OBSERVATION OF THE WORLD OCEAN

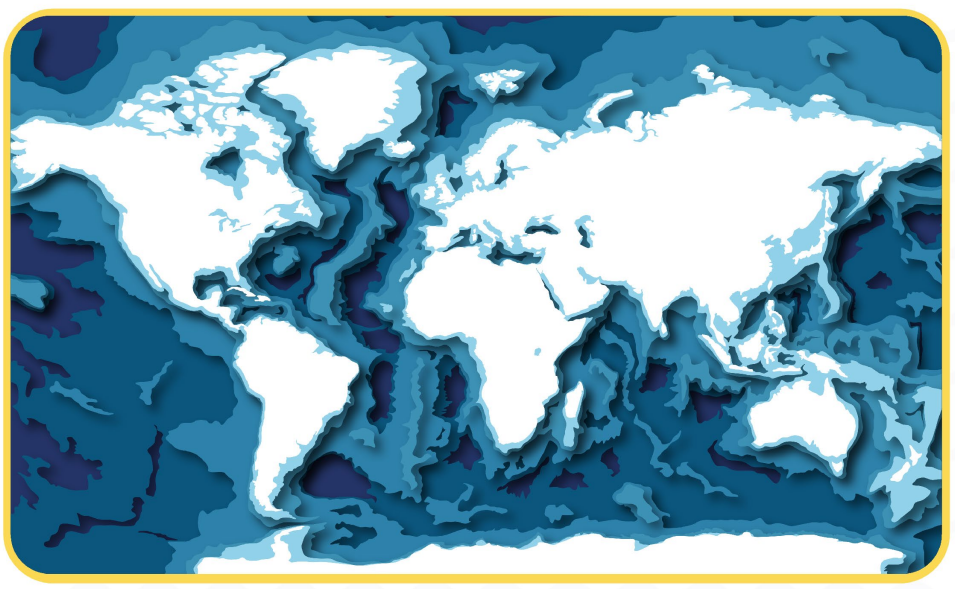
a variety of complementary tools

Ocean observation relies on the use of a multitude of tools. Aside from the research vessel, research is also carried out by remotely operated devices, whether satellites or robots.

Why do we observe the Ocean?

One reason for observing the Ocean is, first of all, **to understand it better, namely by making an inventory of the organisms it hosts or describing its properties (e.g. temperature or salinity).** This knowledge is particularly crucial for a better grasp of the Ocean's functioning and its role in regulating our climate.

It's a fact: the Ocean **stocks huge quantities of heat and gas (oxygen: O_2; carbon dioxide: CO_2), transports them via ocean currents, and exchanges them with the atmosphere.** At the same time, living organisms play a fundamental role in regulating CO_2. Our knowledge about these mechanisms needs to be deepened by observations that help us to understand the Ocean's current state and to predict its future evolutions.

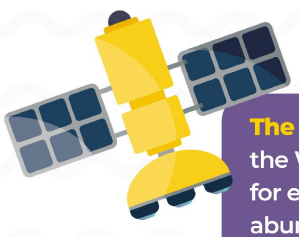


The Ocean stretches out over great depths that are difficult to access. **It therefore represents a mysterious "world" waiting to be discovered.** For example, a diver can, at best, dive to a depth of 100 m whereas the Ocean's average depth is 3800 m. There lies the challenge that oceanographers face in their explorations.

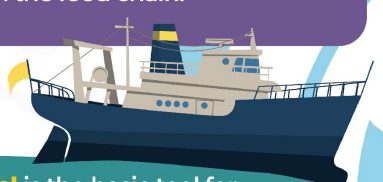
Which observation tools are used?

discover more

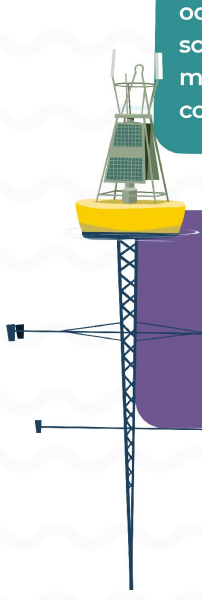
Oceanographers have access to a number of tools for observing the Ocean. But of course scientists can't measure everything, everywhere, all the time either. **They therefore have to set priorities for the properties they choose to measure, the duration and repetition of measurements, as well as the regions observed...** On the basis of these selections, oceanographers will define observation and exploration strategies that guide their choice of tools.



The "water colour" satellite observes the World Ocean daily, and enables us, for example, to compile maps on the abundance of phytoplankton, the first element in the food chain.



The research vessel is the basic tool for oceanography research. It can take many scientists on board to conduct in situ measurements. These measurements complement the ones taken by robots.

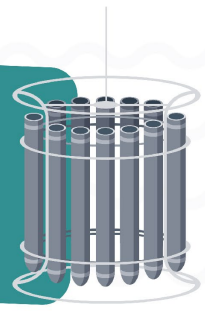


Instrumented moorings are anchored to the Ocean floor. They measure a variety of properties at different depths, every minute over a number of years.

Drifting buoys measure physical, chemical and biological properties at the Ocean's surface, related to CO2 exchanges between the Ocean and the atmosphere.

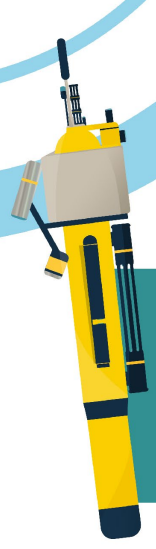
Surface drones are newly developed robots that allow us to observe and better grasp phenomena at the Ocean's surface and the processes involved in exchanges with the atmosphere.

Certain animals, such as elephant seals in the Southern Ocean, become oceanographers themselves when researchers temporarily equip them with miniaturised sensors.

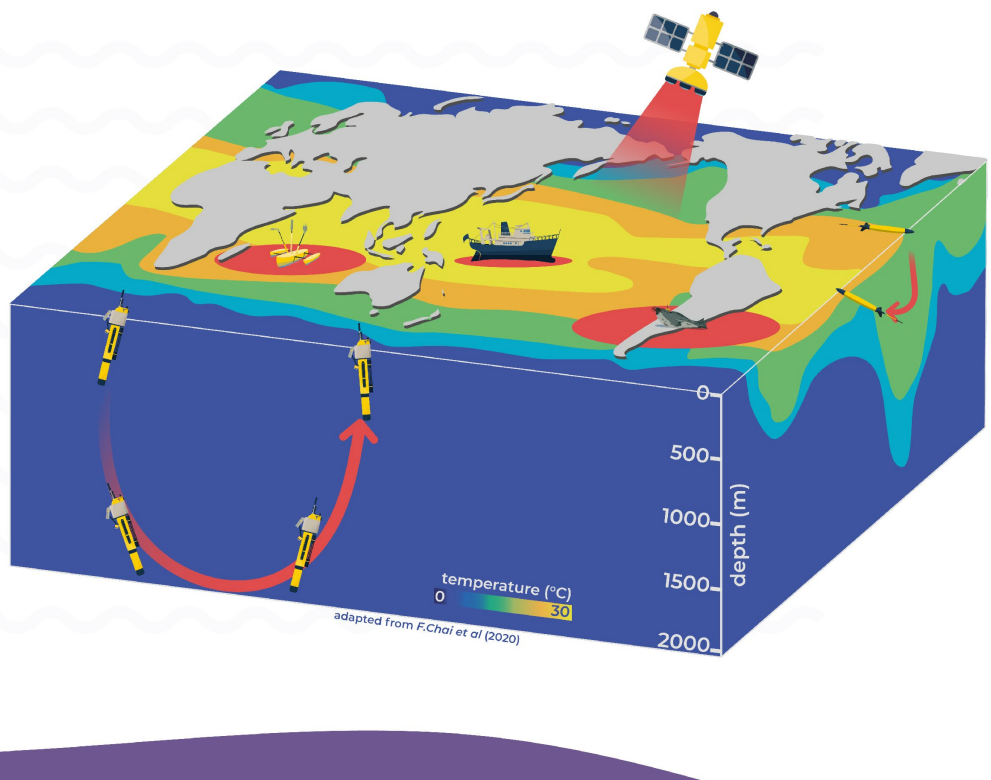


The rosette, deployed from a research vessel, allows seawater to be collected from the surface down to great depths, in order for a range of chemical and biological analyses to then be conducted.

The underwater glider is a robot that measures the Ocean's properties while moving about without a propeller. It can descend as far as 1 km deep and carry out missions lasting several months and over several thousand kilometres.



There are currently over 4000 **profiling floats:** robots that drift in the World Ocean and carry out measurements from the surface down to 2 km deep. They can operate over a number of years.



The different observation tools currently available can also be combined variously in order to meet the scientific objectives targeted.

For example, during an oceanographic campaign, a glider can be deployed around the vessel to "check" that the measurements made by the vessel are truly representative of the wider area. A profiling float can also be deployed just before the vessel leaves the region to measure how it evolves in the coming years.

It is possible to **combine measurements** made by satellites over the whole of the Ocean's surface (but only as far down as the first 50 metres), with measurements made at depth by profiling floats, **to gradually create a 3D representation of the Ocean.**

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