Foraminiferal Records: Orbital Forcing Drives Western Pacific Warm Pool Surface and Thermocline Dynamics in the Bismarck Sea Over the Last 280 Kyr

Bayne, Christina (School: Elmont Memorial Junior-Senior High School)

The South Pacific Convergence Zone (SPCZ) is the largest band of precipitation in the Southern Hemisphere stretching from the Western Pacific Warm Pool (WPWP) to French Polynesia. The WPWP contains the warmest marine waters in the world, driving deep atmospheric convection. With recent reconstructions of hydrography in the WPWP demonstrating glacial/interglacial variability, the influence of orbital forcing on tropical dynamics warrants further consideration. Changes within thermocline water temperature and salinity align with glacial-interglacial transitions, which are known to occur at regular intervals based on the Earth's orbital forcing. However, the influence of obliquity angle maxima and precession minima alignment on tropical surface and thermocline dynamics is not fully understood. This research aims to compare temperature changes of the surface and thermocline in the WPWP to orbital forcing over the last 280 Kyr through the use of planktonic foraminiferal Mg/Ca ratios. Sediment cores were analyzed for Mg/Ca ratios in the three foram species: Globorotalia tumida (tumida), Globigerinoides ruber (ruber), and Pulleniatina obliquiloculata (obliq), which calcify at different depths in the WPWP. After samples were prepped for data analysis Mg/Ca ratios were determined by ICP-MS and then converted to temperature. Warming periods between 140-120 ka and 20-0 ka were noted. These periods notably corresponded with the alignment of obliquity angle maximum and precession minima. Statistical analysis verified the significant ($p < .01$) relationship between alignment of obliquity angle maxima and precession minima with warming surface and thermocline temperatures. Ultimately, this research provides a baseline for long-term climate shift forecasting.

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