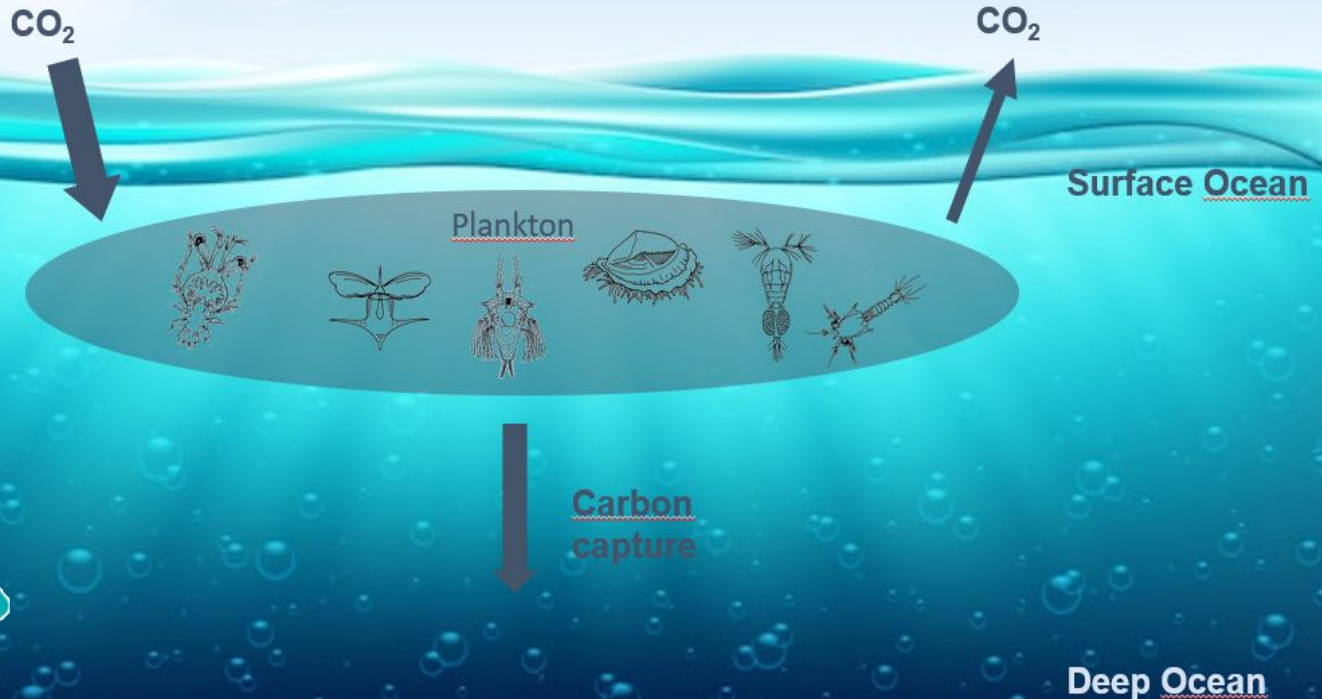


Oceanic carbon sink

99

Nearly 30% of the CO₂ emissions that humans produce are captured and stored by the ocean through two processes. A physical-chemical process and the biological pump.

Biological pump

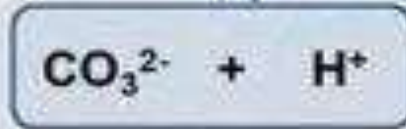
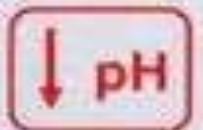
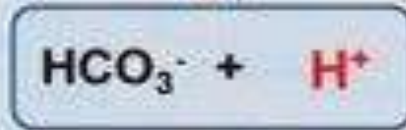
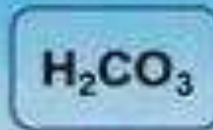


At the surface of the ocean, phytoplankton carry out photosynthesis using CO₂. These microscopic algae absorb CO₂ and convert it into organic matter and oxygen (O₂) using sunlight. When they die, some of the CO₂ is exported to the ocean floor and stored in sediments.

Ocean's chemistry

CO_2
atmosphérique

Echanges
océan-atmosphère





Atmospheric CO₂ dissolve naturally in the ocean. This phenomenon is more easily achieved at low temperatures. Cold water (more dense) sink and take the CO₂ with it.

Coastal pollution

A large green pipe is shown discharging a thick, yellowish, foamy liquid into the ocean. The water is turbulent and creates a large amount of white foam. The pipe is supported by a metal structure. The background shows the dark blue water of the sea.

99

Human beings release a lot of harmful substances in the ocean. These pollutants mainly come from agriculture and industry. They are full of nitrate and phosphate and they cause algae and marine plants proliferation. This facilitates biological pumping.

Ocean stratification

Epilimnion

Warm, less dense, oxygenated water

Metalimnion

Steady temperature decrease, prevents mixing

Hypolimnion

Cold, dense, anoxic water

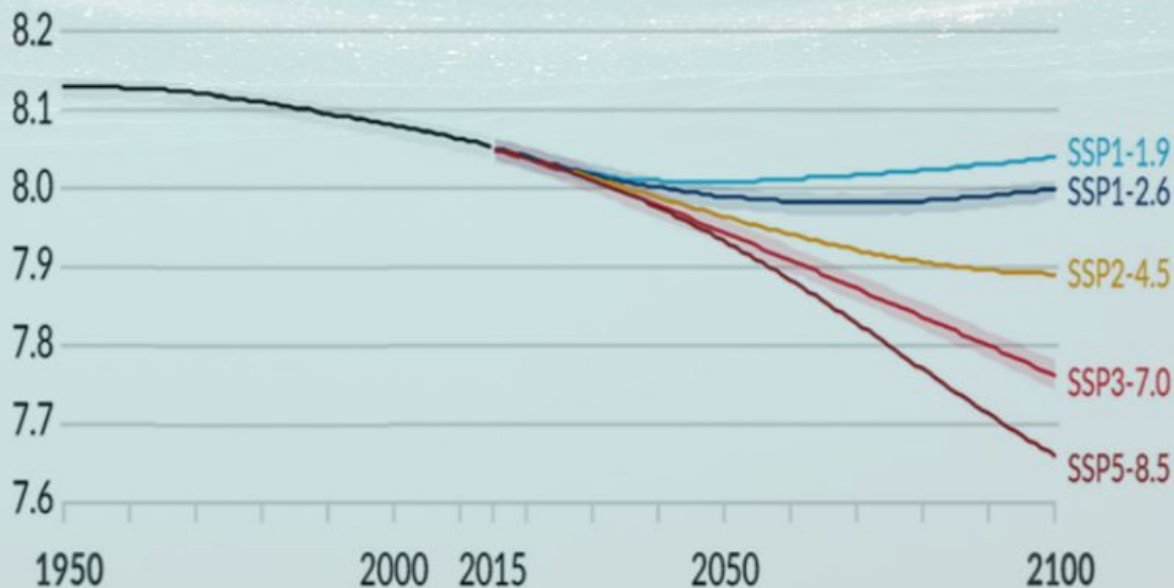
99

Waters with different chemico-physical properties have trouble to mix. Hence, surface waters heat up and can't pass absorbed CO₂ to the depths. This phenomenon increases surface acidification. Moreover, the marine biodiversity is impacted by the vertical exchange reduction of sediments.

Ocean Acidification

Ocean acidification according to RCP scenarios (pH)

Source : GIEC



When CO_2 dissolves in the ocean, it turns into acid ions (H_2CO_3 and HCO_3^-). This makes the oceans more acidic and the pH drops.

Rising Water Temperatures



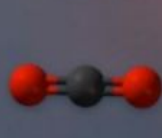
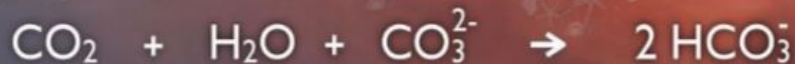


Oceans absorb 91% of the energy accumulated on Earth. The water temperature has therefore increased, especially close to the surface. Water expands as it warms.

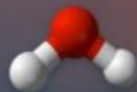
Calcification difficulties

HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?

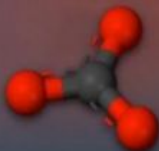
CO₂ absorbed from the atmosphere



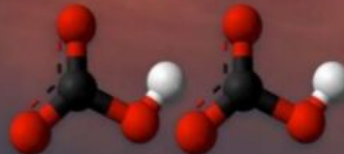
carbon dioxide



water



carbonate ion



2 bicarbonate ions

23

consumption of carbonate ions impedes calcification



When the pH drops, it becomes harder for calcium carbonate seashells to grow.

Marine Biodiversity

27





Pteropods and coccolithophores are at the base of the ocean food chain. If they are driven to extinction, all marine biodiversity will be threatened. Warming ocean waters also threaten marine biodiversity.