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Ecosystem change in the western North Pacific due to global change obtained by 3-D ecosystem model

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We developed a 3-D ecosystem-biogeochemical model based on NEMURO of PICES and applied it to the western North Pacific in order to predict effects of global warming on ecosystem dynamics and biogeochemical cycles. Using data sets of observed climatology and simulated fields according to a global warming scenario, IS92a (CO-AGCM developed by CCSR/NIES) as boundary conditions for our ecosystem model, we conducted the present and global warming experiments. Model results in the global warming experiment show increases in vertical stratification due to rising of temperature. As a result, nutrient and chlorophyll-a concentrations in the surface water decrease at the end of the 21st century, and the dominant phytoplankton group shifts from diatom to the other small phytoplankton. The P/B ratio slightly increases from that in the present due to improvement in temperature conditions, although nutrient conditions become worse. The increase in the P/B ratio causes increases in the NPP and GPP, although new and export productions decrease. Increases in the regeneration rates (i.e., decrease in the e-ratio) also contribute to increases in NPP and GPP through nutrient supplies within the surface water. Changes in seasonal variations of biomass and dominant phytoplankton group in the subarctic-subtropical transition region associated with the global warming are the largest in all regions. The diatom spring bloom occurs early by a half-month from that in the present due to the strengthened stratification. The maximum biomass in the spring bloom drastically decreases from that in the present due to the decreases in nutrient concentration.