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A new innovative way for semi-automated measurements of phytoplankton primary production

Phytoplankton primary production forms the basis of marine food webs. Most measurements of marine primary production (PP) are based on the C14-technique, which measures the uptake of radioactive labelled CO2. Unfortunately there is a decrease in the number of primary production measurements all over the world, partly due to health and safety reasons which make it more and more difficult to use radioactive tracers on board ships. This makes it increasingly difficult to assess the functioning of the marine ecosystem and to assess the effects of global changes versus man-induced changes, for which long term time series are a necessity. As phytoplankton biomass is the result of both top-down and bottom up control, and because of the rapid turnover of phytoplankton cells, chlorophyll-a (chla) is a poor proxy for PP and there are several examples in the literature where a decrease in PP is not accompanied by a decrease in chla. In this presentation we will demonstrate that application of semi-automated Fast Repetition Rate Fluorometry (FRRF) can be a good alternative to measure phytoplankton PP. We will show measurements made on ships in the Dutch Delta, the Belgian and Dutch North Sea and discuss how FRRF measurements (which measure photosynthetic electron transport) and CO2-fixation are coupled. In addition we will show measurements of an automated setup on a jetty in the western Wadden Sea (Marsdiep basin) where the photosynthetic activity is measured continuously and this time series reveals a highly regulated diurnal pattern in activity.

Keywords: phytoplankton, primary production, FRRF