

Oceanographic water masses

- ▶ Complex multidimensional dynamics govern oceanographic water masses, and these are defined by specific internal parameters: temperature, chemical factors and physical factors (1), which regulate the distribution of living organisms, oceanic movements and circulation, and sedimentary processes.

Temperature: a limiting factor

- ▶ Temperature plays a crucial role in determining physical and chemical parameters, distribution of living organisms, and mineral dissolution and precipitation.
- ▶ At depths of 0 to 200 m, the average temperature is around 17.5°C with a maximum of 27 to 28°C in tropical regions and a minimum of -1.8°C in polar regions.
- ▶ It is higher, however, in surface waters from 0 to 50 m, warmed by solar radiation and stirred by currents and waves. Temperature drops around ten degrees between -50 and -120 m. Below 200 m, it continues to drop, but starting at 3000 to 4000m, waters are stable and isothermal (between 0 and 4°C depending on the region) (2).

Chemical composition: a guarantor of ocean life and sustainability

- ▶ Ocean water is a complex solution comprising elements of multiple origins: water (96.5%), gas, salt and over two thirds of all 94 known natural chemical elements (3) (4). Two types of components stand out: primary and secondary components.
- ▶ Primary or "conservative" constituents are by order of importance: chlorine, sodium, magnesium, sulfur, calcium, potassium, bromine, carbon, strontium and boron.
 - ❖ Salinity is a characteristic of ocean water and comes from the presence of chlorine and sodium. Average salinity is about 35 g/l. It ranges from 30 g/l in the North Atlantic to 40 g/l in the Red Sea.
- ▶ Secondary or "non-conservative" constituents are present in low concentration and content varies over time and space as they are part of biological processes (photosynthesis, living matter synthesis). These are nitrogenous mineral compounds (nitrites, nitrates, ammonia salts) and phosphorus.

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Ocean movements: regulators of climate and ecosystems

- ▶ Oceanographic water masses form a dynamic system driven by surface and deep-sea movements, which vary in scale from only a few tens of centimeters (lapping and small eddies) to thousands of kilometers (large currents) and which take place on different timescales.
- ▶ Surface and deep movements are generated by chemical variables*, Earth's rotation (Coriolis effect), planetary attraction (tides), atmospheric conditions (heat exchange, pressure, winds) and internal geodynamics (tsunamis, hydrothermal plumes) (5).

References :

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* Density, which depends on water mass salinity and temperature, is a fundamental parameter in ocean circulation as it drives deep density currents (stratification)