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THE INTERACTIONS
BETWEEN OCEAN AND CLIMATE

6 fact sheets for the general public



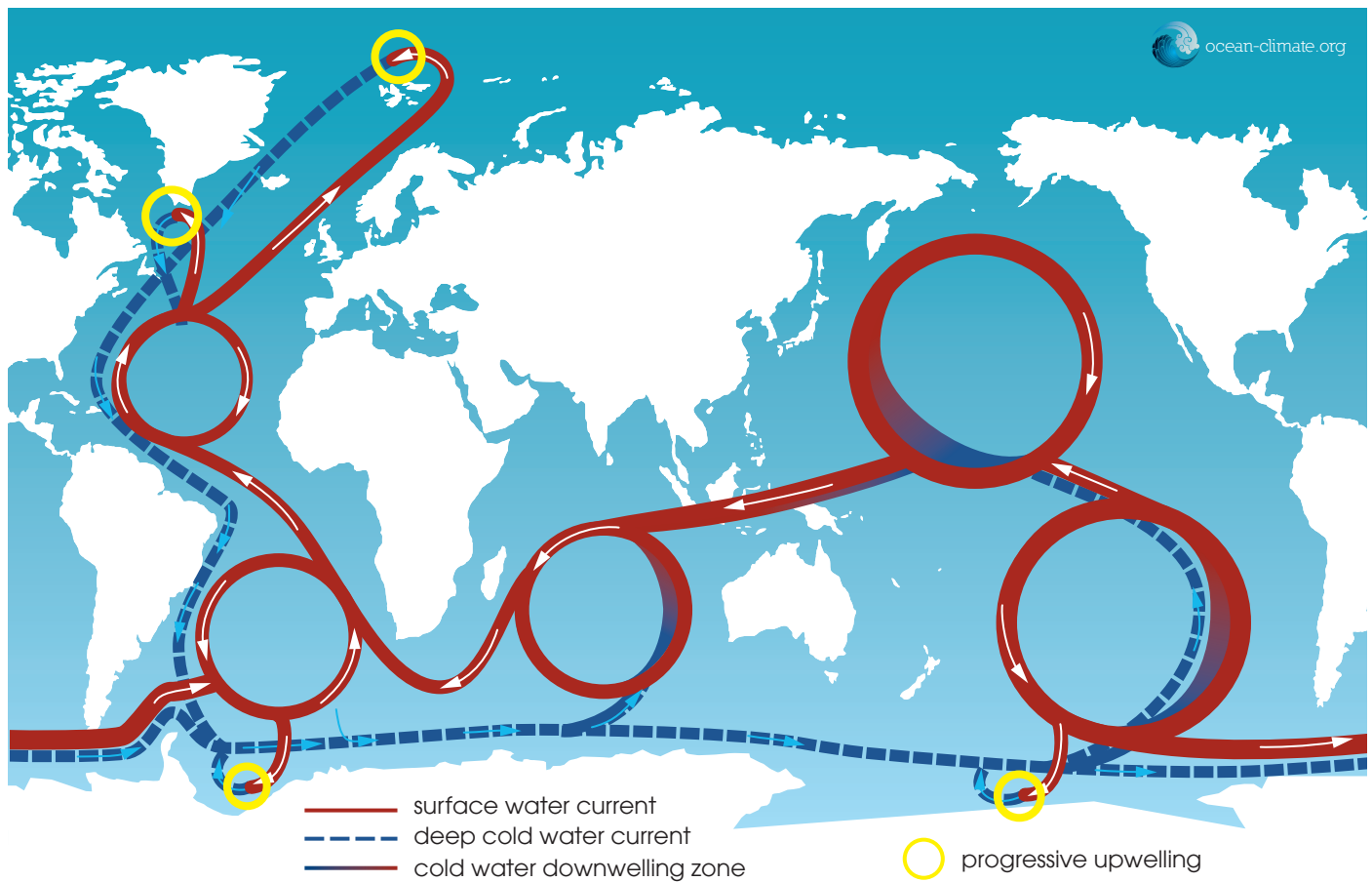
THE OCEAN, THE PLANET'S THERMOSTAT (1/2)

An Ocean is a Massive Pump!

The ocean is constantly exchanging with the atmosphere. It stores and distributes large amounts of heat around the globe via ocean currents. In this way, the ocean plays a key role for the global climate. However this regulatory mechanism is presently disturbed by global warming, consequence of the greenhouse effect.

The five oceans: the Atlantic, Pacific, Indian, Arctic and Southern, all communicate with each other, forming the global ocean. This huge mass of water affects the climate by absorbing solar energy and releasing heat. Indeed, the Ocean has a strong heat capacity which enables it to heat up and cool down very slowly. It is capable of storing approximately a thousand times more heat than the atmosphere. The ocean then restores this heat to the atmosphere over periods that can cover several centuries.

Ocean currents redistribute the absorbed solar energy. Ocean circulation is controlled by surface winds, by the rotation of the earth and by certain physical properties such as temperature and salinity. Warm water masses carry surface heat accumulated in the tropics near the poles, thus reducing latitudinal temperature differences. The Gulf Stream, for instance, fulfills this role. Coldwater currents at great depths follow the opposite direction. This global "conveyor belt" circulation contributes, with constant exchanges to and from the atmosphere, to the redistribution of heat across the planet.

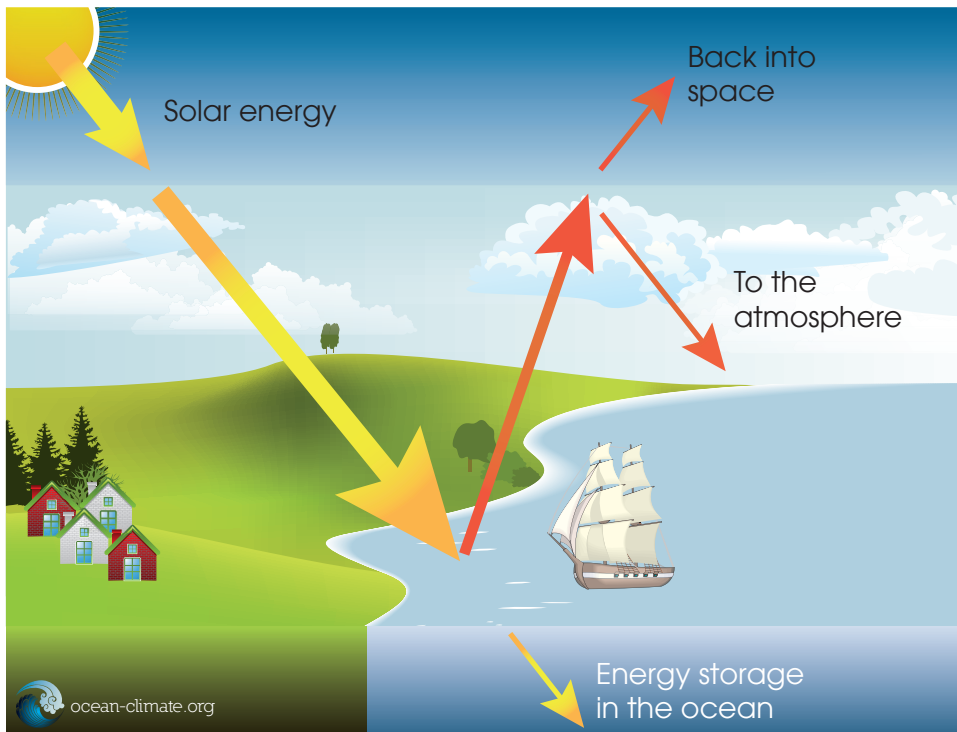


Simplified diagram of the global ocean circulation



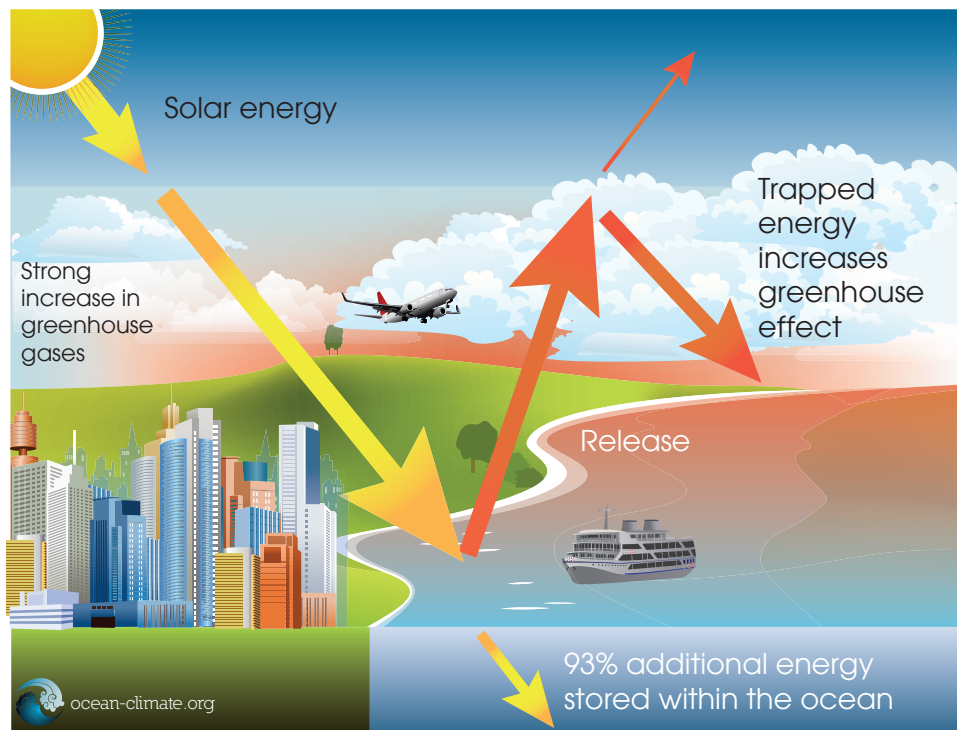
THE OCEAN, THE PLANET'S THERMOSTAT (2/2)

BEFORE INDUSTRIAL DEVELOPMENT



Ninety three per cent of the excess heat generated by human activities via the greenhouse effect is absorbed by the ocean, thus mitigating the increase in temperature of the atmosphere. This heat absorption causes a slight warming of the ocean which can be detected as deeply as seven hundred meters below sea level. It has now reached the deep sea in the polar regions and is spreading to all ocean basins. Considering the volume of the ocean this represents a significant amount of heat! However, even if greenhouse gas emissions ceased today, the effects of the increasing ocean temperature would continue for several decades.

CURRENT SITUATION



The global ocean therefore plays a role in the regulation and control of the large natural planetary balances. It regulates climate fluctuations. Indeed, the latter would be much more rapid and more powerful if they were only governed by the atmosphere.

The increase in temperature related to human activities affects all global thermal mechanics, including the ocean, while the ocean and the atmosphere continue to interact permanently.

Increase of the greenhouse effect