

Author's response to editor comments

April 26, 2015

1 Description of procedure

All changes in result of the editor comments are marked in the manuscript in red and the sections are referred to in the response. All editor comments are marked in bold and the replies always start with "Reply:".

2 Editor comments

1. Before accepting the paper I like to see a justification of the calculated loads. In 2.4 it is stated: 'DOC and DON concentrations were linearly interpolated between sampling occasions' (line 220 in the revised manuscript). This seems illogical because the concentration data don't show autocorrelation (lines 230-232). If concentrations are really uncorrelated, it might be better to use the mean value. However, I guess that although you didn't find autocorrelation in the data (fortnightly), autocorrelation does exist at a smaller time scale. At a small time scale the concentrations is expected to be continuous. This might justify the interpolation. If concentrations and the discharge are correlated (lines 309 - 310) the interpolation might induce bias.

Reply: We thank the editor for his detailed comments but have to partly disagree concerning his arguments on use of interpolation for calculating loads for non-autocorrelated DOC and DON concentrations. The missing auto-correlation revealed that the DOC or DON concentration for one sampling occasion is not correlated to the value at the sampling occasion before but, nonetheless, it must still be assumed that the concentration has changed over time to reach its value at the second sampling occasion. The assumption we make here is that this change was linear. However, when using means, the bias would likely be higher, since we would have to assume a constant concentration for a certain period of time (usually half of the period between two sampling occasions) with an abrupt change to the new value.

We agree with the editor on the higher likelihood of auto-correlation at shorter time steps. But due to lacking data we cannot test, if the auto-correlation

would exist at shorter time steps, but it is much more likely than for a fortnightly sampling scheme.

Concerning the correlation of concentration to discharge: Any kind of interpolation will introduce bias, since the to-be interpolated values are unknown. We were and are aware of that and thus only discussed strong patterns/ differences of DOC and DON loads between the sites and are not discussing weak trends. Moreover, to point the potential bias of the interpolation out to the readers, we now include the following statement in the manuscript (Methods, Calculation of DOC and DON daily and annual loads): "This (.the interpolation..., author comment) approach was compared to other potential approaches in Kauppila and Koskiaho (2003) and was found to provide the most reliable estimates of nutrient loads from discontinuous concentration data. However, since considerable bias of the interpolated data is possible and cannot be ruled out, we only discuss strong patterns related to the calculated DOC and DON loads."

2. Technical correction: Maj should be May (line 122)

Reply: We corrected this word (Methods, Field sampling and laboratory measurements).