ATMOSPHERE AND MARINE ENVIRONMENTS: THEIR RELATIONSHIP IN AFFECTING CLIMATE CHANGES

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Although the phenomena that determine the dynamics of the climate are manifold and complexes, their first cause is unique: the solar energy. The absorption of the radiation coming from the Sun varies from a point to the other of the Earth according to many factors (period of the year, latitude, constitution of the surface etc.), provoking differences that extend to be balanced by the movements of the masses of air and by the oceanic tides. The climate of a region can be therefore thought as the state of equilibrium among the flow of energy in entrance and in exit. If we consider, the power for unity of surface received by the Sun to the various latitudes: it is evident that it is inferior to the poles that to the equator. Besides, in the Polar Regions, contrarily of those equatorial, the power for unity of surface sent forth by the Earth is superior to that receipt from the Sun. This energetic unbalance is partly compensated by the atmospheric circulation. If there was not the terrestrial rotation, the air would stir along a convective cell (the warm and damp air would climb to the equator and would reach the poles from where, after having gone down releasing heat and damp, it would return to the equator. In reality, because of the strength of Coriolis that deflects the winds toward right in the hemisphere North and toward left in the South hemisphere, three cells are created for every hemisphere: of Hadley (between equator and tropics), of Ferrel (between tropics and polar circles) and polar (between polar circles and poles).
As previously mentioned, also the oceanic tides contribute to the energetic equilibrium among poles and equator, in particular in the oceanic system the occurrence of thermohaline circulations strongly affect the transport of heat among equatorial and Polar Regions and they are due to the heat exchange and damp between atmosphere and ocean. The dense water, formed in some sites of the northern Atlantic, slowly spreads along the backdrops and moves in the Indian and Pacific oceans, before slowly rising again and to enter in the upper thermohaline circulation. The deep Antarctic water is produced in proximity of the Antarctica continent and flows both northward, in less salty and warm cells of circulation below saltier and warmer waters in the southern Atlantic, Pacific and Indian oceans through the Circumpolar Current insisting in the Southern ocean. The warm waters, flowing in the Atlantic and in the Pacific, close the great global thermohaline cells: their trip lasts around 1000 years.

The fitoplancton is most likely the best indicator of the biogeochemical oceanic cycles: it is the base of the trophic sea chain, it almost produces all the oxygen released by the oceans in the atmosphere and it is responsible of over the 40% of the global carbon fixation. Its biomass can be estimated by the chlorophyll-a concentration. Among the various possible techniques for the measure of the chlorophyll-a concentration, passive and active remote sensing can supply a strong contribution. The constellation of different ocean color passive remote sensing satellites can supply valuable information on the oceanic water optic characteristics, affected by the presence of different phytoplanktonic species, thus increasing the radiance emitted in the green and the absorbance in the blue and in the red wavelength spectral region. In the active remote sensing the fluorescence of the chlorophyll-a is observed (@ 680 nm) induced by an artificial source (for instance a laser emitting light @ 355 nm). The passive sensors have the advantage to furnish a global coverage and the disadvantage to be less accurate because of the interference originated from the reflectance and absorbance of the atmosphere. The limited ray of action of active sensors, installed on board of ships or from airplanes implicating smaller coverage and greater accuracy. The stream of lidar data, can be fruitfully used to develop regional bio-optical algorithms suitable to treat multispectral data of marine radiance. This approach has been successfully followed for chlorophyll primary productivity and CDOM in southern ocean and in the Antarctic Ross Sea.