

Temporal and spatial variations in oceanic carbonate system in the central and western equatorial Pacific

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Distributions of total inorganic carbon (TCO₂) and other oceanic CO₂ parameters such as pCO₂ and pH in the upper layer of the central and western equatorial Pacific (138E - 160W) have been surveyed during ten cruises since 1994. In the eastern part of the equatorial Pacific, SST is lower, salinity is higher, and pCO₂ and TCO₂ are higher. They showed a significant spatial and temporal variability with the phase of the ENSO event. However, a least square fitting to these surface data and those in 1990s available from CDIAC in the equatorial Pacific (138E-90W, 1S-1N) gave an empirical relationship between salinity-normalized TCO₂ (NTCO₂) and SST that covered both warm and cold phases of the ENSO event.

The variability of TCO₂ are explained by the variability of atmosphere-ocean dynamic interaction and oceanic biological activities. This TCO₂-SST relationship, together with alkalinity, is to be used for the estimates of pCO₂ from SST fields in the equatorial Pacific within the uncertainty of 20 uatm. In addition, net community production (40 mmolm⁻²day⁻¹ in the central equatorial Pacific in January 1999) was evaluated from the empirical NTCO₂ & SST relationship and a simple horizontal transport model.

NTCO₂-nutrient relationships suggests that diatoms play rather minor role in the net TCO₂ consumption and Prochlorococcus may be important.