**Recent decadal trends in global phytoplankton composition**

Cecile S. Rousseaux 1,2 and Watson W. Gregg 1

1 Global Modeling and Assimilation Office, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA

2 Universities Space Research Association, Columbia, Maryland, USA

Abstract

Identifying major trends in biogeochemical composition of the oceans is essential to improve our understanding of biological responses to climate forcing. Using the NASA Ocean Biogeochemical Model with ocean color data assimilation, we assessed the trends in phytoplankton composition (diatoms, cyanobacteria, coccolithophores and chlorophytes) at a global scale for 1998-2012. We related these trends to physical conditions (surface temperature, surface photosynthetically available radiation [PAR] and mixed layer depth [MLD]) and nutrients (iron, silicate and nitrate). We found a significant global decline in diatoms (-1.22% y-1, P<0.05) that was associated with a significant shallowing of the MLD (-0.20% y-1), a significant increase in PAR (0.09% y-1) and a significant decline in nitrate (-0.38% y-1). The global decline in diatoms was mostly attributed to their decline in the North Pacific (-1.00% y-1) where the MLD shallowed significantly and resulted in a decline in all three nutrients. Regionally, there was a decline in nutrients in the northernmost latitudes that coincided with a significant decline in diatoms (North Pacific, -1.00% y-1) and chlorophytes (North Atlantic, -9.70% y-1). In the northern mid-latitudes (North Central Pacific and Atlantic) where nutrients were more scarce, a decline in nutrients led to a significant decline in the smaller cyanobacteria (North Central Pacific, -0.72% y-1; Atlantic, -1.56% y-1) and coccolithophores (North Central Atlantic, -2.06% y-1). These results provide a first insight into the existence of trends in phytoplankton composition over the maturing satellite ocean color era and illustrate how changes in the conditions of the oceans may have affected them.

1 Cecile.S.Rousseaux@nasa.gov

2 Watson.Gregg@nasa.gov