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TITLE: Phytoplankton class?specific primary production in the world's oceans: Seasonal and interannual variability from satellite observations

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ABSTRACT:

We apply an innovative approach to time series data of surface chlorophyll from satellite observations with SeaWiFS (Sea?viewing Wide Field?of?view Sensor) to estimate the primary production associated with three major phytoplankton classes (micro?, nano?, and picophytoplankton) within the world's oceans. Statistical relationships, determined from an extensive in situ database of phytoplankton pigments, are used to infer class?specific vertical profiles of chlorophyll a concentration from satellite?derived surface chlorophyll a . This information is combined with a primary production model and class?specific photophysiological parameters to compute global seasonal fields of class?specific primary production over a 10?year period from January 1998 through December 2007. Microphytoplankton (mostly diatoms) appear as a major contributor to total primary production in coastal upwelling systems (70%) and temperate and subpolar regions (50%) during the spring?summer season. The contribution of picophytoplankton (e.g., prokaryotes) reaches maximum values (45%) in subtropical oligotrophic gyres. Nanophytoplankton (e.g., prymnesiophytes) provide a ubiquitous, substantial contribution (30?60%). Annual global estimates of class?specific primary production amount to 15 Gt C yr ?1 (32% of total), 20 Gt C yr ?1 (44%) and 11 Gt C yr ?1 (24%) for micro?, nano?, and picophytoplankton, respectively. The analysis of interannual variations revealed large anomalies in class?specific primary production as compared to the 10?year mean cycle in both the productive North Atlantic basin and the more stable equatorial Pacific upwelling. Microphytoplankton show the largest range of variability of the three phytoplankton classes on seasonal and interannual time scales. Our results contribute to an understanding and quantification of carbon cycle in the ocean.

SOURCE: Global biogeochemical cycles

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