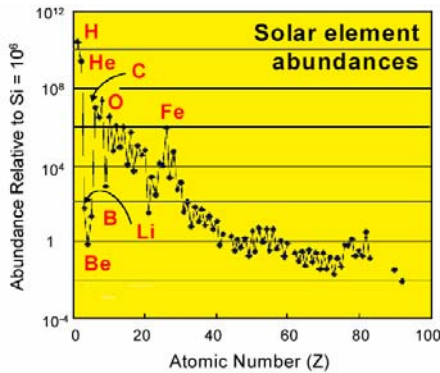


The Earth and its neighborhood

- Earth, the “Third Rock from Sun”, is called the “Lonely Planet” because, to our knowledge as yet, earth is the only planet with the evidence of life. It is also called the “Blue Planet”, because water is abundant on Earth.



Member of Solar system	Dominant chemistry
Sun, Jupiter, Saturn	Hydrogen, Helium
Uranus, Neptune	Carbon, Nitrogen, Oxygen
Mercury, Venus, Earth (and Moon), Mars, Pluto and Asteroids	Iron, Silicon, Magnesium, Potassium, Aluminum, Calcium, Sodium

- Compositionally, three groups of elements form the major constituents of Solar System:

- the gaseous elements H and He (e.g., Sun, Jupiter and Saturn),
- the ice-forming elements C, N, O that occur as solid NH_3 (ammonia) and CH_4 (methane) and H_2O (ice) (e.g., Uranus, Neptune), and
- the rock-forming elements Mg, Fe and Si (e.g., the inner or terrestrial planets — Mercury, Venus, Earth, Mars) and the asteroids and Moon.



	Orbital Radius (10 ³ Km)	Sidereal Period (days)*	Axial Rotation (days)	Equatorial Radius (10 ³ Km)	Mass (relative to Earth)	Density (Kg/m ³)
Sun	...	~240 Ma	25.38 ^s	696.00	333×10 ³	1409
Mercury	57.91	87.97	59	2.42	0.05	5410
Venus	108.21	224.70	244.3†	6.15	0.82	4990
Earth	149.60	365.26	0.997	6.38	1.00	5517
Mars	227.94	686.98	1.026	3.40	0.11	3940
Asteroids	...	...	...	...	...	...
Jupiter	778.34	4332.59	0.410 ^s	71.40	317.89	1330
Saturn	1427.01	10759.20	0.426	59.65	95.14	706
Uranus	2869.60	30685	0.451†	23.55	14.52	1700
Neptune	4496.70	60190	0.625	22.40	17.46	2260
Pluto	5900	91×10 ³	6.390	2.95	0.10	5500?

*excepting that for Sun ^sat equator, as the period varies with latitude †retrograde

- Two reasons explain why water, which should occur all over the Solar System wherever the temperatures are between 0°C and 100°C, is abundant on Earth but a rarity elsewhere: (a) hydrological cycle and (b) plate tectonics.
- Of these, hydrological cycle is the continuous recycling of water between oceans, atmosphere and land. As the run-off from land would eventually fill up the ocean basins and level the land, hydrological cycle carries the seeds of its own destruction because the resulting smoothening of the surface eventually translates into the drying up of the Earth.

Note that oceans lose more water by evaporation than is returned by precipitation, while the opposite occurs on land. The run-off from land thus completes this hydrological cycle.

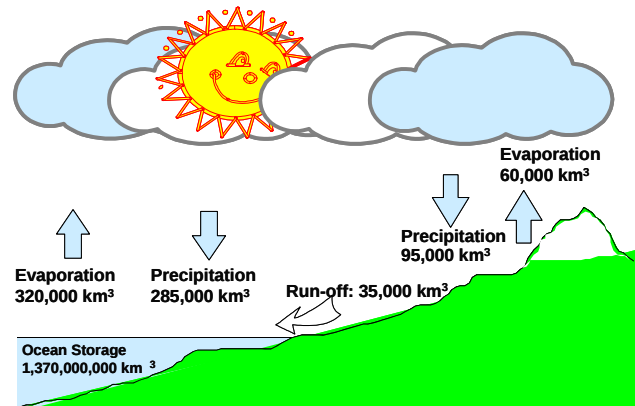
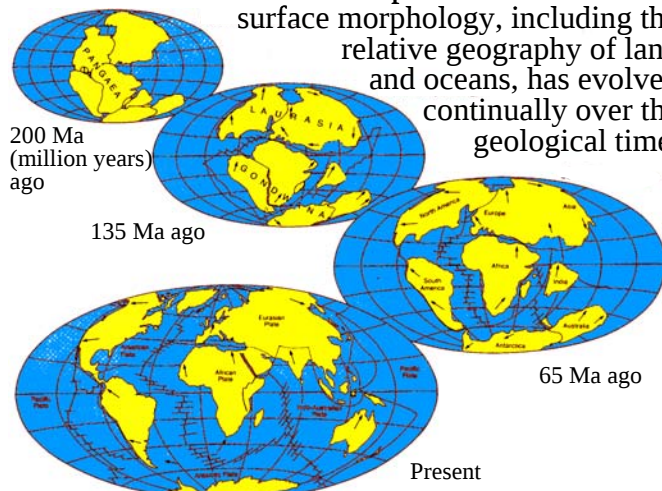


Plate tectonics explains how the Earth's surface morphology, including the relative geography of land and oceans, has evolved continually over the geological time.



- Plate tectonics, on the other hand, involves the creation of new surface area, as ocean basins that form from incessant volcanic injections at the spreading submarine ridges, and an equal surface area is lost in the folded mountain belts and deep sea trenches. This explains why the ocean floor is made up of basalt, a volcanic rock.
- Obviously, the water on Earth would have long disappeared had plate tectonics not existed to continually create the ocean basins that hydrological cycle would then fill up. Earth remains the water planet because (a) temperatures over most of the Earth's surface are between 0°C and 100°C, (b) temperature gradient in the troposphere is steep enough to allow the precipitation

of atmospheric moisture, (c) the hydrological cycle has been perennially present, and (d) plate tectonism has occurred throughout, ever since the oceans evolved 3.7-4 billion years (Ga) ago.