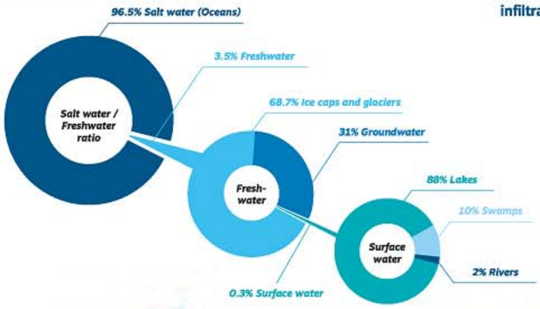
THE WATER CYCLE

Water distribution on the Earth

Water has been on the Earth for **more than 4 billion years** and it originated from ice found in falling meteorites. Currently, the amount of water on the Earth is not changing anymore. However its distribution is greatly irregular both in space and time. Thus, some regions struggle with its deficiency (huge parts of Africa and Australia) while other places have abundant water resources (North Asia, equatorial regions).

About 71% of the Earth's surface is water-covered, but its mass comprises only **0.02% of the Earth's weight**.



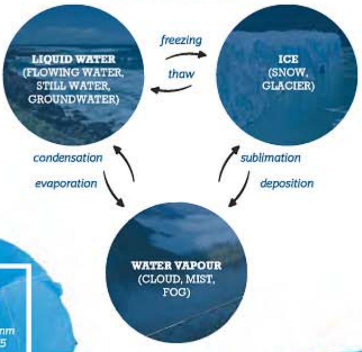
Water cycle

Water is constantly circulating on the Earth and it changes its state at the same time. The circulation of water may be split into the one taking place solely over the ocean and the one over the land. The exchange of water between these two domains forms a **global water cycle**. The fundamental source of energy for the water cycle is the incoming **solar radiation**. Therefore, the water cycle is primarily ensuring the distribution of energy from the Sun and compensating partially for the differences in temperature between regions.

The main processes of the water cycle are: **evaporation, condensation and precipitation**, **infiltration** and **runoff**.

Water evaporates mainly from the water bodies (***evaporation***) but also from living organisms. Especially, plants are releasing water to the atmosphere (***transpiration***). Overall loss of water vapour from the Earth's surface is called ***evapotranspiration***. Evaporated water is then carried in the atmosphere in the form of clouds over long distances by wind. Under suitable conditions, the water vapour condenses and transforms into **precipitation**. Liquid water that falls on the ground either **flows** over the surface or **infiltrates** into the soil and further to the deeper layers. Water is then retained in the soil or in the bedrock ***(retention)*** or it can flow towards the streams ***(subsurface runoff)*** or it possibly infiltrates deeper into the bedrock ***(percolation).***

Cycle of changes of state of water



In addition to the evaporation

from the free water surfaces and plant transpiration, water can also enter the atmosphere directly from the snow cover in the process called ***sublimation****. Under the conditions of the Czech Republic, such water loss can reach up to 1 mm per day. However, more than 5 mm per day can be evaporated from the landscape in summer.*

The average annual precipitation

in the Czech Republic is around 700 mm (being approximately equal to the 75 full Orlík water reservoirs). On average, 70% of this volume is evaporated and remaining 30% is drained by rivers. This ratio is determined mainly by climate conditions. In deserts, it is possible that all precipitation can be evaporated back to the atmosphere. Contrarily, in higher altitudes or latitudes more than 80% of precipitation can be carried away by rivers.

Analyses

of the isotopic composition of stream water show that it does not originate solely from the recent precipitation. It is also composed of ***"old water"*** *that was stored in the soil or groundwater reservoir for weeks or months (in the case of large catchments it can be several years). The* ***"new water"*** *from actual precipitation forms only a part of the runoff depending mainly on the catchment characteristics (geology, soil cover, etc.).*

Vast majority

of evaporated water comes from the ocean. However, 90% of this water falls out as precipitation back to the ocean, so it is not transported over the land. Despite this, around ***40 000 km³*** *of water is transferred over the continents every year (more than 55 000× the volume of the full Orlík water reservoir).*

Precipitation over

individual continents reaches ***around 675 mm*** *per year on average. The only exception is South America with more than a double amount (1500 mm per year). Different natural conditions result in different amount of runoff. The least amount of water is running off surface of Africa and Australia (150 mm per year), then from Europe, Asia and North America (280 mm per year). On the contrary, the highest observed runoff takes place in South America (650 mm per year).*

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