

Ecosystem modeling of ice and ocean carbon production in the Arctic

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In the Arctic Ocean, both phytoplankton and sea ice algae are important contributors to the primary production and the arctic food web. A coupled ice algal and ocean phytoplankton ecosystem was developed within the global sea ice and ocean climate model POP-CICE (Parallel Ocean Program- Los Alamos Sea Ice Model). The model results were validated with various observations of Chl and primary production. The model results compared well with the following observations and observed trends: 1) an increase of ocean primary production from 2003 to 2007 in the arctic open water areas as derived from remote sensing data; 2) regional annual ice and ocean primary production measured in the Bering and Chukchi seas, and Canadian Basin; 3) primary production rate with phytoplankton size composition and Chl-a concentration along an arctic cruise track in the Chukchi Sea and Canadian Basin from August 2 to September 7, 2008; 4) observed decadal changes of ocean primary production from the 1990s to 2007 due to rising temperature and increasing open-ocean area in the western Arctic. The changes were shown as a trend of a northward shift of production with a decrease in the Bering Sea and an increase in the arctic shelf.

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