

Direct and indirect evidence of coccolithophore activity in the deep euphotic zone: A review

Josué G. Millán, Amos Winter

Indiana State University, Department of Earth and Environmental Systems, Terre Haute, Indiana 47809, USA; Jmillan1@sycamores.indstate.edu, Amos.Winter@indstate.edu

A large part of our knowledge of oceanic primary productivity comes from satellite information. Satellites are a valuable tool that offers convenient remote access for monitoring marine surface conditions and providing periodic observations, and this accessibility to spatial and temporal information has provided important contributions to marine sciences. However, our understanding of primary productivity dynamics is restricted to the surface layer because of the satellites' limited capacity to reach environmental processes and population dynamics that occur deeper in the water column. Little is known about the deep euphotic zone (DEZ) because most studies of phytoplankton distributions in relation to environmental conditions and carbonate chemistry are limited because studies must rely on using ships of opportunity. Moreover, the literature studying phytoplankton populations has omitted, incorrectly classified or misinterpreted data from coccolithophore communities, resulting in the mischaracterisation of the population dynamics occurring in the DEZ. Only a handful of studies have observed monthly/seasonal phytoplankton changes in the DEZ in which the coccolithophore communities have been fully characterised. Coccolithophores contribute to the base of the marine food web and play an essential role in the cycling of carbon. Therefore, it is critical to our understanding of the biogeochemistry of the Earth system to identify the partitioning of carbon between the surface and deep layers in the marine environment. This integration allows us to expand our knowledge of the role and contribution of coccolithophores to the carbon pump, as well as their sensitivity to changes in carbonate chemistry and ocean acidification.