Formation

Our planet and the rest of our solar system coalesced (became stuck together) from a cloud of cosmic dust on the western spiral arm of just one galaxy of many in the universe. Gravity pulled the hot dust into a clump and it became a ball of molten rock. The planet slowly cooled and a thin crust began to form. Molten material below kept breaking through and recycling, powered by heat from radioactive decay in the core.

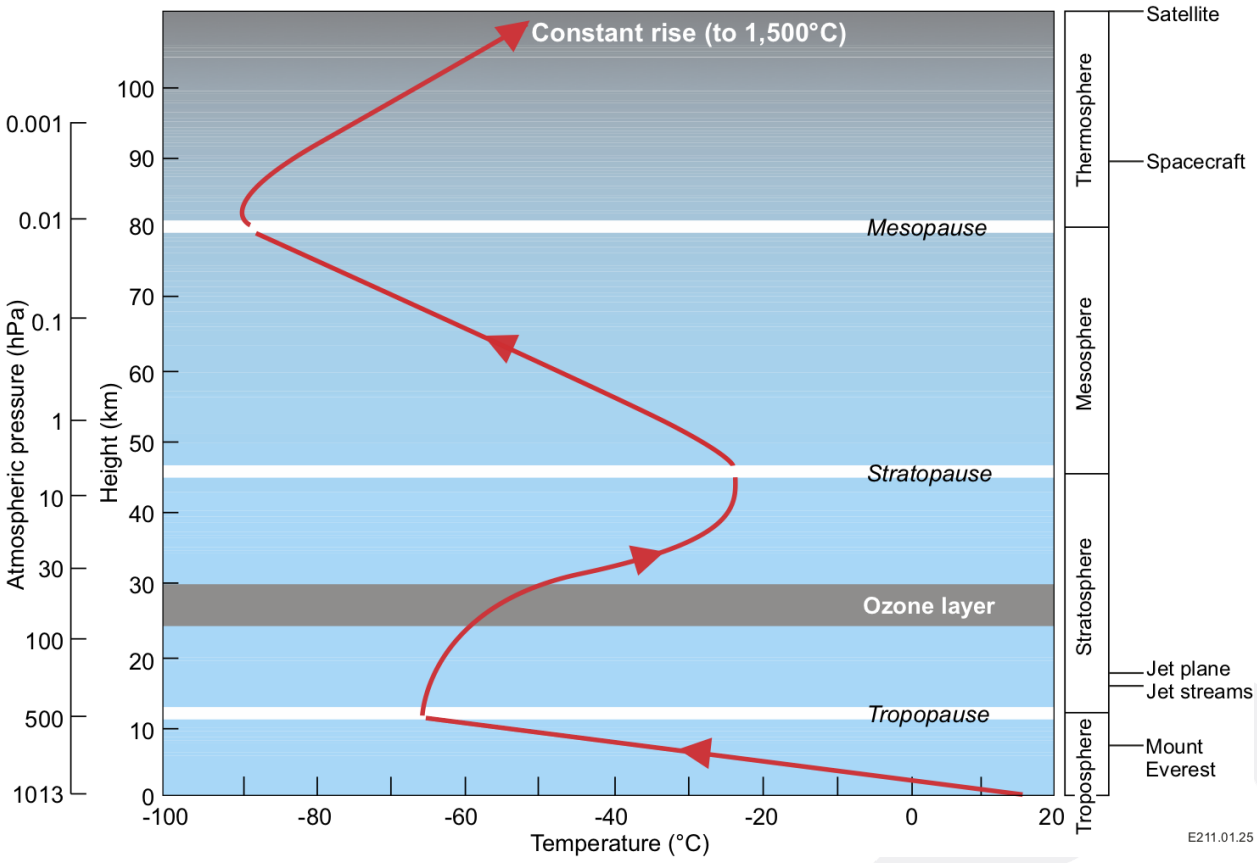
Planet Earth can now be categorised into three major units

1. The ***atmosphere*** (gas)
2. The ***hydrosphere*** (liquid)
3. The ***geosphere or lithosphere*** (solid)

However, these major divisions have many subdivisions.

Atmosphere

Our atmosphere (Greek atmos = vapour) consists of five regions or layers: Troposphere, Stratosphere, Mesosphere, Thermosphere and Exosphere. They are separated by changes of temperature with altitude. The gases in the atmosphere, 78% nitrogen, 21% oxygen, 1% argon 0.3% carbon dioxide and others, are retained by a gravitational field created by the mass of the planet. If our planet were smaller or closer to the Sun, like Mercury, our atmosphere would be drawn away by the greater gravitational pull.



Pressure from the atmospheric column above our heads is about 100kg/cm^2. We aren't affected by this as air pressure within our body balances that without.

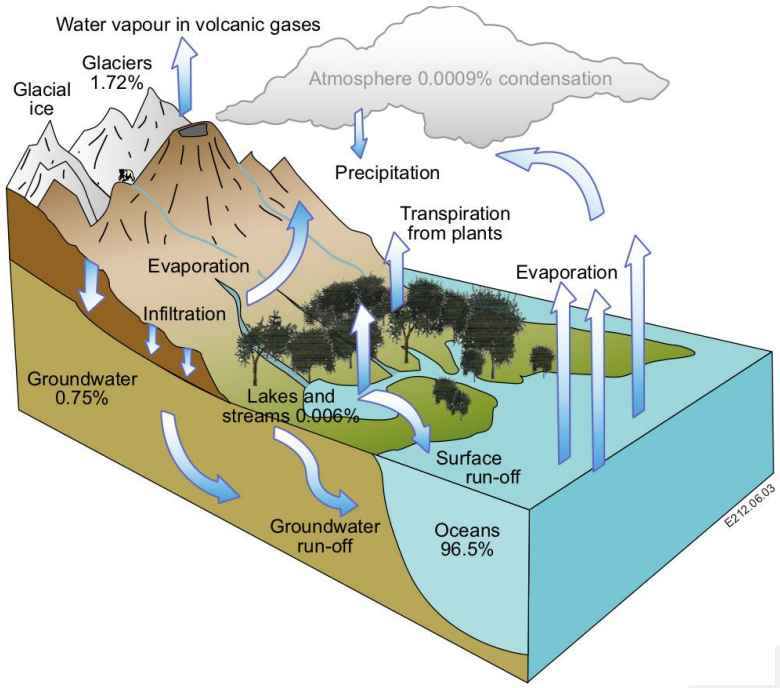
Due to decreasing gravitational pull, air gets thinner and thinner (or more correctly less dense) as you increase altitude, until at about 550km, when there is so little remaining atmosphere that the vacuum of space begins. At this point, without a space suit, our body would bloat, our eardrums would burst and fluids within our body would begin to boil. Luckily (?) we would pass out from lack of oxygen before this point.

The atmosphere is subject to enormous solar driven convection currents, which create winds, modifying climate around the globe. These winds are powered by infra-red radiation.
The average temperature at the surface of the Earth is 15^{0}C. This is due to the blanketing effect of water vapour, methane, carbon dioxide and other gases (known as the greenhouse effect). Without this blanket our surface temperature would be approximately 33^{0}C cooler.

At altitudes of 6,000 and 20,000 km lie the Van Allen belts of charged particles forming a double doughnut, or torus, which thin towards the North and South Poles. Here charged particles follow the lines of the Earth's magnetic field. Affected by solar winds they are responsible for the Aurora Australis and Aurora Borealis.

Hydrosphere

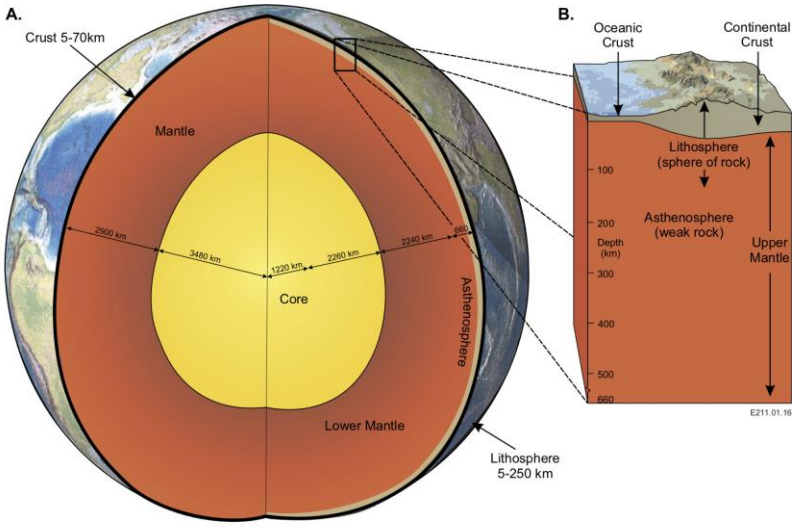
Water on modern Earth is subject to the water cycle but it is also strongly influenced by tectonic processes. Water is carried into the mantle, contained within hydrous minerals, by subducting oceanic lithosphere. Water is released into the atmosphere through volcanic activity.



Spheres of the Earth Reading

Geosphere

Over time, earth processes moved denser materials to the core and lighter to the **crust**. Less dense minerals formed the continental crust whilst the slightly denser the oceanic crust. Beneath the crust lies the **mantle**. It is also layered. The **core** is very dense and rich in iron and nickel oxides. This core is responsible for the Earth's magnetic field which protects us from solar radiation.



As a range of technologies are developed our understanding of our Earth improves. However, our current understandings of which rock types might lie beneath the crust, their physical state and which sub-crustal processes occur are mostly the result of inference and subject to interpretation, as it is only on rare occasions that such material rises to the surface.

Vocabulary

Atmosphere	Zone of gases enveloping Earth
Hydrosphere	All the water on Earth's surface (oceans, seas, rivers and lakes). Many also include the water contained within the Earth in this category.
Geosphere	The parts of the Earth that are solid (note, not all rocks are in solid form)
Troposphere	Lowest portion of Earth's atmosphere hosting weather & life
Stratosphere	Second layer of atmosphere where an abundance of ozone can be found
Mesosphere	Third layer of atmosphere in which temperatures fall rapidly
Thermosphere	Uppermost layer of atmosphere exposed to Sun's radiation
Core	Deep interior iron and nickel rich zone of Earth
Mantle	Zone underlying crust. Although solid it can flow under tectonic pressure
Lithosphere	The crust and the upper part of the mantle
Crust	Outermost thin solid shell of the planet

References:

All diagrams from: Dianne E. Tompkins and Joanne M. Watkins (ESWA), Exploring Earth and Environmental Science, Year 11 and 12

Van Allen Radiation Belts, SPACE.com, 11/05/2018, accessed at https://www.space.com/33948-van-allen-radiation-belts.html