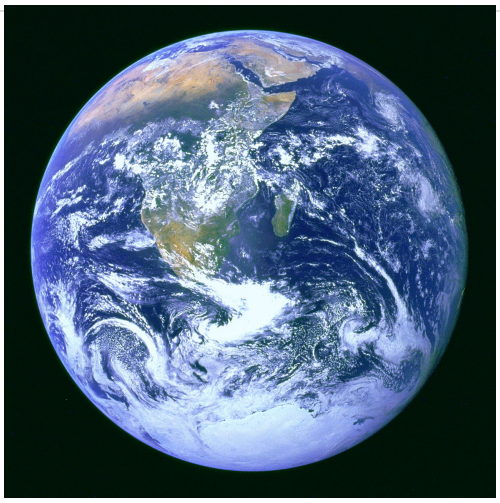
7.8: Planet Earth



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Earth is the largest of the Solar System's rocky planets and the **only known planet with liquid water**. Water makes up about 75% of Earth's surface.

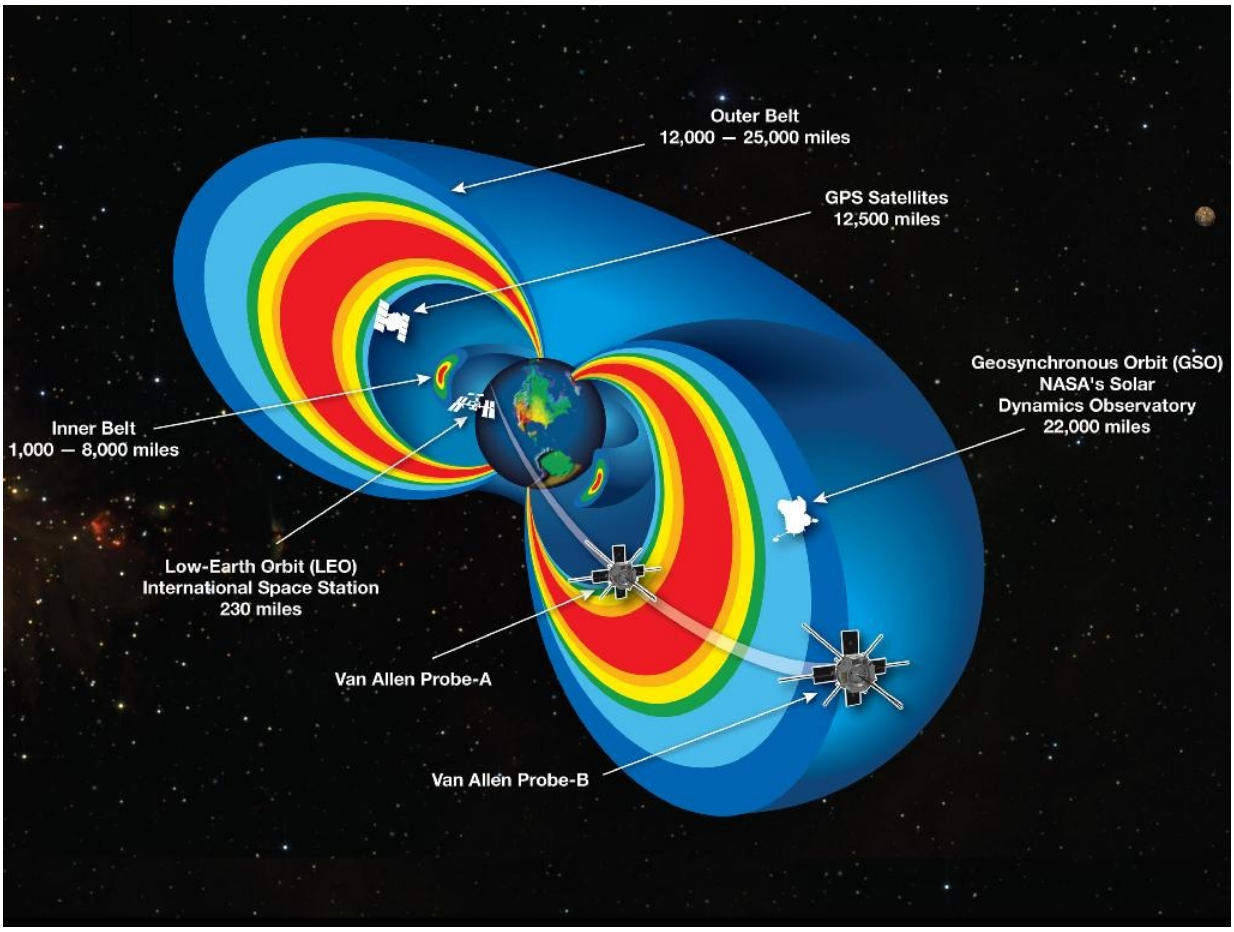
Daily changes in the level of the water – known as **tides** – are due to the Moon and Sun's gravitational influences. These gravitational effects raise tidal bulges in the oceans. The size of a specific tide primarily depends on the Sun-Moon orientations relative to Earth. Tidal interaction between Earth and Moon causes the Earth's rotation to slow and the Moon to be locked in a synchronous orbit – revolution is equal to rotation. Some "rocking" of the Moon back and forth occurs, called **librations**.

Forces that Shape Earth: Earth's Geological Processes

Impact Cratering was very intense during the early period of the Solar System; this also shaped Earth into its characteristics.

Other forces that shape Earth include **erosion, weathering, plate tectonics, and volcanism.**

- **Erosion, which is a continuous process,is** the wearing away of the surface by water, atmosphere, mechanical, and chemical processes.
- **Weathering is** a gradual physical and chemical wearing away of rocks and surface material.
- **Plate tectonics is** the motion of a body's plates driven by internal stresses.
- **Volcanism is** the eruption of molten rock from a body's interior onto its surface.



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Earth has a dynamic and active **atmosphere**. Overall, Earth has the most dynamic weather in our Solar System. Our atmosphere is not as thick as the Gas Giants or even Venus (Rocky Planet), yet it is like looking through 30 feet of water.

Earth also has a strong **Magnetic Field**, which is unusual for a Rocky Planet. It is believed to be due to Earth's molten core undergoing rotation and convection (giving off heat). Mercury and the Moon exhibit very weak magnetic fields, whereas Venus has none and Mars virtually none; yet there is evidence of a magnetic field in Mar's early history.

The **Van Allen Radiation Belts** are charged Particle Belts made up of ions and electrons, which were predicted by James Van Allen, and discovered in 1958 by the US Satellite Explorer 1. These belts protect Earth as intense solar particles from the Sun's solar wind strikes Earth. These solar wind particles can occasionally be seen as **Aurora**, as the charged solar particles strike Earth's poles.

Earth is the only known planet with life. Earth's orbit is within the **circumstellar habitable zone** – area in a star's orbit where ideal conditions exist for life. If Earth was 5% closer to the Sun, it would be Venus-like, and 20% farther out from the Sun, Earth would be Mars-like. Earth also exists in a system that has the right type of star, only one star, good location within the Milky Way Galaxy, the right type of galaxy, etc. Astronomers, biologists, and physicists have identified over 800 identified factors necessary for intelligent life.

Planet Earth at a Glance

Characteristic — Current State

- Impact Craters — Yes
- Tectonic Craters — Yes
- Volcanoes — Yes
- Atmosphere — Nitrogen (N), Oxygen (O_2), Clouds, Rain, Snow
- Water — Vapor, Liquid, and Ice → Primarily a water planet
- Erosion — Yes

- Dunes — Yes
- Polar Caps — Yes
- Satellites — One, Moon
- Life — Yes
