Abstract

Rapid in situ measurements of some components of fluorescent spectra are now possible with submersible multi-wavelength fluorometers, which implies that phytoplankton composition can be measured, at least implicitly, at a spatial resolution that allows many scales of patches to be resolved. We present a method for identifying the location of patches of distinct fluorescent groupings of phytoplankton by using principal component analysis (PCA) to process in situ spectral data. The processing method potentially allows retention of more information from the raw data than existing methods because it depends on fewer assumptions. Furthermore, it can be applied without the need for site-specific calibration of the fluorometer. A series of idealized spectral data sets were used to explain the conceptual basis of the approach; the method was then applied to field spectral data sampled in Lake Victoria, Kenya. The results demonstrate that the main features of large sample sets of multi-component spectral data can be summarized in a single graph that reveals the number of spectrally distinct groups of phytoplankton at the site, and allows information about the spatial structure of those different phytoplankton groups to be derived from subsequent analysis. In this way, fluorescent spectral data collected at high spatial resolution can be used to identify the locations of patches and facilitate targeted water sample collection from those locations to investigate the species diversity and distribution at a study site.