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TITLE: Global trends in ocean phytoplankton: a new assessment using revised ocean colour data

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ABSTRACT:

A recent revision of the NASA global ocean colour record shows changes in global ocean chlorophyll trends. This new 18-year time series now includes three global satellite sensors, the Sea-viewing Wide Field of view Sensor (SeaWiFS), Moderate Resolution Imaging Spectroradiometer (MODIS-Aqua), and Visible Infrared Imaging Radiometer Suite (VIIRS). The major changes are radiometric drift correction, a new algorithm for chlorophyll, and a new sensor VIIRS. The new satellite data record shows no significant trend in global annual median chlorophyll from 1998 to 2015, in contrast to a statistically significant negative trend from 1998 to 2012 in the previous version. When revised satellite data are assimilated into a global ocean biogeochemical model, no trend is observed in global annual median chlorophyll. This is consistent with previous findings for the 1998–2012 time period using the previous processing version and only two sensors (SeaWiFS and MODIS). Detecting trends in ocean chlorophyll with satellites is sensitive to data processing options and radiometric drift correction. The assimilation of these data, however, reduces sensitivity to algorithms and radiometry, as well as the addition of a new sensor. This suggests the assimilation model has skill in detecting trends in global ocean colour. Using the assimilation model, spatial distributions of significant trends for the 18-year record (1998–2015) show recent decadal changes. Most notable are the North and Equatorial Indian Oceans basins, which exhibit a striking decline in chlorophyll. It is exemplified by declines in diatoms and chlorophytes, which in the model are large and intermediate size phytoplankton. This decline is partially compensated by significant increases in cyanobacteria, which represent very small phytoplankton. This suggests the beginning of a shift in phytoplankton composition in these tropical and subtropical Indian basins.

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