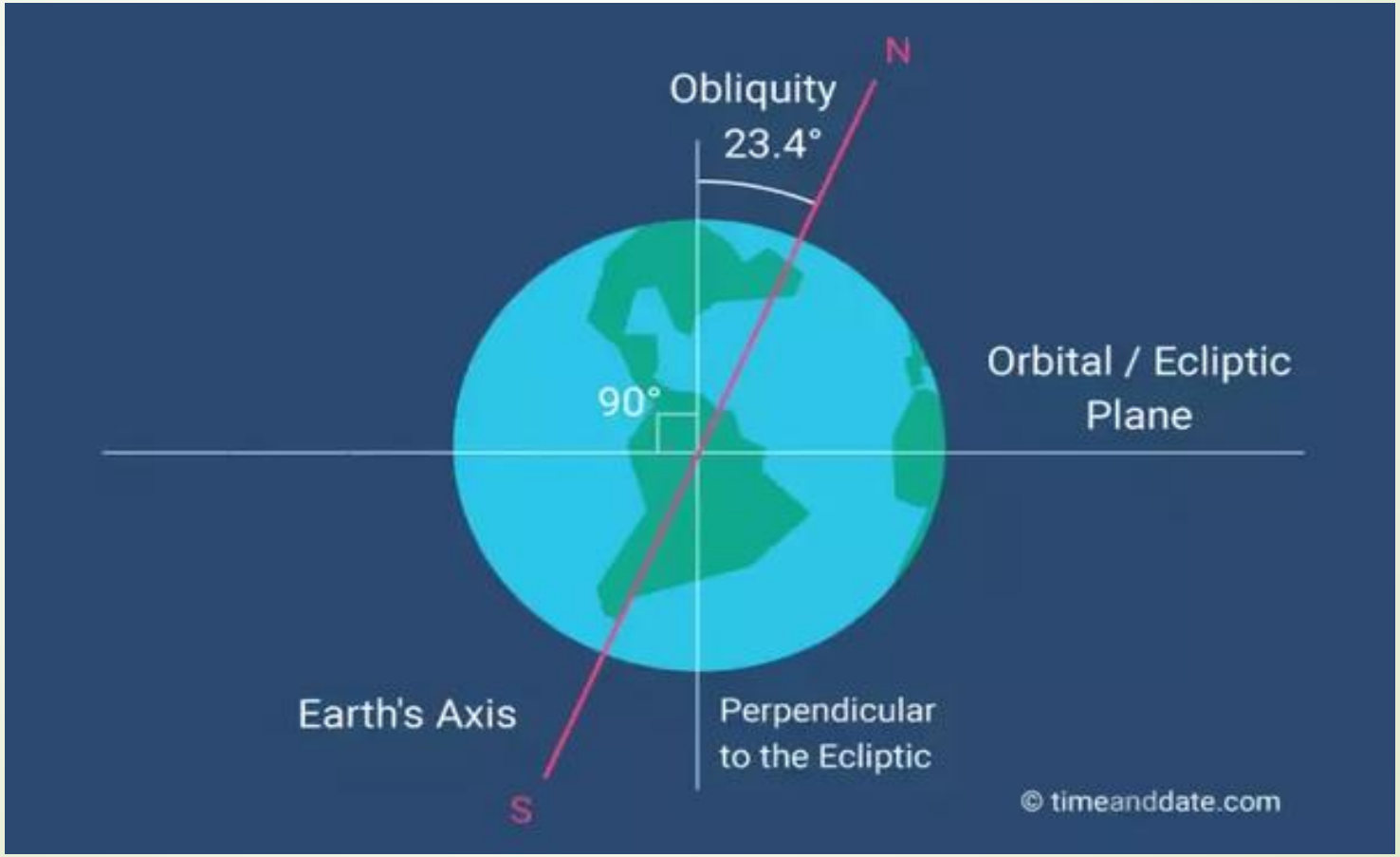
Between Sossusvlei and Walvis Bay, Namibia, Africa

Tropic of Capricorn:

- **Latitude** approximately **23°27′ S** of the terrestrial equator.
- **Corresponds to the southernmost declination** of the sun's ecliptic to celestial equator

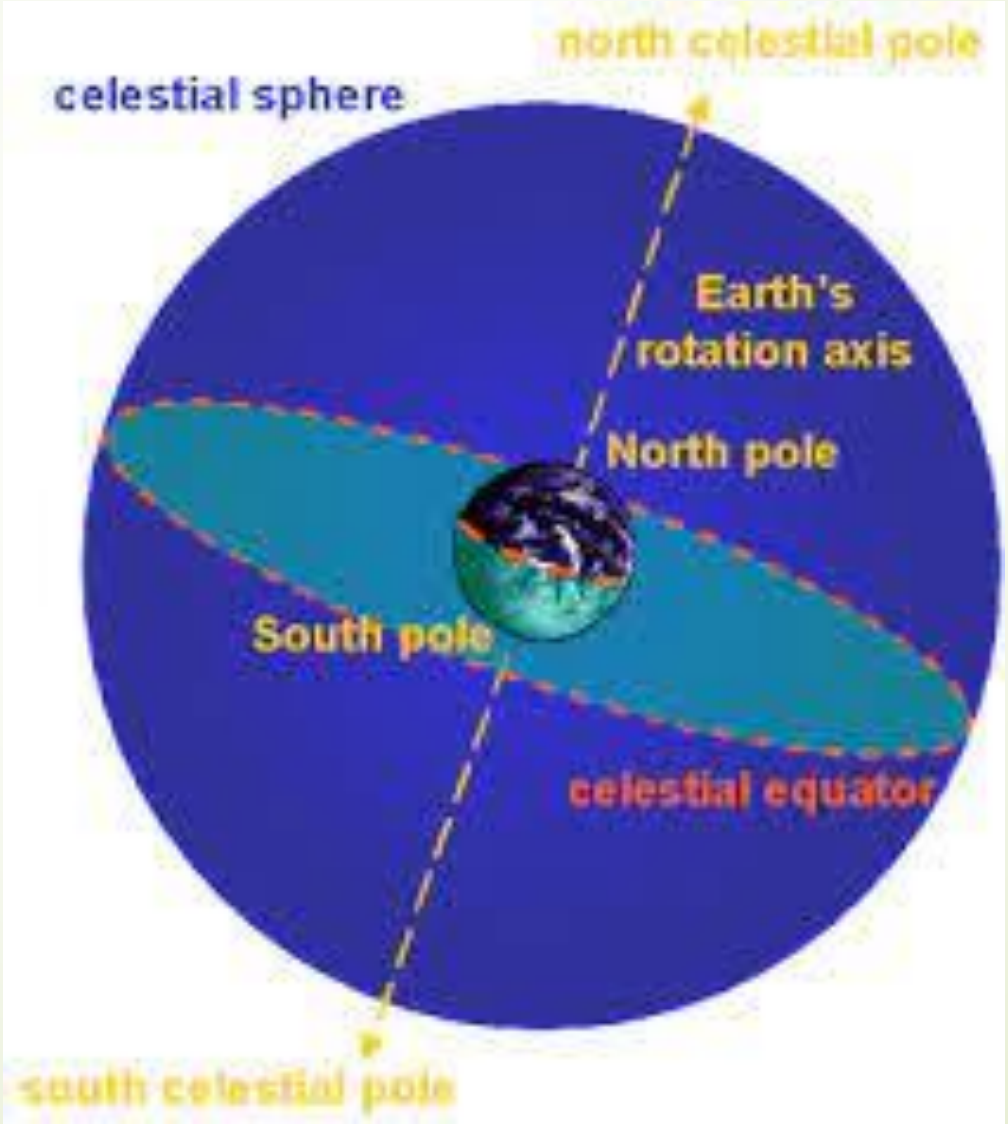
- **Axis of the Earth: An imaginary line drawn** from the North Pole to the South Pole through the center of the Earth.

- **North & South Poles:** Location where Earth’s axis meets the Earth's surface.



North and South Celestial Poles:

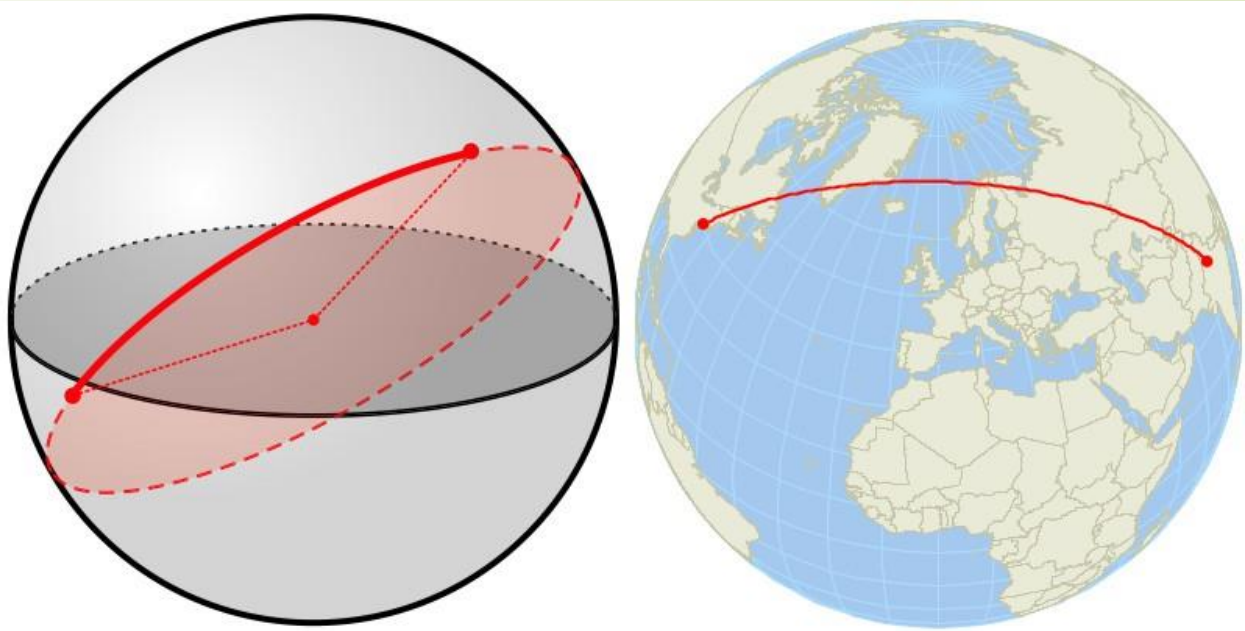
- **Two imaginary points in the sky** where the Earth's axis of rotation, indefinitely extended, **intersects the celestial sphere**



Great Circle:

- Any circle that **circumnavigates the Earth** and **passes through the center** of the Earth.

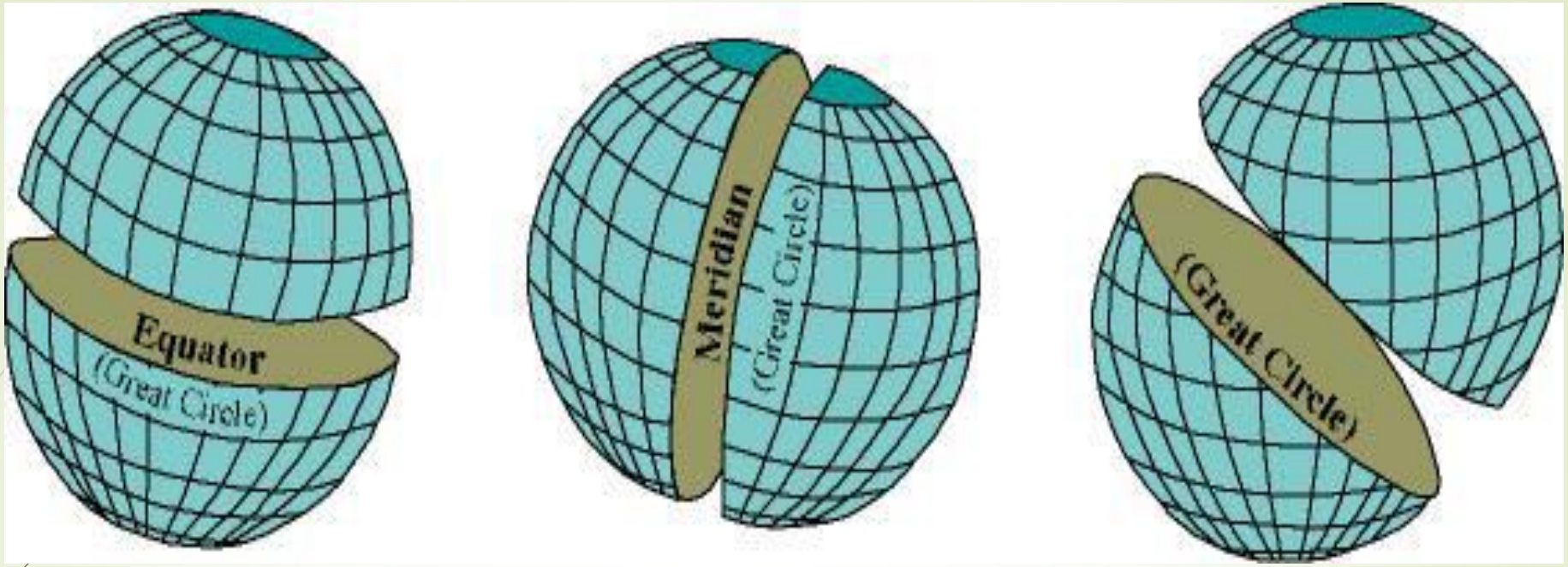
- **Always divides the Earth in half**, thus the **Equator** is a great circle (but no other latitudes) and **all lines of longitude** are great circles.

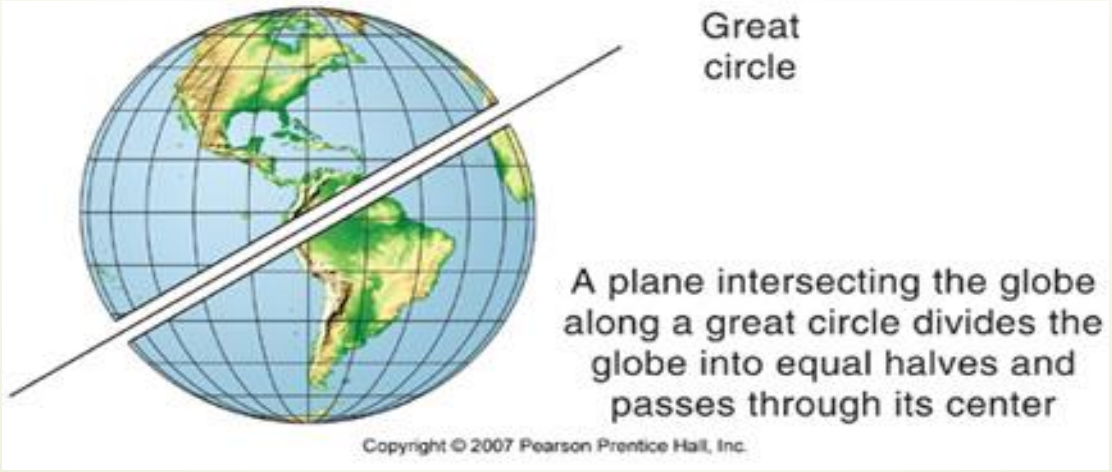


New York City and New Delhi, lies along a great circle.

- A great circle is a **geodesic** ie the **shortest distance** between any two points on the Earth lies along a great circle.

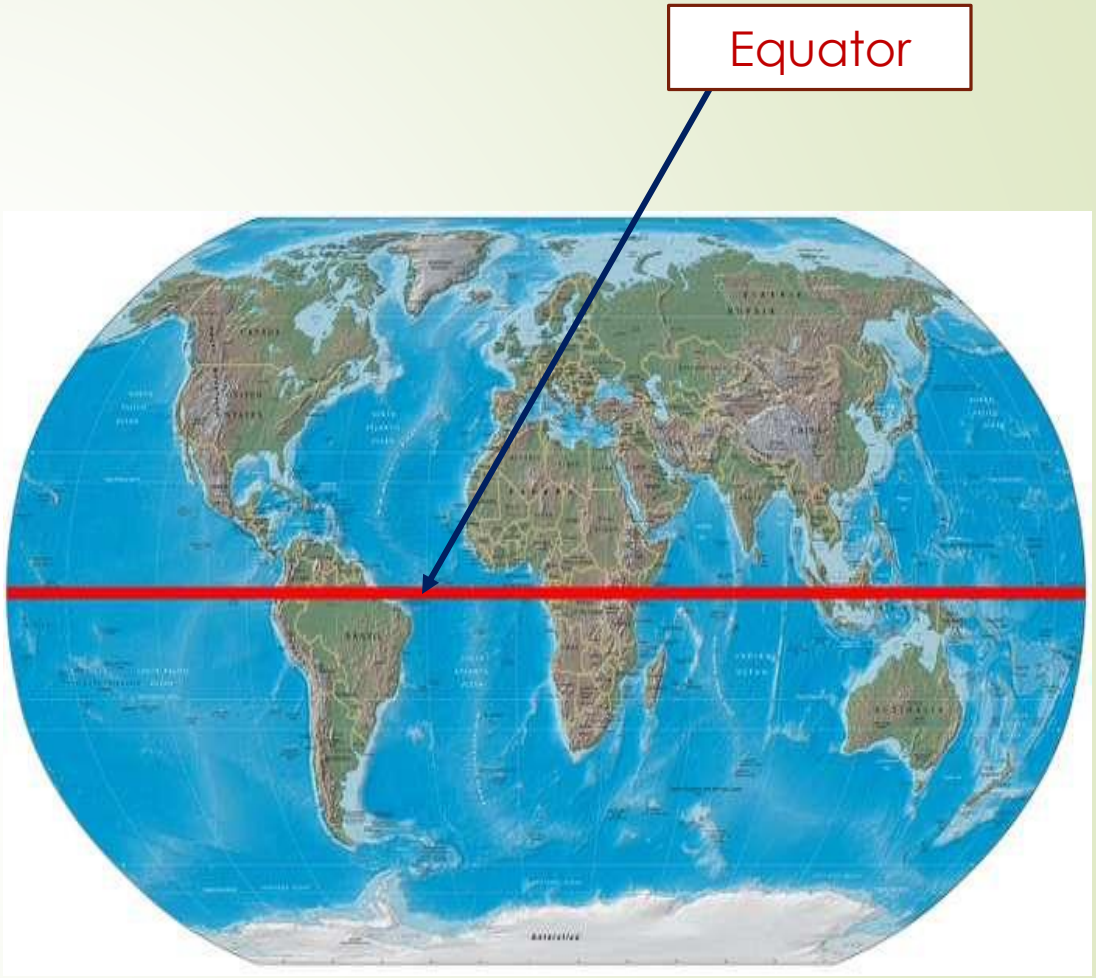
- **Length of a great-circle arc** on the surface of a sphere is the **angle between its end-points.**


Equator
(Great Circle)
Meridian
(Great Circle)
(Great Circle)

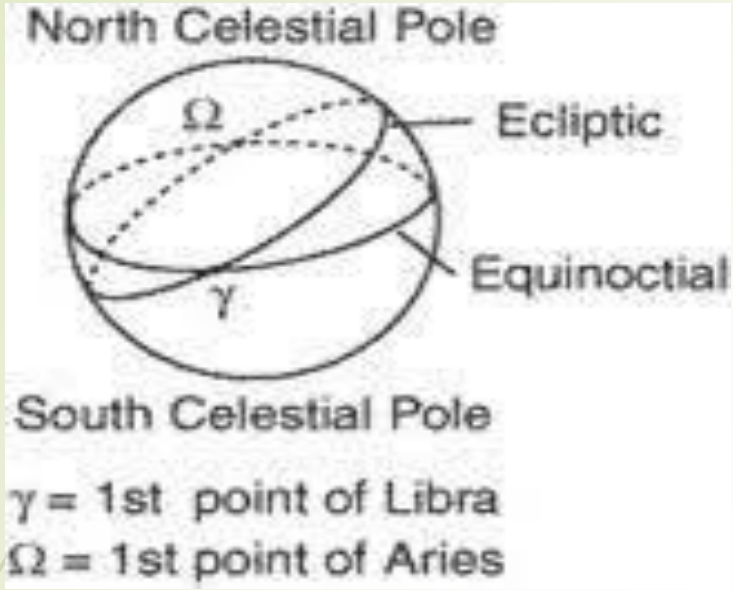

Great
circle
A plane intersecting the globe along a great circle divides the globe into equal halves and passes through its center
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Equator:

- An **imaginary line around the middle of a planet** or other celestial body.
- **Halfway between the North Pole and the South Pole**, at 0 degrees latitude.
- **Divides the planet** into a Northern Hemisphere and a Southern Hemisphere.
- Earth is **widest** at its **Equator**



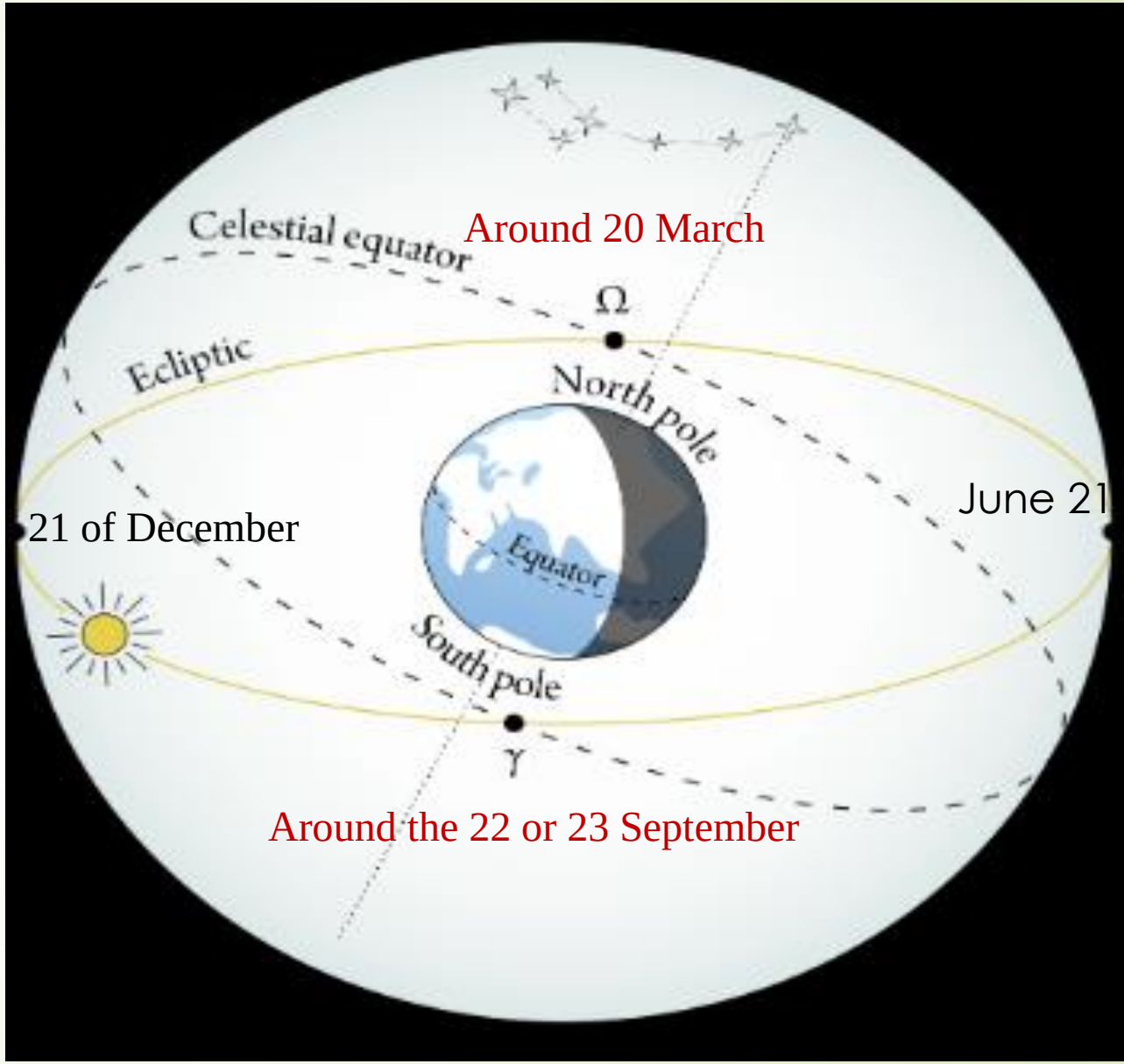
Equator/Geographical equator/terrestrial equator



Celestial Equator:

In astronomy, the celestial equator is the **great circle in which the plane of the terrestrial Equator intersects the celestial sphere.**

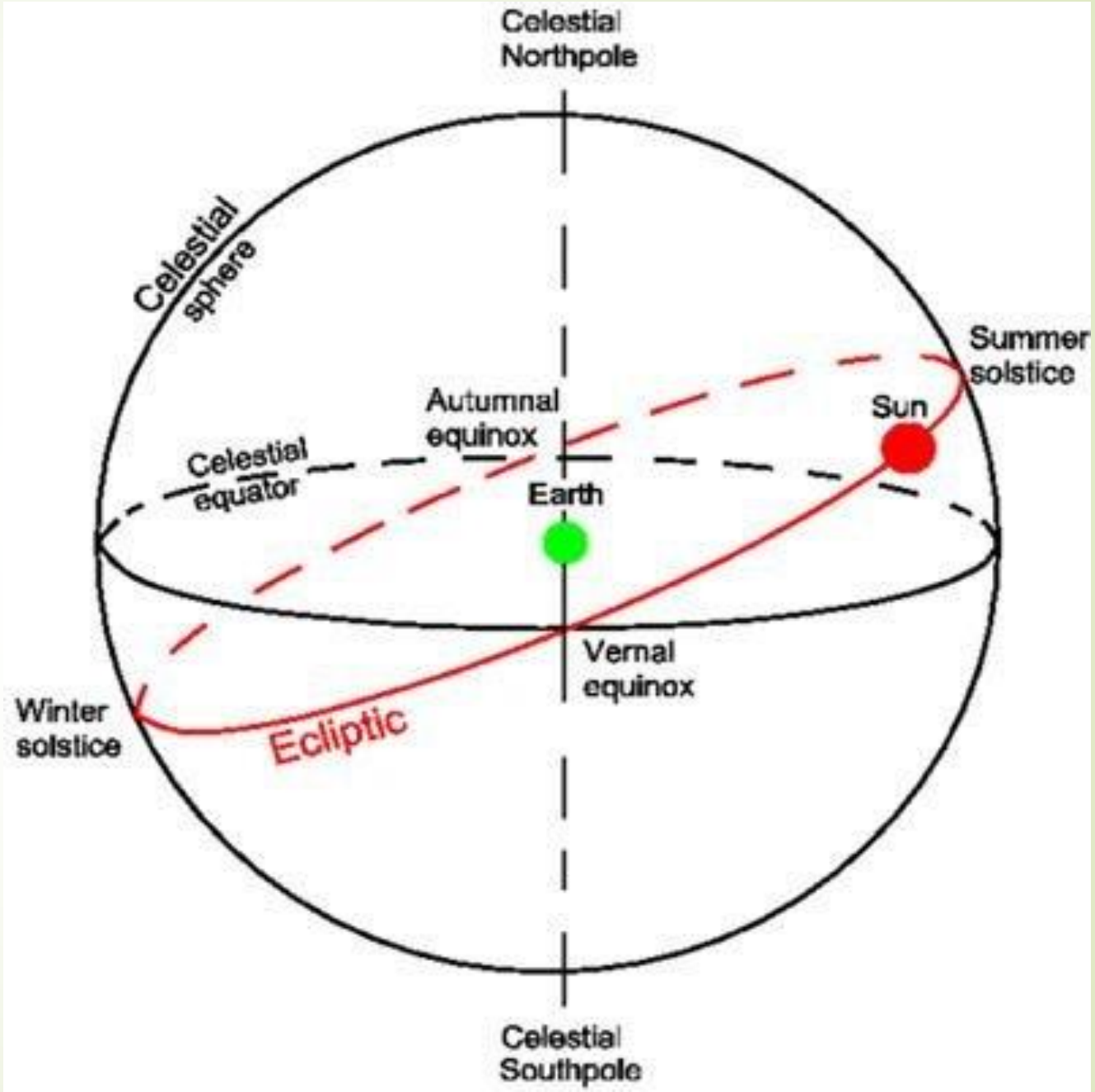
- Consequently is equidistant from the celestial poles.



- When the **Sun lies in its plane**, day and night are everywhere of equal length,

twice-per-year occurrence known as **equinox.**

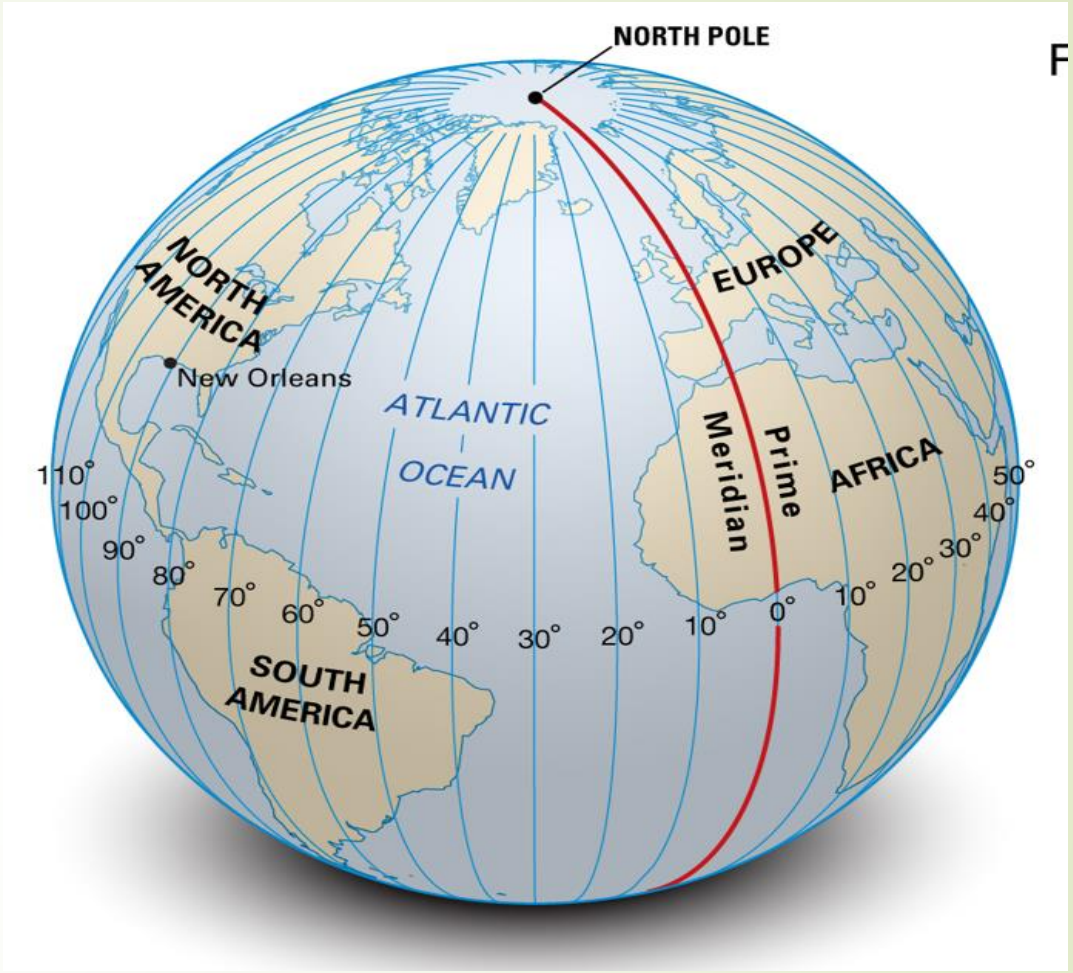
- **Summer**
- **Autumn**
- **Winter**
- **Spring**



Meridian:

- A meridian is **an imaginary line from the North Pole to the South Pole**.

- Meridians are drawn on maps to help you **describe the position of a place**.



Thanks