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Increased CO_2 reinforcing the contrast of continental and ocean temperature: A case study from United States

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Concentration of carbon dioxide in atmosphere act as one of the major climatic factors that controls the global mean temperature and the temperature distribution in landmass and ocean. The positive correlation (Pearson's R = 0.96) of pCO_2 levels [1] in the atmosphere during four different Phanerozoic time windows with the difference in the temperature of coastal with the open marine revealed the effect of thermal specific heat in driving the temperature of ocean water away from the continent. Coastal water temperature is reconstructed from the mean clumped isotope temperature [2] derived from otoliths of Cretaceous, Eocene, Oligocene and Pleistocene sedimentary sequences of United States. Whereas open marine temperature is estimated using the mean temperature values available from same time frame using other proxies e.g., TEX_{86}, Mg/Ca from the drill core samples. A trend showing saturation of temperature difference with a higher quantum of CO_2 suggests an ice-free world has high heat capacity, making the water sluggish in terms of the hydrological cycle. The evolution of the oxygen isotope composition of coastal water using the LOESS method also shows a gradual shift towards lighter composition (from 2.3 to -1.4‰) due to increased glacial input from the continental ice sheets. The correlation is validated using the available sea surface temperature data [3] from Pacific and Atlantic Ocean as well as mean annual temperature of US landmass. This shows that the continental and open marine temperature contrast is similar for both of these surrounding oceans and correlated with the increasing trend of pCO_2(ppm) levels documented from recent observations.

Refs: [1] Ghosh et al., 2006 GCA 70; [2] Royer et al., 2004 GSA Today 5173; [3] NOAA National Time Series, 2022.