

Spatial and Temporal Patterns of Chlorophyll Concentration in the Southern California Bight

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EXECUTIVE SUMMARY

Distinguishing between local, anthropogenic nutrient inputs and large-scale climatic forcing as drivers of coastal phytoplankton biomass is critical to developing effective nutrient management strategies. Here we assess the relative importance of these two drivers by comparing trends in chlorophyll-a in coastal (0.1–16.5 km) to offshore (17–700 km) areas, hypothesizing that coastal regions influenced by anthropogenic nutrient inputs would have different spatial and temporal patterns in chlorophyll-a concentration from offshore regions where coastal inputs are less influential. Quarterly CTD fluorescence measurements collected from three southern California continental shelf regions since 1998 were compared to chlorophyll-a data from the more offshore California Cooperative Fisheries Investigations (CalCOFI) program during the same period. We found the trends in the coastal zone were comparable to those offshore, with a gradual increase in total chlorophyll-a and a shallowing of the subsurface chlorophyll-a maximum depth since the beginning of observations, followed by chlorophyll-a declining and deepening from 2010 to present. An exception was the northern coastal part of SCB, where chlorophyll-a continued increasing after 2010. The observed trends appear to be strongly associated with ocean physical environment. The long-term increase in chlorophyll-a prior to 2010 was correlated with increased nitrate concentrations in deep waters, while the recent decline was associated with deepening of the upper mixed layer. The observed trends in chlorophyll-a appear to be linked to the low-frequency climatic cycles of the Pacific Decadal Oscillation and North Pacific Gyre Oscillation. These large-scale factors affecting the physical structure of the water column may also influence the biological response to terrestrially derived nutrient sources, making it difficult to distinguish the effects of anthropogenic inputs on chlorophyll along the coast.

Full Text

http://ftp.sccwrp.org/pub/download/DOCUMENTS/JournalArticles/998_BightChlorophyllPatterns.pdf

