

The Earth's continents do not surround the sea. Rather, the seas surround the continents that are islands in an ocean world. On this blue planet **70%** of the earth's surface is covered by salt water. This is our **WATERY WORLD!**

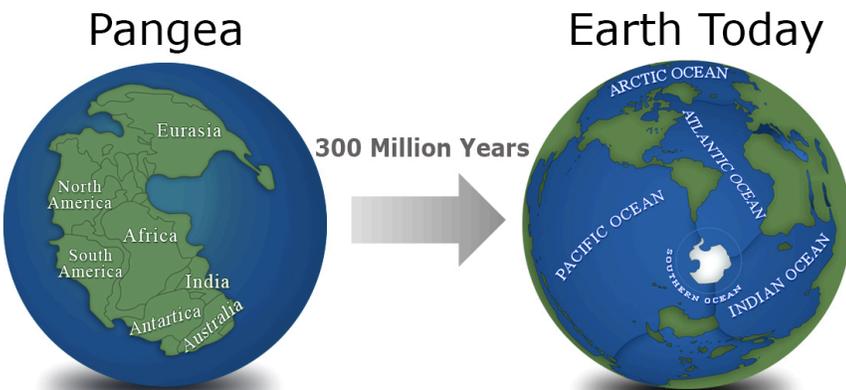
Where did all the water come from?



The best evidence indicates Planet Earth is 4.6 billion years old. At the beginning it was a giant mass of boiling lava hundreds of miles thick. Slowly, the climate cooled and lava hardened to form the Earth's crust. At this time volcanoes were also erupting and spitting enormous amounts of steaming water vapor into the atmosphere. As the water vapor cooled it condensed into clouds. Rain fell day and night for thousands of years. This flood created the first ocean about 3.8 billion years ago.

How did the individual oceans form?

At one time, all the continents were part of one land mass, called "Pangea". Oceans are formed when tectonic plates in a land mass move apart, creating gigantic chasms called "continental rifts". After millions of years, water from neighboring oceans pour into these deep rifts, giving birth to a new ocean. As long as the plates move apart, the ocean continues to grow. The Atlantic Ocean, for example, was created in this way 150 million years ago.



We speak of the oceans as if they were separate, but they are one connected body of water that flows around the world. For purposes of geographical identification we divide the earth's oceans into 5 bodies of water: the **Atlantic, Pacific, Indian, Arctic and Southern Oceans.**

Ocean Facts:

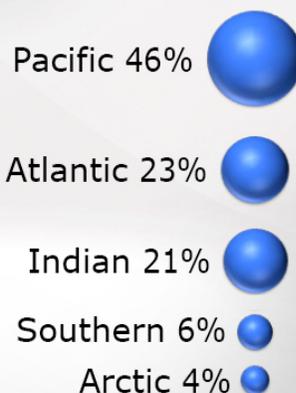
How much water is in the ocean?

It has been calculated there is 1.5 quintillion (1,500,000,000,000,000,000) tons of water in the ocean, which is 100 billion gallons of water for each person on earth.

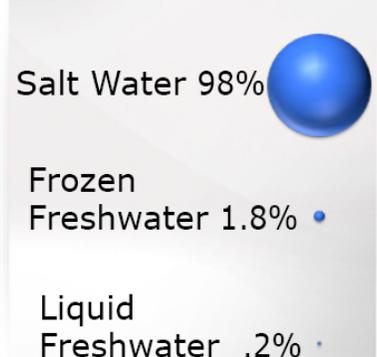
How deep is the ocean?

Measurements reveal underwater mountains twice as tall as 29,029 ft. tall Mt. Everest and 6 times deeper than the 1 mile deep Grand Canyon. The Java Trench in the Indian Ocean is more than 4 miles deep. The Puerto Rico Trench in the Atlantic is even deeper. The deepest is the Mariana Trench in the Pacific at 7 miles deep. A two pound iron ball falling into the Mariana Trench would take about an hour before reaching the bottom.

World's Oceans



Earth's Water



It is estimated if all the salt in the ocean could be removed and spread evenly over the Earth's land surface it would form a layer more than 500 feet thick.

Where does the salt in the ocean come from?

Salt is mostly washed into the ocean by rivers and streams. Freshwater runs over rocks releasing sodium chloride (common table salt) from the Earth. As the sun warms the waters of the ocean water evaporates and rises into clouds. Because salt is too heavy to rise it stays in the ocean and accumulates over time. Saltiness, or salinity, is measured in parts per thousand (ppt). The ocean's salinity is about 35ppt, meaning every 1000 pounds of seawater contains 35 pounds of salt. Humans cannot drink this because our bodies can't filter out this much salt, but sea animals do just fine as their bodies filter our excess salt as it enters their systems.

Water is always moving

The sun's energy drives the motion of water. The sun warms the water and the air accumulates moisture through evaporation. This process is especially active in the warmer tropics where the moisture condenses into clouds and releases heat into the atmosphere. The uneven distribution of heat from the clouds causes winds that blow across the surface of the sea, producing waves and currents.

Test Your Knowledge

Q: Where is the deepest part of the ocean?

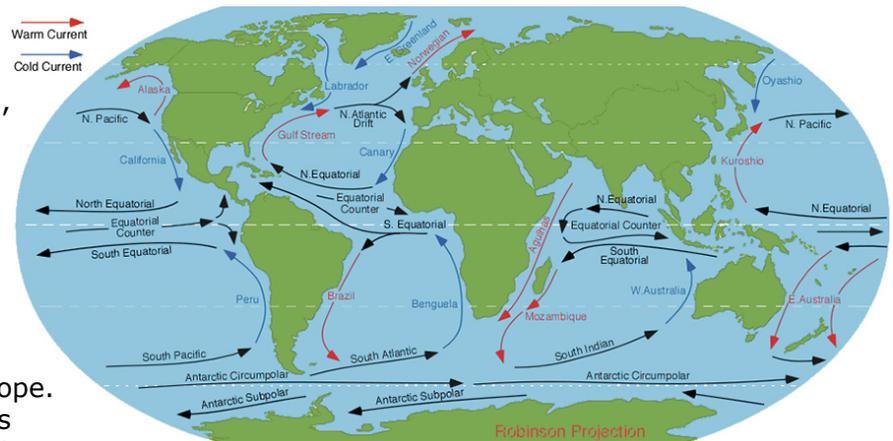
Q: How salty is the ocean?

Q: Which ocean is the smallest?

Q: The highest tides happen twice a month, what are they called?

Ocean Currents

The major ocean currents flow in circular paths called "gyres". One of the most well known is the **Gulf Stream**, which Dave and Bodacious Dream have travelled through many times. It moves up the east coast of North America at speeds up to 100 miles a day, and can be 18 degrees warmer than nearby water. In the middle of the Atlantic, the Gulf Stream divides, part of it becoming the North Atlantic Current which brings warmer air to Northern Europe. When boats sail in the same directions as these currents, they get to their destination



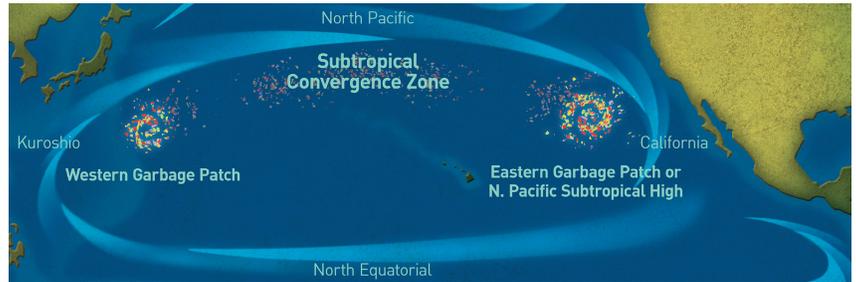
much faster, and when they have to sail against them, it slows them down. A similar current in the Pacific, the warm Japan Current, becomes the North Pacific Current, which brings warmer air to the west coast of North America. The central gyres dominate the surface circulation patterns of all oceans, except in the Arctic and Antarctic regions. Since there is no barrier to zonal flow in the Antarctic, water flows around the Earth in the Great Circumpolar Current. This is the greatest current in the ocean, about twice as big as the Gulf Stream. It involves not only surface waters, but reaches several miles down.

The world's largest mountain range is underwater. It is the Mid-Oceanic Ridge, which at 40,000 miles, 4 X longer than the Andes, the Rockies and the Himalayas put together!

Trash Gyres

Sadly, trash is thoughtlessly discarded. It is thrown off boats, dumped along the coastlines, or washes out to sea through rivers, or arrives by tsunami or hurricane. Once trash gets into the ocean, it moves with the currents and gets carried along by these same gyres, and at central points, it begins to collect and accumulate...

As it gathers, it forms floating tangles or garbage patches. In terms of how big these patches can get, there is one in the North Pacific gyre that scientists and environmentalists estimate to be twice the size of Texas. That is a lot of trash! What kinds of material collect in a trash gyre? How do you think a gyre affects marine wildlife?



Tides

Every day the waters of the ocean rise and fall in what are called "tides". Tides are caused by the combined gravitational pull of the moon and the sun. As the earth rotates, the ocean waters nearest the moon are pulled outward in a bulge called **high tide**. There is also a pull on the side of the earth opposite the moon which is less powerful ... but still noticeable, which means that most areas along the coast have two high and two low tides every day. The highest tides happen twice a month when the Sun and the moon are lined up directly with the Earth. These are called **Spring Tides**. The lowest tides happen twice a month when the Sun and the moon are at right angles to each other. These are called **Neap Tides**.

Sunlight's Reach

On the surface of the ocean, the sunlight is quite bright. The upper 330 feet (100 meters) of the water can support plants and all sorts of algae and seaweed like organisms called "plankton". Below that depth, there is not enough light for plants to "photosynthesize". And below 3,300 feet (1,000 meters,) the sea is completely dark.

Why are the oceans different colors?

Water absorbs colors of the light spectrum as light rays travel through the water. Red is the first color absorbed at about 20 feet, followed by orange, yellow, green, blue, indigo, and violet. Blue, indigo, and violet are absorbed below 60 feet. This is why underwater photos and videos seem so washed out with blues. To see the full range of colors while underwater it's a good idea to carry a flashlight. This will bring out colors you never imagined existed. Also water looks green when it contains many tiny phytoplankton. The Red Sea gets its name from red algae. The Black and Yellow Seas get their names from the colors of the sediment.

Different Color Light Goes to Different Depths

