Geophysical Research Abstracts
Vol. 15, EGU2013-11487-1, 2013
EGU General Assembly 2013

Assessment of the spatio-temporal structure of chlorophyll pigments and the characterization of algae patchiness in Lake Constance

Thomas Wolf (1), Thomas Heege (2), Ludger Kempken (1), Karin Schwenk (2), and Hans-Bernd Stich (1)

(1) LUBW - Institut für Seenforschung, Argenweg 50/1, 88085 Langenargen, Germany (thomas.wolf@lubw.bwl.de), (2) EOMAP, Sonderflughafen Oberpfaffenhofen, Friedrichshafener Str. 1, D-82205 Gilching, Germany

The determination of the chlorophyll- a content by water sampling and subsequent liquid chromatography (HPLC) as well as algae species analysis using microscopy form the basis for many limnological studies and the assessment according to the EU WFD. Because of the sampling and analysis effort which is associated with these methods, for routine monitoring purposes only a limited number of points can be sampled and investigated within a lake. On the other hand it is well known, that the spatial distribution of algae in aquatic environments is often nonhomogeneous and spatially highly variable making it sometimes difficult to determine the algae stock content by using only a few water samples. In order to bridge the gap between the stochastically distributed algae pattern on one hand and the sampling methodologies which allow only for a limited number of samples (HPLC, microscopy) we tested the applicability of additional alternative algae monitoring techniques – the in-situ fluorometry and satellite remote sensing techniques – for Lake Constance.

The usage of these alternative methodologies enables us to get information about the spatial structure of the algae pigment distribution in a lake with higher temporal and spatial resolution. Thus we can get a more detailed picture about the structure and the statistical properties of algae pigment distribution and thus about the distribution of algae in the lake.

In order to make use of this additional information about the spatial distribution of algae pigments we use some conceptual approach which describes some of the characteristics of the algae pattern more quantitatively. Therefore we apply some statistical and geostatistical methods and we derive parameters which describe different aspects of the patchiness phenomenon. By combining these parameters into some patchiness state vector we have a possibility to describe and classify the patchiness we are faced with. Using this set of parameters we then can investigate which environmental parameters do influence the patchy algae pigment distribution.

Initial results show the potential of the alternative methodologies – the satellite remote sensing methodology and the in-situ fluorometry – for getting additional information about algae pigment distribution and thus algae stocks in a lake. Using these methods we can enhance our knowledge about inhomogeneity and spatial variability of algae pigment distributions in Lake Constance considerably. Both the measurements along transects as well as the analysis of satellite images show a large spatial variability of the measured algae parameters. Using a set of statistical and geostatistical parameters and combining them into one so called patchiness state vector enables us to better discriminate the state and type of the algae patchiness.

The supplemental application and the combination of different algae monitoring techniques - classical, in-situ fluorometry and satellite imagery - is discussed.