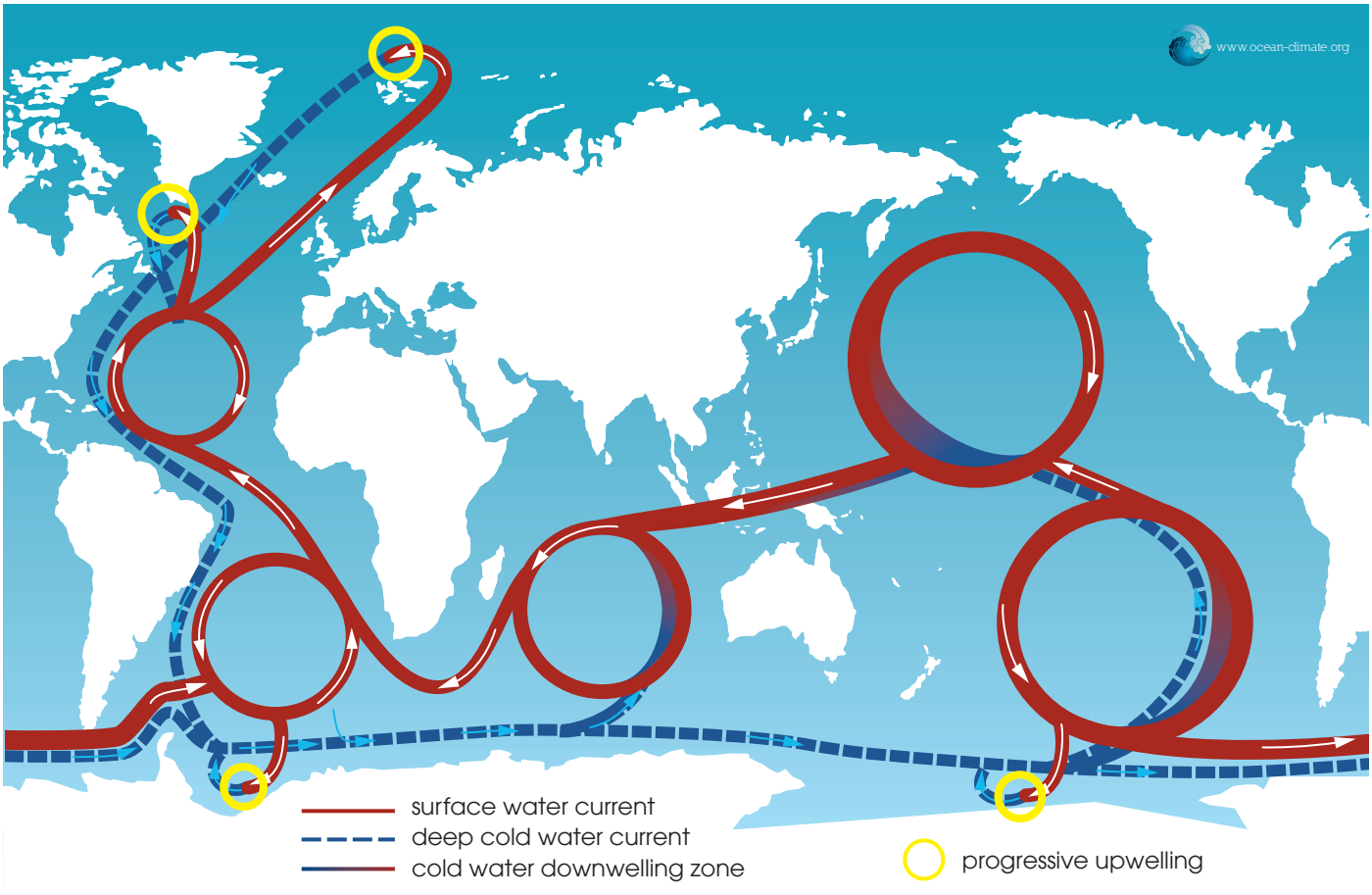
THE OCEAN, THE PLANET'S THERMOSTAT (1/2)

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. It can heat up and cool down very slowly and is capable of storing around a thousand times more heat than that of the atmosphere. The ocean then restores this heat to the atmosphere over periods that can cover several centuries.

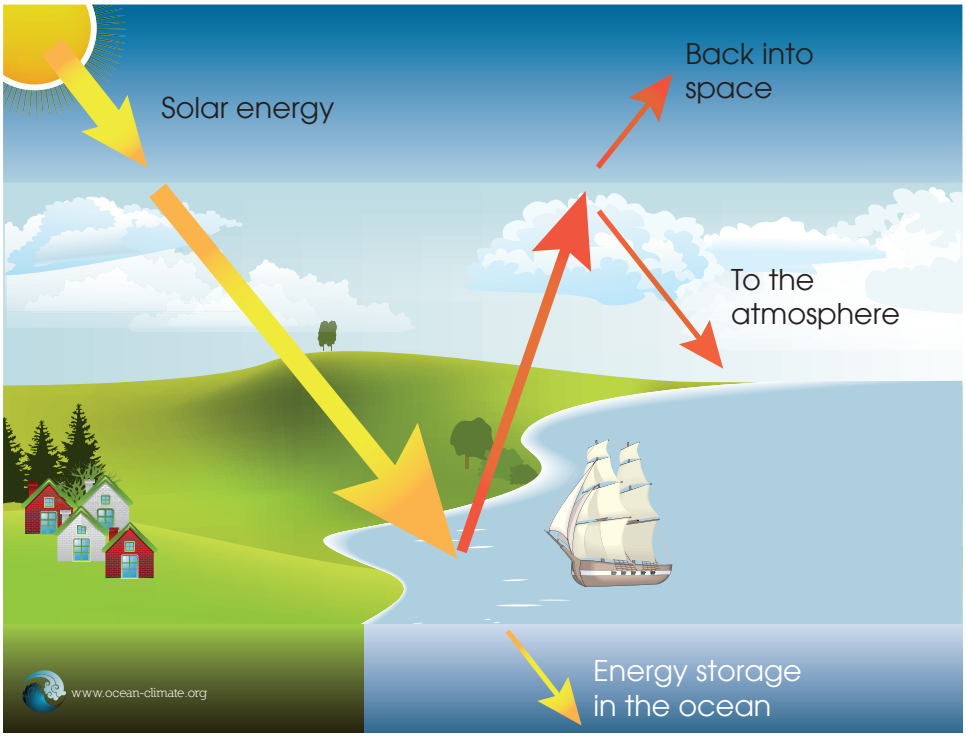
Ocean currents redistribute the absorbed solar energy. Ocean circulation is controlled by surface winds, by the rotation of the earth and by certain physical properties such as temperature and salinity. Warm water masses carry surface heat accumulated in the tropics towards the poles, thus reducing latitudinal temperature differences. The Gulf Stream, for example, has 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.



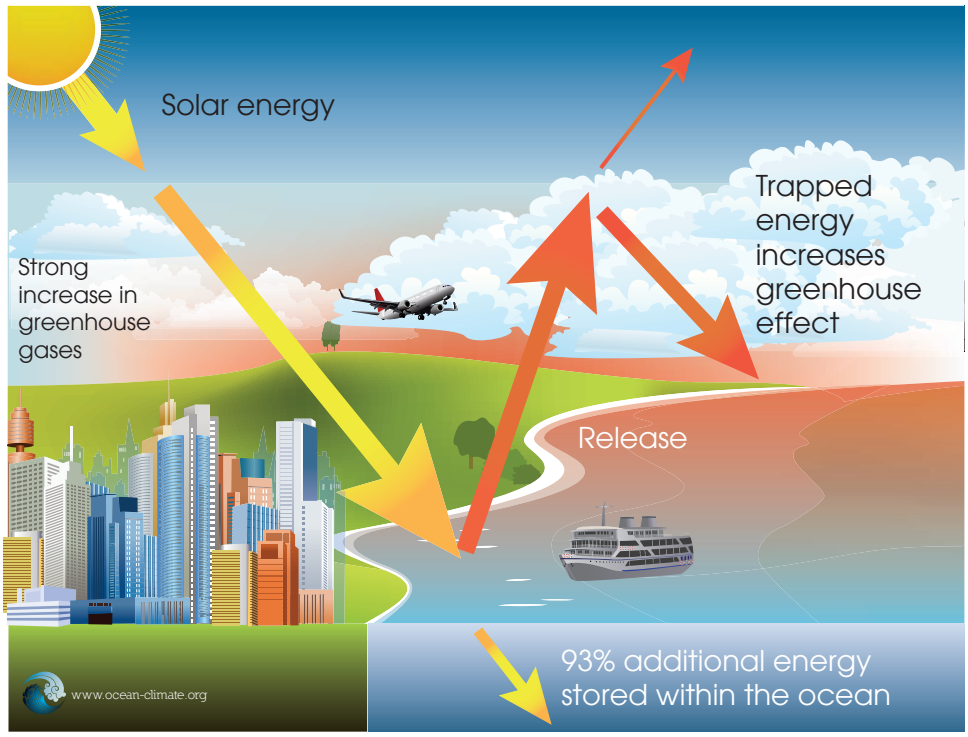
Simplified diagram of the global ocean circulation

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

BEFORE INDUSTRIAL DEVELOPMENT



CURRENT SITUATION



Increase of the greenhouse effect

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. This can be felt down to at least seven hundred meters depth. It has now reached the great depths of the polar regions and is being spread towards all the ocean basins. Given the volume of the ocean, this represents an enormous amount of heat! However, even if greenhouse gas emissions were to be interrupted today, the effects of the increasing ocean temperature would persist for several decades.

The global ocean therefore has 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 atmosphere continue to interact permanently.