

The Earth as a cosmic matter

The Earth, together with the Sun, other planets, satellites, comets, meteoric matters and the planetary dust, is the part of the Solar system.

Our Earth is the third planet in the Solar system in terms of distance from the Sun, and it is fifth largest. It is also the only place in the universe known to support life.

Until the existence of ancient Greeks it was widely known that Earth is a disk. Since these times the earth is known as a round shaped planet. There were many scientist, astronomists and also mathematicians who explored the Earth.

The first was *Mikulas Kopernik* who said that the centre of the universe is not the Earth but the Sun. And all the other planets are rotating around the Sun. This is called the **heliocentric system**.

The second was *Johannes Kepler* who found out that the earth and planets travel around the Sun in **elliptical orbits**. He is also known for his three laws:

1. **Kepler's elliptical orbit law:** The planets orbit the sun in elliptical orbits with the sun at one focus.
2. **Kepler's equal-area law:** The line connecting a planet to the sun sweeps out equal areas in equal amounts of time.
3. **Kepler's law of periods:** The time required for a planet to orbit the sun, called its period, is proportional to the long axis of the ellipse raised to the $3/2$ power. The constant of proportionality is the same for all the planets.

The third was **Issac Newton** who was interested in **gravitation** and its effect on the orbits of planets, with reference to Kepler's law of motion. Newton said that the same force which pulls object (an apple) to fall on the ground, is the gravity, that keeps the Moon orbiting around the Earth

The Earth's shape is a **geoid** (looks like a pear) but more is used an **oblate spheroid**, with an average diameter of approximately 12,742 km. Because of the shape there is a different amount of sunlight getting to every part of the Earth. The biggest amount of solar radiation is getting to the equator and than how we move norther or souther to the poles it is getting cooler. That means we have different climatic zones with different fauna and flora.

The Earth was formed about 4,75 billion years ago out of the **solar nebula**. It has its natural satellite, **the Moon**, which was orbiting the Earth for about 4.53 billion years. The Moon's weight is 80 times smaller than the weight of the Earth and its distance from the Earth is about 60 Earth's radius. The Moon as well as the earth does not have its own of the sunlight so it reflects the sunshine from the Sun. Because the time of which Moon rotates around its axis is the same as the time of rotation around the Earth (27 days 7 hours and 43 minutes) we can see from the earth just one side of the Moon.

The Moon by its gravity provides ocean tides which we can see when we are somewhere by the sea. This is very important, for example, high tides allow ships to sail into a continental cities such as London or Rotterdam, and also tides are wisely used for a hydrological power.

The earth makes two movements in the same time. The rotation around the Sun and the rotation around its own axis.

The rotation around of the Sun is in the shape of ellipse. The length is about 940 mil. km. The orbital speed is about 30 km/s. and it is changing according to the position of the Sun (perihelium/30.3km/.s, is the closest point to the Sun and afelium/29.9km.s/ is the farrest point. The time of rotation is 365 days and 5 hours, 48 minutes 45.7 seconds and it is known as 1 sidereal year. The rotation around the Sun causes that we have seasons and also day and night.

It takes the Earth, on average, 23 hours, 56 minutes and 4.091 seconds to rotate around its axis that connects the north and the south poles. This is called 1 sidereal (astral) day.

The rotation around the Sun and around the axis causes that we have seasons and also day and night. The Earth rotates from the west to the east which appears to us as the movement of the Sun from the east to the west.

The cause of the seasons is that the rotation axis of the Earth is not perpendicular to its orbital plane, but makes an angle of about 23.44° . For half a year (from around 20 March to 22 September) the northern hemisphere tips toward the Sun, with the maximum around 21 June, while for the other half year the southern hemisphere has this process, with the maximum around 21 December.

An **equinox** in astronomy is the moment when the Sun is located right over the equator. The event occurs twice a year, around March 20 and September 23. More technically, the equinox happens when the Sun is at one of two opposite points on the celestial sphere where the celestial equator and ecliptic intersect. In a wider sense, the equinoxes are the two days each year when the center of the Sun spends an equal amount of time above and

below the horizon at every location on Earth. In practice, at the equinox, the day is longer than the night.

A **solstice** is either of the two times of the year when the sun is at its greatest distance from the equator: in technical words, when the celestial equator and ecliptic reach their largest separation. This is happening on June 21st and December 21st.

A **time zone** is a region of the Earth that has adopted the same standard time, usually referred to as the **local time**. Most time zones are exactly one hour apart, and by convention computer their local time as an offset from [Greenwich Mean Time](#).



Standard Time Zones of the World

Standard time zones can be defined by geometrically subdividing the Earth's spheroid into 24 lines (wedge-shaped sections), bordered by meridians, each 15° of longitude apart. The local time in neighboring zones is then exactly one hour different.