

Processes Responsible for Global Freshwater Loss

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much longer lasting process than hypothesized [4-6]. As direct evidence of salinity increase was still missing experiments related to the osmolarity of the inner environment of terrestrial vertebrates were expected to prove that it was not the reduced osmolarity of blood serum of land vertebrates, but the salination of seawater that caused the increasing salinity gap [7]. Among the possible causes responsible for the salinity changes of sea, the following processes were discussed [8]:

- Continental drift and outpouring lava increase the surface of the seabed.
- The formation of snow ice in the Polar Regions, cause freshwater deficit, its melting causes sea level rise.
- Weathering and denudation carry away the surface of land. The material is deposited in oceans building sedimentary rocks the dissolved salt content of which increases the salinity of seawater.
- The hydrologic cycle is based on evaporation from sea, evapotranspiration from soil and vegetation, and precipitation. One pathway is the flow of freshwater that rivers carry constantly as diluted salt to the ocean.
- Anomalies in geochemical balance and sea-to-sea variations in chemical composition, even if very small, may cause a long-term change but could appear in short-term as a steady-state system.
- Chemical pollution contributed by man was formerly neglected but is becoming of increasing concern. Environmental pollution is related to the principle of randomness. Biological organisms are highly organized, but the price of this organization is paid by the increasing disorganization (randomness) of the outer environment (milieu exterior). The major contributor to disorganization is mankind. This aspect of loss of freshwater and focus in the next chapter will be placed on the loss of water caused by the hydrolysis of water:

Photohydrolysis of water by irradiation

Atmospheric photodissociation: Penetrating photon components present in the visible and ultraviolet light, in x-rays and gamma irradiation can induce among many other reactions the photohydrolysis of water. Hydrogen atoms and molecules generated by photolysis from water vapour are relatively distant from surface of the Earth. These are smallest volatile components of air and are much less attracted by gravitation than the heavier oxygen atoms. Volatile, reductive gases of Earth, primarily hydrogen, helium and biogenic methane are trickling away to the space and cause irreversible oxidation [9]. That

The hydrolytic reactions in amino acid metabolism are summarized

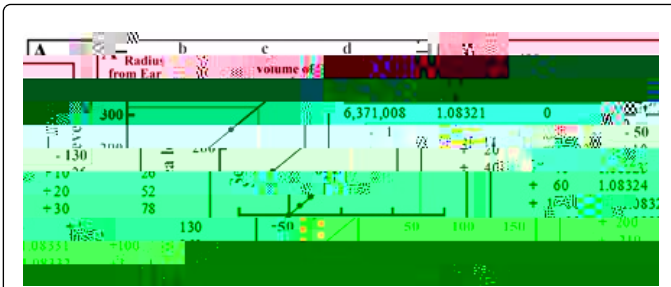


Figure 1: Fluctuation of freshwater reserves based on sea level rises and falls in the past 500 million years. A) Seawater volumes belonging to different seawater level elevations. a) radii relative to the Earth's mean radius denoted R [17]; given as the distance from the Earth's centre to its surface, estimated to be 6,371,008 km [20]. b) volumes of seawater in the absence of oceanic crust, c) volumetric increase of seawater levels in the presence of oceanic crust under the seawater (+30%), d) sea level rises. B) Calibration curve: seawater level rise versus seawater volume increase. Red lines indicate the lowest (-130 m) (~20,000 years ago) and highest (320m) (~500Mya) seawater levels. Modified with permission [19].

References

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