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Nutrient and temperature controls on modern carbonate production: An example from the Gulf of California, Mexico

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In addition to salinity and temperature, nutrient concentrations in surface waters are known to have a significant impact on distribution of carbonate-producing biota, but have never been quantitatively evaluated against different temperatures along a latitudinal transect. The western coast of the Gulf of California, Mexico, presents a natural laboratory for investigating the influence of oceanographic parameters such as salinity, temperature, and chlorophyll a, a proxy for nutrients, on the composition of a range of modern heterozoan and photozoan carbonate environments along a north-south latitudinal gradient spanning the entire warm-temperate realm (29°N–23°N). Chlorophyll a, measured in situ at halfhour resolution, is highly variable throughout the year due to short-term upwelling, and increases significantly from the southern to northern Gulf of California. Salinity, in contrast, fluctuates little and remains at an average of 35‰. From south to north, carbonate production ranges from oligotrophic-mesotrophic, coral reef–dominated shallow-water areas (minimum temperature 18.6°C) through mesotrophic-eutrophic, red algal–dominated, inner-shelf carbonate production in the central gulf (minimum temperature 16°C), and to molluscan-bryozoan, eutrophic inner- to outer-shelf environments (minimum temperature 13.7°C). The Gulf of California data, supplemented with oceanographic and compositional information from a database compiled from a spectrum of modern carbonate systems worldwide, demonstrates the significance of nutrient control in the formation of heterozoan, photozoan, and transitional heterozoan-photozoan carbonate systems and serves as a basis for more accurately interpreting fossil carbonates.

Palabras clave: Specialist, Nutrients, Heterozoan, Photozoan, chlorophyll