

Interactive comment on “Factors challenging our ability to detect long-term trends in ocean chlorophyll” by C. Beaulieu et al.

Anonymous Referee #2

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General appraisal

The paper by Beaulieu and co-workers deals with the search for long-term trends in global time series of satellite ocean colour observations. This topic is particularly relevant to a journal like Biogeosciences, and it is at the forefront of current interests in the global community working on predicting how the ocean biology will change in response to global environmental changes. What this paper brings in addition to previously published studies on similar topics (in particular by Henson and co-workers) is a careful look at how 1) gaps or discontinuities in the time series may confuse the detection of long-term trends and, 2) how autocorrelation in a time series of ocean colour satellite observations challenges the detection of a long-term trend. They first look at regional and global trends in the SeaWiFS time series, as an illustration of the fact that

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the longest time series we currently have is still not long-enough to allow detecting a global trend. Then the number of years needed to detect a change at the 5% significance level is quantified under several hypotheses (discontinuities or continuous time series etc.). The large numbers they obtain (often several decades) demonstrate that a sustained effort is needed in terms of preparing and launching successive satellite missions with, when this is possibly feasible, an overlap between them. Clear summary statements are provided (page 16436) about the assumptions behind this work, which is a very good thing. They also make a clear distinction between a discontinuity and a gap in a time series (page 16429). This is the first time I see clearly this distinction in such a paper (I may have missed others), and I think this should be more often put forward because confusion about these two definitions can have dramatically diverging consequences on how we design our global observing systems. In terms of presentation: the paper is clearly written and well organized.

Some more detailed comments

Abstract, line 12: OLCI will not be launched before the end of 2014, at the best.

Page 16423, lines 18–22 (and page 16437, lines 21–23): the issue with biases is maybe somewhat overlooked here. I'm not sure what the authors mean actually by “reducing a bias”. Does this mean forcing one time series to agree with another one on average because the latter is considered closer to the truth? Or bringing both time series to a common “average” or any other possibility? The question behind this comment is: do we have to remove biases or do we “simply” have to characterize them as accurately as we can? (and then we can incorporate the knowledge about these biases in the process of detecting long-term trends). Authors should say something here about this (this might be done in the summary of hypotheses at the end of the paper).

Section 2.2: I would like to see here better statements of hypotheses underlying selection of the equations. This is partly done in the summary of hypotheses at the end (for instance point 4), but readers who are not fond of statistics might better under-

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stand what's behind all this if some more explanations would be given. For instance, authors should clearly say that they assume here that the average seasonal cycles are identical year after year (as far as I have well interpreted their paper). Violation of this hypothesis might confuse trend detection, again. In other words, translate some of the statistical jargon into geophysical considerations.

Page 16436, line 26: what authors mean by "persistent" here? There are currently very few floats equipped with the necessary sensors, and the plans for developing a global network of these "bio floats" are far from established. In addition, such networks will undoubtedly be useful for many purposes, but I doubt they can be of any help in this search for long-term trends. This should be discussed a bit further.

Appendix B: a 4-line appendix is quite useless. You should reincorporate this in the main text.

Note sure all acronyms are properly expanded when they first appear in the text. A general check for this is needed.

I'm not sure how figures will be eventually reproduced in the published paper. In their present form they have ridiculously small size for labels etc.. This is really poor-quality figures, and should be improved.

Recommendation:

Overall, this is an excellent and very useful paper. I recommend publication after a few minor corrections are incorporated (see my comments).

Interactive comment on Biogeosciences Discuss., 9, 16419, 2012.