

2017-2020

EARTH'S OLDEST WATER

A record for the oldest water found on Earth was set in 2013 as researchers found several kilometers deep in a Canadian mine that produces copper, zinc and silver. The water was found bubbling up from a shaft, rather than trapped in solid rock (as is usually the case), and estimated to be between 1.5 and 2.0 billion years old. Considering that scientists place the planetary age at about 4.5 billion years, this water was probably produced and trapped in the Earth's crust as it cooled and could support life. Traces of sulfate and other simple ions in the freshwater suggest that ancient microbes were present and producing fluids over geologic timescales. By comparison, perhaps the world's oldest fossils (tube worms) may have been formed almost 4.3 billion years ago near thermal vents on the ocean floor, where seawater (comprising the entire planet surface) and nutrient-rich magma were mixed.

DEUTERIUM

Water is composed of two atoms, hydrogen and oxygen, that exist in several varieties depending on the number of neutrons in their nucleus. These "isotopes" are present in water at ratios that reflect its source, its planetary journey and its interactions with earthly life forms. Deuterium is a stable (non-radioactive) isotope that represents only 0.02% of the hydrogen in water and was likely formed early in the universe's history. Because the lighter and more common isotope of hydrogen is preferentially utilized by biological systems, low-deuterium drinking water has been used to treat specific health issues in humans. By contrast, deuterium-rich water is preferred in nuclear fission reactors because it more effectively slows down the process. Recently, an ultra-dense form of deuterium has been created to serve as fuel for the safer nuclear fusion reactors that produce only helium and hydrogen as byproducts.