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A preview of the ocean acidification effect on potential respiratory activity

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Increasing seawater CO_2 concentrations are causing pH decreases in the world ocean, Ocean Acidification. In response, several on-going research programs are evaluating the impact of acidification on marine organisms, intent to predict their future. In the KOSMOS GC14 mesocosm experiment we assessed the effect of different CO_2 concentrations on metabolism in microplankton (0.7-50µm size) and in biogenic particles harvested by sediment traps. Samples were collected from mesocosms anchored in Gando Bay, Gran Canaria (Canary Islands) from September to December 2014. These mesocosms consisted of eight 15m-long plastic tubes suspended vertically in the Bay. Each tube was charged with different pCO_2 levels ranging from 400 to 2000µatm. We measured potential respiration (respiratory electron transport system activity, Φ), potential respiratory CO_2 production (Isocitrate dehydrogenase enzyme, IDH) and protein biomass (B) in each mesocosm and in seawater, a kilometer away, as a control. In microplankton, the time-courses of all parameters were similar. However, the maximum values of Φ and B occurred in the most acidificated mesocosm (6.32 $\mu lO_2 \cdot h^{-1} \cdot L^{-1}$ and 0.201 $mgprot \cdot L^{-1}$, respectively). The maximum value for IDH (0.842 $\mu lCO_2 \cdot h^{-1} \cdot L^{-1}$) occurred in the 1000µatm mesocosm. In sediment traps, maximum values of all parameters occurred on day 41 of the experiment, but in tubes with different pCO_2 treatments. The maximum values for Φ and B occurred in the 1250µatm mesocosm (57.41 $mlO_2 \cdot h^{-1} \cdot L^{-1}$) and 1750µatm (457.32 $mgprot \cdot L^{-1}$) respectively, and the maximum value for IDH occurred in 2000µatm mesocosm (1.888 $mlCO_2 \cdot h^{-1} \cdot L^{-1}$).

Keywords: potential respiration, electron transport system, isocitrate dehydrogenase, ocean acidification, sediment traps, microplankton

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