Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.30638

AI Modeling of Carbon Sequestration Responses to Climate Change in the Western Pacific

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Forecasts, such as the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6), provide reliable predictions of global warming. To understand how ocean biogeochemistry responds to this warming trend, semi-analytical models like the widely used Vertically Generalized Production Model (VGPM; Behrenfeld & Falkowski, 1997) are often applied. Previous studies in the South China Sea indicate that primary production (PP) decreases in a warming climate (Shih et al., 2021). Further research suggests that particulate organic carbon (POC) export, a key mechanism driving carbon sequestration into deep water, also declines under warming conditions. However, studies in the East China Sea indicate that POC export is not highly temperature-dependent.

Given the variability in biogeochemical characteristics across different regions, an AI-based approach offers greater adaptability and accuracy. This study will employ a back-propagation neural network (BPN) to develop AI models using sediment trap data from the East China Sea, South China Sea, and western North Pacific Ocean (Hung et al., 2024). The model will be trained on various environmental factors, optimized by minimizing root mean square error (RMSE), and applied to assess carbon sequestration changes under different warming scenarios. By comparing results across locations, this study aims to provide insights into the spatial variability of carbon sequestration responses to climate change.

References

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