# Review of the manuscript “A regional evaluation of the influence of climate change on long term trends in chlorophyll-a in large Italian lakes from satellite data”, by Free et al.

## General comments

This manuscript is presented as an investigation on the variability of monthly chlorophyll concentration (CHL) in four subalpine lakes from 2002 to present. Possible causes of the change are studied with the end of a commercial statistical software, implementing the “NPMR” method.

I am disappointed with this manuscript. I was looking forward to reading it because I have had enough of papers making yet-another-CHL-algorithm-for-inland-waters, and I believe that the field needs to shift to climate research, so I liked the intentions of the paper. However, the methods are sometimes weak and sometimes poorly described. The conclusions might be true, but the evidence is not shown in the article. Overall, the reader has to believe the authors rather than be guided in the discovery.

My troubles with this manuscript start with the construction of the CHL time series. As MERIS was short-lived, MSI, OLI and especially OLCI are used. Data quality is different and processing is different, so inter-sensor biases will certainly appear, that will disrupt trend analysis, unless they are corrected (see for example the careful work in the CCI or Globcolour multi-sensor time series). This fact is completely ignored while it should be central to the manuscript. If there were some ground-truth data, individual sensor data could be first-order adjusted. But even in this case, when authors include in-situ data in the time series, they realize there is a bias between it and the satellite (which?), and adjust the in-situ data to match the satellite! Too bad this goes against recommendations of satellite calibration and validation, data merging and “ground-truthing”.

As a side and less important comment, I have concerns regarding the compliance to open policy. The in-house software “BOMBER” is used, that is available “upon request”. The statistical analysis is made using commercial software “HyperNiche” that implements the “NPMR” method. What if I want to reproduce the paper’s results. While this might be acceptable for some editors and within certain groups, it is not certainly what should be promoted in modern science, that has to go towards open data and open software.

As a major result, it is claimed that the seasonality of CHL has changed, but I cannot see it anywhere. One would guess that the time series in Figure 2 do not look stable, but that is not the way to present such evidence. One has to make a seasonal decomposition, allowing for a varying seasonality. This also affects the “observed decline in Spring chlorophyll-a” (line 311).

These insufficient results are followed by a lengthy discussion in which the readers have to believe the statements instead of finding out themselves based on the presented evidence.

Overall, I can only recommend a rejection and new submission using proper methods and presentation of results as indicated.

## Specific comments

When downloading datasets like ERA5 wind, for example, one has to precisely indicate the dataset that was downloaded, with a link to the product user manual. Otherwise, it is impossible to know the data the authors are dealing with. For example, if one says “wind”, there may be many products delivering wind data from many types of sensors, time span and resolutions.

I am confused on the “model results” of Figure 4. I do not see any model data here. It is temperature, CHL and year. On the other hand, the contour plots lack a color bar and a reasonable size for the contour labels.

Figure 5: Here, the temperature (not °C) at which the maximum annual CHL occurs is plotted. As the maximum CHL value can change from year to year, it is not clear to me how to interpret this result.

The satellite regions of interest are not detailed. The reader does not now where does the data come from.

In the inset in Figure 1, the authors annexed part of Switzerland to Italy by incorporating the whole watershed to the latter, including some major towns like Locarno and Lugano. Specifically on the lakes, lake Maggiore lays partly in Switzerland.

I do not know the meaning of “inputing” data (line 131). Is it common within other communities? I assume it must be adding new data to a time series, but does it have other technical details behind? Again, simply citing an “R” package adds to the overall sensation of black box.

If one is going to cross the CHL data with some predictors, it would help to show the time series of these, or at least of those that the model determines as the most significant.