

The geology of the Earth's surface is dominated by the particular properties of water.

Present on Earth in solid, liquid, and gaseous states, water is exceptionally reactive.

It dissolves, transports, and precipitates many chemical compounds and is constantly modifying the face of the Earth.

Evaporated from the oceans, water vapor forms clouds, some of which are transported by wind over the continents.

Condensation from the clouds provides the essential agent of continental erosion: rain.

Precipitated onto the ground, the water trickles down to form brooks, streams, and rivers, constituting what is called the hydrographic network.

This immense polarized network channels the water toward a single receptacle: an ocean.

Gravity dominates this entire step in the cycle because water tends to minimize its potential energy by running from high altitudes toward the reference point that is sea level.

The rate at which a molecule of water passes through the cycle is not random but is a measure of the relative size of the various reservoirs.

If we define residence time as the average time for a water molecule to pass through one of the three reservoirs—atmosphere, continent, and ocean—we see that the times are very different.

A water molecule stays, on average, eleven days in the atmosphere, one hundred years on a continent and forty thousand years in the ocean.

This last figure shows the importance of the ocean as the principal reservoir of the hydrosphere but also the rapidity of water transport on the continents.

A vast chemical separation process takes place during the flow of water over the continents.

Soluble ions such as calcium, sodium, potassium, and some magnesium are dissolved and transported.

Insoluble ions such as aluminum, iron, and silicon stay where they are and form the thin, fertile skin of soil on which vegetation can grow.

Sometimes soils are destroyed and transported mechanically during flooding.

The erosion of the continents thus results from two closely linked and interdependent processes, chemical erosion and mechanical erosion.

Their respective interactions and efficiency depend on different factors.