

Coccolithophore response to marine alkalization: The results of ocean alkalinity enhancement exposure

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<https://doi.org/10.58998/jnr3206>

Understanding phytoplankton adaptation to changing ocean conditions is paramount when investigating both fossil and present-day assemblages. Ocean alkalinity enhancement (OAE) is carbon dioxide removal (CDR) technology aimed at increasing the ocean's CO₂ uptake capability by dispersing alkaline substances (e.g., Ca-hydroxide) on the ocean surface. Investigating the response of coccolithophores to this technology within an OAE mesocosm experiment has seldom been done, despite their potential effects on the ocean trophic chain and carbonate cycle.

Two sets of experiments were conducted where mesocosms were exposed to increasing concentrations of Ca-hydroxide slurry with two different trophic conditions and coccolithophore presences. These experiments took place at the CIM-ECIMAT (Marine Research Centre of the University of Vigo, CIM UVIGO) and CretaCosmos (Hellenic Centre for Marine Research, Crete) facilities. Coccolithophore assemblage composition and abundances were assessed through optical microscopic analysis of filtered mesocosms seawater. The results indicate that there is coccolithophore sensitivity to mesocosm confinement. Interestingly, a slightly positive correlation to low slurry concentration was observed, whereas a high slurry concentration was detrimental to coccolithophore abundance. The same kind of response was observed in diatoms in experiments conducted in Crete, and a comparison with the diatom abundance patterns shows a similarity between the two groups. Finally, a tentative coccolithophore morphological analysis was performed on some samples. These findings could provide a baseline for understanding the potential adaptation of coccolithophores to changes in ocean alkalinity.