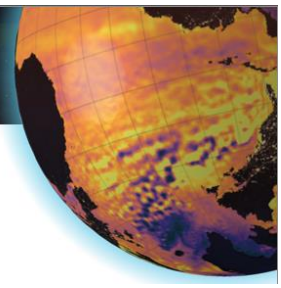

Quantifying the Causes of Winter and Summer Phytoplankton Blooms in Gwangyang Bay, Korea: A Numerical Model Approach

Phytoplankton in mid-latitude regions typically exhibit seasonal variations with peaks in spring and fall. However, in Gwangyang Bay, which is a shallow, well-mixed, low-turbid, and nutrient-rich temperate ecosystem, chlorophyll concentrations are higher in winter and summer than in spring and fall. While few studies have documented winter blooms in the open ocean, the literature suggests that potential factors such as vertical mixing, upwelling, marine heatwaves, resuspension processes, and cold temperatures can trigger winter and summer blooms. A deeper understanding of winter blooms is needed, especially in coastal areas where influencing factors are more complex than the open ocean. The ecological conditions in Gwangyang Bay, situated downstream from the Sumjin River, are greatly affected by changes in river discharge. Previous studies on Gwangyang Bay have suggested possibilities that various factors, including light availability, temperature changes, nutrient levels, trophic cascades, and shifts in dominant species could influence phytoplankton biomass. However, the effects of these ecological factors on the blooms have not been quantified. The ROMS-Laurent model was utilized to quantify the impact of these seasonal changes on primary production in Gwangyang Bay. This research aims to quantitatively explore how seasonal variations in light, temperature, nutrient levels, and river discharge affect primary production through sensitivity tests.

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