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Abstract

A seasonal variation of phytoplankton community structure in Shimizu Port was estimated from photosynthetic pigment compositions based on a nonlinear optimization algorithm. Observations were carried out 20 times from February 2006 to February 2007 at 7 stations. 7 major pigments including chlorophyll-a were quantified by HPLC, and five dominant classes of alga were selected for the analysis based on microscopic observations. Obtained station-pigment data matrix **Y** for each observation date was decomposed to the product of an alga-pigments matrix **A** and a station-alga matrix **X** simultaneously by using a nonlinear optimization program equipped in Microsoft Excel Solver. Each element of matrix **X** was constrained to be non-negative, and each element of matrix **A** was limited within a minimum and a maximum values. A time series of matrices $\hat{\mathbf{X}}_{\mathbf{k}}$ and $\hat{\mathbf{A}}_{\mathbf{k}}$ $(k = 1, \Lambda, 20)$ were obtained from the iterative calculation for 20 observation datasets. The resulted $\hat{\mathbf{A}}_{\mathbf{k}}$ showed a seasonal variation of the fucoxanthin/chlorophyll-a ratio contained in *Bacillarophyceae*, which increased when their sizes increased. On the contrary, zeaxanthin/chlorophyll-a ratio contained in *Cyanophyceae* decreased when their population increased. The characteristics of the method applied to spatial datasets were also examined.