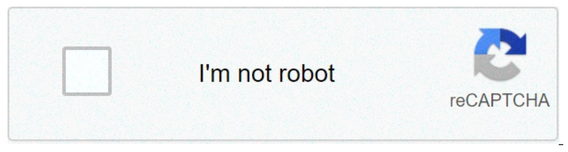

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How old the earth today

There's a whole lot of water on Earth! Something like 326,000,000,000,000,000,000 gallons (that's 326 million trillion gallons) of the stuff (roughly 1,260,000,000,000,000,000,000 liters) can be found on our planet. This water is in a constant cycle — it evaporates from the ocean, travels through the air, rains down on the land and then flows back to the ocean.The oceans are huge. About 70 percent of the planet is covered in ocean, and the average depth of the ocean is about 12,100 feet (3,688 meters). Ninety-eight percent of the water on the planet is in the oceans, and therefore is unusable for drinking because of the salt. Less than 3 percent of the planet's water is fresh, but about 1.6 percent of the planet's water is locked up in the polar ice caps and glaciers. Another 0.36 percent is found underground in aquifers and wells. Only about 0.036 percent of the planet's total water supply is found in lakes and rivers. That's still thousands of trillions of gallons, but it's a very small amount compared to all the water available.The rest of the water on the planet is either floating in the air as clouds and water vapor, or is locked up in plants and animals (your body is 65 percent water, so if you weigh 100 pounds, 65 pounds of you is water!) With all the soda pop, milk and orange juice you see at the store and in your refrigerator, there's probably several billion gallons of water sitting on a shelf at any one time!Now That's a Lot o' LakesAt last count, there were 117 million lakes in the world, covering nearly 4 percent of the world's land surface, (excluding the glaciers of Greenland and Antarctica). There are 1,681 lakes in the United States. Photo Courtesy: David Gray/Getty Images 2020 got off to a rocky start — and then turned into a complete climate disaster. On top of the COVID-19 pandemic, the world went through many environmental emergencies this year. Some of them forced thousands of people to flee their homes, while others have impacted wildlife forever. According to Scientific American, the U.S. alone experienced 16 natural disasters that cost more than $1 billion in damages — each. Many environmental experts believe that climate change played a key role in recent crises. With the Paris Agreement climate pact now approaching five years since its drafting, this topic is more important than ever. For 2020, we're highlighting the most extreme natural disasters on the planet, ranging from record-breaking forest fires to highly disturbing locust swarms, to help raise awareness about our ever-growing global climate crisis. The National Hurricane Center's Twitter account described 2020's hurricane season the best: "Ugh." The season was crazy busy, with a record high of 30 storms. There were so many tropical cyclones that meteorologists ran out of names to give them, so they used letters of the Greek alphabet — only the second time this has ever happened. Photo Courtesy: @NWSNHC/Twitter The Atlantic's warmer water and air temperatures created the perfect recipe for non-stop hurricanes from June to November. The worst part is just how strong and massive the storms were. For instance, Hurricane Hanna dumped more than 15 inches of rain on South Texas, causing flash floods and power outages everywhere. Another deadly storm, Hurricane Isaias, unleashed a fury of tornadoes in Virginia, Maryland, Delaware and New Jersey. After a wild hurricane season, the last thing we want to think about is the possibility of more hurricanes. Unfortunately, extreme-weather expert Jill Trepanier believes the situation will get worse. "Rapid intensification seems to be the name of the game right now," Trepanier said. "We should expect to see events intensify quickly when conditions are as warm as they are presently." We all knew wildfire season was coming to California, but we didn't expect it to turn into a scene from Stranger Things or Blade Runner 2049. In September, Northern California residents woke up to a dark orange-red sky that looked as though the end of the world was approaching. Photo Courtesy: Philip Pacheco/Getty Images Why was the sky glowing in these strange colors? It all started with an abnormal thunderstorm in August, which brought more than 9,000 lightning strikes across the dry, hot state. The rare spectacle sparked 500 wildfires — and the worst wildfire season in California history. The smoke from the northern fires blew into the Bay Area and stayed at a high altitude due to extreme winds, ultimately causing this phenomenon. With the sun nowhere in sight, "What time is it?" became the most-asked question on the West Coast for nearly two weeks. Just when we thought the world couldn't get stranger this year, swarms of locusts turned the sky dark and consumed everything in their way like a verse from the Bible. The Guardian reported that Kenya went through the worst outbreak of locusts in 70 years, and Uganda, India and Pakistan were also living in a nightmare because of these pests. Photo Courtesy: Minasse Wondimu Hailu/Anadolu Agency/Getty Images Thanks to climate change, unusually heavy rain in the regions created the perfect locust breeding grounds, leading to massive new swarms. According to National Geographic, "Swarms can swell to 70 billion insects — enough to blanket New York City more than once." Although these pests don't harm humans, they can cause a hunger crisis; a swarm is powerful enough to destroy crops, pasturelands and trees. The Famine Early Warning Systems Network predicts that locusts can devour enough crops to feed 280,000 people for six months in Somalia. Hopefully, the affected regions can prevent those pests from causing any more damage. Did you know that the Philippines is home to 23 active volcanoes? The thought that these land formations can erupt at any moment is a frightening one. So, when Taal, the second most active volcano in the country, began to shake, those fears became a terrifying reality for the surrounding residents. Photo Courtesy: TED ALJIBE/AFP/Getty Images In early January, the volcano spewed gas, lava and ash into the air. This prompted the Philippine Institute of Volcanology and Seismology (PHIVOLCS) to release an Alert Level 4 — meaning a dangerous explosive eruption was possible within hours to days. According to the New York Post, 300,000 people needed to flee. By the end of January, the alert on the volcano was lowered, allowing residents to return to villages buried in thick layers of ash and destroyed homes. Unfortunately, this wasn't Taal's last rumble; the PHIVOLCS reported a total of 2,484 volcanic-tectonic earthquakes near the volcano. Poultry farmer Emer Siscar told The New York Times, "It looks like we now have a more active volcano going forward." Things went from bad to worse in Australia as flames and smoke covered forests and cities from June 2019 to May 2020 — a year known as Black Summer. The deadly wildfires forced thousands to evacuate, burned at least 46 million acres and destroyed 6,000 buildings. Another heartbreaking outcome was the death and harm of almost 3 billion animals. More than 100 species were in need of "urgent help" to survive, including koalas, wallabies and several species of birds. Many of their beautiful habitats vanished in the devastation, making it challenging for the animals to find food and shelter. Photo Courtesy: Lisa Maree Williams/Getty Images Why were the fires so catastrophic? With record-breaking temperatures and months-long droughts, there was more energy to power the fires. Climatologist Joanna Wibig believes climate change is to blame, saying, "Climate change definitely contributes to fires spreading more easily, in Australia, but also in California, for example." On a positive note, some rescued animals have been released back into the wild — just look at this koala climbing a tree. With so much loss, it's comforting to know that some animals were saved and returned home. Our beautiful planet is transforming at an alarming rate. This is a problem; the changes in temperature can cause dangerous shifts in climate and weather. This devastating year of disasters is a reminder of the seriousness of climate change. By following guidance from climate experts and taking immediate action to save the planet, we can help shape the future in preserving the health of Earth. Super-Earths And Life is a course about life on Earth, alien life, how we search for life outside of Earth, and what this teaches us about our place in the universe. In the past decade astronomers have made incredible advances in the discovery of planets outside our solar system. Thirty years ago, we knew only of the planets in our own solar system. Now we know of thousands circling nearby stars. Meanwhile, biologists have gained a strong understanding of how life evolved on our own planet, all the way back to the earliest cells. We can describe how simple molecules can assemble themselves into the building blocks of life, and how those building blocks might have become the cells that make up our bodies today. Super-Earths And Life is all about how these fields, astronomy and biology, together with geology, can help answer one of our most powerful and primal questions: are we alone in the universe? HarvardX requires individuals who enroll in its courses on edX to abide by the terms of the edX honor code: . HarvardX will take appropriate corrective action in response to violations of the edX honor code, which may include dismissal from the HarvardX course; revocation of any certificates received for the HarvardX course; or other remedies as circumstances warrant. No refunds will be issued in the case of corrective action for such violations. Enrollees who are taking HarvardX courses as part of another program will also be governed by the academic policies of those programs. HarvardX pursues the science of learning. By registering as an online learner in an HX course, you will also participate in research about learning. Read our research statement: to learn more. Harvard University and HarvardX are committed to maintaining a safe and healthy educational and work environment in which no member of the community is excluded from participation in, denied the benefits of, or subjected to discrimination or harassment in our program. All members of the HarvardX community are expected to abide by Harvard policies on nondiscrimination, including sexual harassment, and the edX Terms of Service. If you have any questions or concerns, please contact harvardx@harvard.edu and/or report your experience through the edX contact form: . How life may have arisen on Earth How we discover planets around other stars What makes a planet favorable for life How we search for life in our universe This course consists of seven modules, which investigate questions like: What is life? How did it arise? How does it change over time? What is a planet? How do we find and learn about planets outside our solar system? How has the Earth changed over time? What do these changes mean for the evolution and survival of living things? How do geological processes shape planets? How do these processes contribute to life? How many habitable planets are there? How can we search for life? Harvard UniversityDimitar SasselovReceive an instructor-signed certificate with the institution's logo to verify your achievement and increase your job prospectsAdd the certificate to your CV or resume, or post it directly on LinkedInGive yourself an additional incentive to complete the courseedX, a non-profit, relies on verified certificates to help fund free education for everyone globallyAmazing course. It gives a strong foundation on how life might have arisen on Earth, and how to look for other habitable planets in the universe. This is a good introduction to astrobiology, with sections on life on Earth and the search for extrasolar planets, and how these two subjects come together to determine how we might look for life on other planets. The content is clear and informative, and the instructors are knowledgeable and engaging (including the guest lecturers). For nearly four years, NASA's Kepler spacecraft whisked through space, surveying our corner of the galaxy. It monitored more than 150,000 stars, looking for planets about the size of Earth that belonged to other solar systems. The mission didn't disappoint; Kepler found countless examples of a type of planet known as a super-Earth. These faraway planets might remind you of home — they're rocky, smaller than gas giants, located near their star and sport a relatively thin atmosphere. But they're way larger than the blue marble: These super-Earths are a honking two to 10 times bigger in mass than our Earth. Because there are so many super-Earths out there, it begs the question: What would happen to our planet if it were two or even 10 times the size it is now? Related: What if the Earth was flat?It's possible that Earth and the other inner planets of our solar system were headed in that direction, Mickey Rosenthal, a doctoral candidate studying planet formation at the University of California, Santa Cruz, told Live Science. One theory is that the gargantuan planet Jupiter became so large that it cut off access to cosmic building blocks needed to make the inner planets bigger — effectively starving them, Rosenthal said. No matter the reason for Earth's current size, there's no way to truly know what would happen to Earth if it were super. But scientists have some ideas based on what they've learned about our faraway cousins.For starters, you'd be shorter — you, Mount Everest and every tree in California's Sequoia National Park — because if you increase the size of a planet and keep everything else identical, gravity increases, too. If Earth were twice its size, you'd be heavier, because the force of gravity increases as the planet's density and radius increase. It would take more energy to resist gravitational pull, so the structures we have today wouldn't be strong enough to stand as tall as they do now. With a larger planet and stronger gravitational field, Earth would also experience more collisions, Rory Barnes, a theorist who studies planet habitability at the University of Washington, told Live Science. As a superplanet, Earth's greater gravitational pull would effectively attract more and larger asteroids, so "Armageddon-type" collisions would become more of a concern than they are now, Barnes said. If the hypothetical super-Earth were even bigger, say, 10 times its current mass, dramatic changes could start happening in Earth's interior. The iron core and liquid mantle would also be 10 times larger, and with more gravity acting on a larger mass, the pressure beneath Earth's surface would increase. This high pressure could cause the iron core to solidify, Barnes said. As of now, convection currents in our partially liquid core generate Earth's magnetic field. But if the core solidified, the currents would stop and the magnetic field could be weakened or eliminated, Barnes said. If our magnetic field faded or disappeared, it would be very bad for life on Earth, Barnes said. Our magnetic field "shields life on the planet from the nastiness of space," Barnes noted. Without it, charged particles flying through space, also called solar storms, could slam into Earth. And these tiny particles can cause all kinds of problems, including breaking up DNA and increasing the risk of cancer, he said.Barnes also pointed out that a larger interior could make super-Earth more volcanically active than it is now. As the radius of the planet increases, there's more energy inside and fewer places for that energy to escape. More volcanic eruptions wouldn't be surprising, he said. Plate tectonics, too, would be different on a super-Earth. But the exact effect is still an open question. A larger mantle would also be hotter, possibly causing more vigorous convection currents that would push plates around more. In contrast, it's possible that under the high pressure, the crust would be totally fused together and plate tectonics wouldn't exist at all.Based on the super-Earths that scientists have found so far, we can't really be certain Earth would even be habitable if it were a super-Earth. The Kepler space telescope was best at detecting planets close to their star — much closer than Earth is to the sun. Most super-Earths known to science are almost as close to their star as Mercury is to our sun. For Earth to be comparable, it would need to have an orbit of about 100 days, said Hilke Schlichting, an associate professor of astrophysics at the University of California, Los Angeles. That orbit might be habitable in systems with a star smaller than the sun, but if our Earth were that close to our sun, all of the water on the planet would vaporize, Schlichting said. In other words, Earth would be out of the habitable zone and, in essence, would become a steam planet, she said.Surprisingly, many of the super-Earths discovered so far seem to be water rich, like entire water worlds, Rodrigo Luger, the Flatiron Research Fellow at the Simon Foundation's Center for Computational Astrophysics in New York City, said in an interview. It's possible that these planets formed from large pieces of ice and then later migrated close to their stars, which prompted their ice to melt, he said. However, these planets might not be habitable, since their deep oceans plummet to a solid ice layer. This ice is not formed by low temperatures, but by the intense pressure of the super-deep ocean, which forces water molecules into a solid state. This ice layer blocks any interaction between the atmosphere and the planet's interior, meaning there is no carbon cycle (a process in which carbon cycled through the atmosphere, ocean, and crust) or no mineral exchange (which regulates Earth's long term temperature via an interaction between atmosphere and the mantle), according to Luger. That doesn't promote habitability — at least for life as we know it. The reality is that scientists have more questions about super-Earths than they have answers. And we don't fully understand the physics of our own interior, much less that of a planet many solar systems away, Luger said. We don't know what would happen if Earth were supersized or closer to the sun. But, so far, it seems very fortunate that we aren't living on a planet that's any of those things.Editor's note: This story was updated to note that if Earth were twice its mass, gravity would increase, but not by twice as much. Also, to clarify that super-Earths are planets that are between two and 10 times the mass of our planet.Originally published on Live Science.