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Interactive comment on "Comparison of UV/Vis and FDOM sensors for in situ monitoring of stream DOC concentrations" *by* G.-Y. Yoo et al.

Anonymous Referee #1

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General Comments

This paper describes a study that compares laboratory and field measurements of UV/Vis and FDOM sensor measurements across gradients of temperature and turbidity. These sensors are often used as proxies for DOC concentrations in natural waters and this is the first study that I am aware of to directly compare the performance of these sensors. The authors suggest that the UV/Vis sensors are more sensitive to changes in turbidity than the FDOM sensors, while the FDOM data are suggested to be more sensitive to changes in temperature. I think that this is a worthwhile effort, but have a few concerns regarding the approach described in this paper.

My main concern is related to the fact that the authors simply show that temperature and turbidity differentially affect UV/Vis and FDOM sensor readings, but do not

take the important step of showing how/if the sensor data can be corrected to provide reasonable proxies for DOC concentration. Specifically, uncorrected UV/Vis data are compared with temperature corrected (but not turbidity corrected) FDOM data. While it is important to show the varying influence of temperature and turbidity on the different types of sensor data (which the authors do well), it is also important to quantify how these varying influences can be accounted for to provide the most accurate estimates of DOC concentration from sensor data. Downing et al (2012) provide an excellent example of how corrections for FDOM sensor data can be derived and applied to estimate DOC concentrations. The manuscript would be strengthened by taking a similar approach for the FDOM and UV/Vis sensor data reported here.

UV/Vis and FDOM sensor readings are made across a small range of turbidity and DOC concentrations. The authors suggest that this is because these small ranges are consistent with those observed in the study watershed. While this may be true, and informs future studies at this specific site, limiting the investigation to such small ranges does not allow for the results presented here to be applied in streams/rivers with broader ranges of environmental conditions.

Specific Comments

1. UV/Vis and FDOM sensor data can be used as proxies for DOC concentrations. The authors refer to the sensor data as proxies at certain locations in the text, but not consistently (e.g. see the third paragraph of section 2.1). I recommend that the sensor data are consistently referred to as proxies throughout the manuscript.

2. It is stated that the UV/Vis sensor obtains data across a range of wavelengths (220-720 nm) and that "global calibration" is used to estimate organic carbon concentrations. It would be helpful to be more specific, and state what wavelengths are used, and how they are used to estimate concentrations.

3. It would be helpful to state the precision associated with the laboratory measurements of DOC concentrations.

4. Three IHSS reference materials and artificial stream water were used in the laboratory experiments. The artificial stream water was created by mixing leaves and soil from the study stream with DI water and then extracting the DOC from this mixture. This approach eliminates any contributions from other sources of DOM that would be found in natural waters (e.g. algal-derived DOM). Given that different sources of DOM have different absorbance and fluorescence characteristics (as stated at the end of the second to last paragraph of section 3.1.1, the second to last paragraph of section 3.1.2, and the third paragraph of section 3.2) it is difficult to use information gained from the laboratory results to improve our ability to interpret sensor measurements obtained in natural water samples. Therefore, it would be more informative to use actual stream water instead of artificial stream water for the laboratory experiments.

5. Figure 1: There are no data between [DOC] $\sim$ 5 and 11 mg/L for the comparison of UV/Vis and FDOM readings of SRNOM as a function of DOC concentration. This data gap should be filled or the $\sim$11 mg/L sample should be removed from the analysis.

6. Are the slopes shown in figure 2a significantly different from zero?

7. "BW" is referenced in figure 2, and I assume it is the artificial stream water, but it is not defined in the text. I recommend that this be defined in the methods section.

8. Section 3.1.3: It is stated that the FDOM20 slightly decreased as a function of turbidity when [DOC] = 5.2 mg/L. It appears that there was a relatively large decrease in FDOM 20 ($\sim$20% decrease across a small range of turbidity (0-25 NTU)). Is the slope of this line significantly different from zero?

9. For the in situ data, I recommend either applying existing temperature and turbidity corrections to the sensor data (e.g. the corrections provided by Downing et al., 2012 for FDOM) or using the results shown in figures 2 and 3 (preferably over a broader range of turbidity and DOC concentrations) to generate corrected UV/Vis and FDOM sensor data specific to the study site. Comparing these corrected values against laboratory-derived [DOC] data would provide useful insight into the performance/utility of the sen-

sors as proxies for [DOC], which is the stated objective of the study. Such comparisons could be presented instead of the comparisons currently presented in Figure 5.

Technical Corrections:

1. There are many grammatical mistakes throughout the manuscript. The clarity of presentation would be improved by consultation with an experienced technical editor.

Interactive comment on Biogeosciences Discuss., 11, 16855, 2014.