PROCESSES CONTROLLING THE AIR-SEA EXCHANGE OF OXYGEN IN SOUTHERN KANEOHE BAY, OAHU, HAWAII

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ABSTRACT

Measuring the net rate of exchange of O_2 across the air-sea interface is, in conjunction with CO_2 exchange, one of the most fundamental ways in which the trophic status of a system can be determined. This study investigates the annual averaged direction and magnitude of the O_2 flux across the air-sea interface of Southern Kaneohe Bay. The role of biological and physical mixing processes in the O_2 flux is also investigated. A Coral Reef Instrumented Monitoring Platform (CRIMP)-CO_2 buoy with pO_2, pCO_2, temperature, salinity, chlorophyll *a*, and turbidity instrumentation was deployed in the bay to measure the O_2 concentration of the surface waters and related parameters. The data collected were used to calculate the annual averaged magnitude and direction of the O_2 flux. Photosynthesis and respiration were the major controls on the changes in the O_2 content of the surface waters in Southern Kaneohe Bay. Turbulent mixing by winds played a major role in enhancing the O_2 flux. In spite of the tendency toward net autotrophy during storm events due to enhanced primary production induced by input of nutrients via storm runoff, the net air to sea O_2 flux during the course of this study was -0.104 mol O_2 m^{-2} yr^{-1}, suggesting that Southern Kaneohe Bay was a net heterotrophic system for the time period of the duration of this study.