Deep Ocean and Society

The deep sea is vast, dynamic, important, fragile, and unexplored. Even without visiting the deep sea, our human presence in it is growing exponentially.

The deep ocean is big, important, and unexplored.

Yet humans have only explored a small portion of the ocean. Most of what we know about the ocean is merely in the thin surface layer, the deep sea remains vastly unexplored. But one thing we do know is that the deep ocean is not merely a black, empty, unchanging void, it is full of life, vibrant, dynamic, and fragile. Recent technological advances have made the deep ocean more accessible than ever before.

A global initiative, like DOOS, will provide novel insights into this unexplored frontier.

* Half of the Oxygen produced by plants on Earth is produced in the ocean.
^ 99% of all available living space on the Earth, by volume, is in the ocean.

The deep ocean is critical for the maintenance of the Earth’s climate.

The oceans have taken up over 90% of heat accumulated in the Earth’s climate over the last 4 decades. One third of that extra heat is stored in the deep ocean. The ocean has absorbed 50% of the CO2 released into the atmosphere.

Evidence of this heat has been found deeper than a mile into the ocean. Most sea level rise is due to thermal expansion - the warmer the water, the more space it takes up, similar to how a cold balloon shrinks and expands when it warms again.

Warmer water is not able to hold as much oxygen as cold water; so as the ocean warms, it also loses oxygen.

Sequestering carbon in the deep sea is being explored to help reduce carbon in the atmosphere.

Observations of the deep sea will help us understand how changes in temperature, oxygen, and carbon impact the deep sea.
Throughout the globe energy and materials flow from the surface into the deep. It takes about 500 years for water to make one completed trip around the Earth from the surface to the deep sea and back up again.

Surface water is pulled to the deep near the poles in overturning circulation. Deep water rushes to the surface in upwelling areas like along the equator.

Throughout the global ocean particulates sink to the bottom...dead whales, sunken ships, dead algae, trash & plastics.

Nearly 8 million tons of plastic enters the ocean each year. Creatures living over a mile deep have been found with plastic inside of them.

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Deep Sea Biodiversity

Most of the creatures we know about in the ocean live in the sunlit upper layer. Every time a scientist collects a sample from the deep sea, they discover a new species. Deep sea creatures have unique adaptations that allow them to live in this challenging environment.

Animals in the deep sea typically grow very slowly; some live to be over 100 years old. Some of these long lived, slow growing fish you see on dinner menus – Orange Roughy, “Butterfish”, and Perch.

Almost 1 in 10 people depend on fisheries for their livelihood. Fish accounts for 17% of animal protein consumed globally. Fish provides 3.1 billion people (44% population) with 20% of their animal protein intake.

Though Deep Sea Fishing only brings in a tiny fraction of the global annual fish catch, it leaves a devastating footprint on deep sea ecosystems.

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The deep sea is viewed as both the next frontier to explore and an untapped resource. Oil extraction from two miles deep is now routine, and many minerals are mined from the deep sea including Gold, Silver, and Copper, as well as Manganese, Nickel, and Zinc. These metals are very important, for example Manganese is an important element in the construction of steel, batteries, and electronics. The areas where these minerals are found are also very active and fragile underwater habitats. The Hawaiian Casper Octopus exclusively lays their eggs on sponges that grow on Manganese Nodules. A sound understanding of deep sea habitats is critical to inform sustainable mining practices.

Underwater Volcanic Activity

Over 75% of the World’s volcanic activity occurs at the bottom of the ocean. The deepest ocean eruption ever observed was the 4,000 feet deep West Mata volcano in the area between Samoa, Fiji and Tonga, observed in 2009. On April 24, 2015, the NSF Ocean Observatories Initiative was the first to ever detect in real time a volcanic eruption. Seismometers deployed on the OOI Cabled Array were able to detect an eruption at the Axial volcano as it happened and send data to shore in near-real time. Understanding volcanic and tectonic activity on the seafloor helps us better understand and predict earthquakes and tsunami waves.