Response to reviews

Reviewer comments are in **bold**. Author responses are in plain text. Modifications to the manuscript are in *italics*.

We acknowledge the reviewer for the valuable suggestions that were provided for the revised manuscript. These aspects are considered in this revision. Detailed replies to each comment are given below.

Reviewer #3

1. In response to comment 20 we accept the authors' explanation of the use of Sun's (2007) equation for calculation the imaginary part of the complex refractive index. But it should be emphasized that a significant assumption in made. The calculation assumes that the absorption spectrum measured for diluted solutions can be linearly extrapolated to extremely high solution concentration. This implies that no intramolecular interactions occur in the dry material that affects light absorption and may not play a role in the diluted solution phase. In addition, it is assumed that and no chromophores structure changes occur for example due to pH differences in different solution concentrations or environments. This should be clarified.

We agree with the reviewer on this point. The *k* values derived from the UV-visible spectroscopy of SOM extraction can possibly be influenced by a number of factors, including the solvent effects, as that were pointed out by the reviewer. This point is emphasized in the revised manuscript, as follows.

Section 2.3

Even so, this method requires sample extraction, and artifacts associated with extraction efficiency, material density, and solvent effects can be introduced.

The good overall agreement between *k* values from two techniques, however, indicates that the overall artifact from solvent extraction is small (cf. Fig. S1 in the updated supplement).

2. Also In response to comment 20 the authors referred the reader to figure S1. From the "response to reviewer" : "Another piece of evidence is that the k values calculated from Eq. 1 are not systemically higher than those derived from ellipsometry, as shown in Fig. S1, indicating that Eq. 1 does not overestimate k." Figure S1 has only UV-Vis derived k and not ellipsometry data. Please show explicitly in the graph the ellipsometry derived data.

There seems to be a point of confusion regarding the reference of "Figure S1". In response to comment 20, we referred to the figure that was newly added into the revised supplement (cf. supplement uploaded on 23 Nov 2014). This figure is different from the “Figure S1” in the original ACPD paper. In this new figure, both UV-vis and ellipsometry data are explicitly shown.

3. In response to comment 29 regarding the density values assumed in k calculation of SRFA the authors write: “The k values for Suwannee river fulvic acid were also derived with Eq 1. Information about material density is added in the revised manuscript”. The addition to the manuscript is: Page 20590 Line 17 A material density of (1.4 ± 0.1) × 10^3 kg m^{-3} was used in the analysis for toluene- and m-xylene-derived SOMs (Ng et al., 2007). For Suwannee river fulvic acid, a material density of (1.47 ± 0.02) × 10^3 kg m^{-3} was used (Dinar et al., 2006).

Based on communication with IHSS there are differences in the density of the "Reference Humic and Fulvic Acids" (1.5 gr cm^{-3}) and the “Standard Humic and Fulvic Acids” (1.1 and 1.3 gr cm^{-3}). This could lead to 10-33% overestimation of k. Please clarify which sample of SRFA you used and amend accordingly.

We thank the reviewer for providing the useful information. The sample that we used was one of the “Standard Fulvic Acids” (IHSS, 2S101F). In this revision, sample information is added. A material density of 1.3×10^3 kg m^{-3} is used for SRFA, as suggested by the reviewer. Main text and Fig. 4 are revised accordingly.

Section 2.3

For Suwannee river fulvic acid (International Humic Substances Society, 2S101F), a material density of 1.3×10^3 *kg m-3 was used.*