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Ocean Respiration: New Concepts, New Significance, and New Applications

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Respiration defines life, even more so than photosynthesis. It is the fire of life, oxidizing organic matter to CO_2 with the concurrent remineralization of organically bound elements, reduction of environmentally available electron-acceptors, and production of biologically usable energy-currency molecules. Normally, in ocean studies, we measure respiration only to calculate net primary productivity or food requirements for key zooplankton species. But, respiration can yield much more information. In ocean water-columns it can afford time-space definition of the biological pumpvertical carbon flux and its transfer efficiency, heterotrophic energy production, water-mass nutrient retention efficiencyremineralization, and even benthic respiration metabolism and carbon burialsequestration. Advances in these respiration studies by the EOMAR team at the University of Las Palmas, Gran Canaria are presented here.

We explain the new concept of Nutrient Retention Efficiency, how to calculate vertical elemental flux from enzyme activities in plankton respiration, the importance of the curvature in the plankton respiration-depth profile, the calculation of heterotrophic energy production, from respiratory electron transport system activity, calculations of zooplankton respiration profiles from Hardy Longhurst-Hardy pPlankton Rrecorder samples, the real meaning behind Kleiber's Law, corroboration of the enzyme kinetic model of respiration, the calculation of seafloor respiration and benthic carbon burial from respiration-depth profile, and finally the role of stoichiometry in calculating potential physiological rates.

Keywords: Respiration, Carbon Flux, ETS, ATP, zooplankton

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