Atmos. Chem. Phys. Discuss., 8, S1355–S1358, 2008
www.atmos-chem-phys-discuss.net/8/S1355/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on “Properties of atmospheric humic-like substances – water system” *by* I. Salma et al.

I. Salma et al.

Received and published: 7 April 2008

The authors would like to thank the Referee #2 for his/her precious and competent comments and suggestions for further improving and clarifying the manuscript. We have considered all recommendations, and made the appropriate alterations according to our best.

We completely agree with the Referee that the full atmospheric relevance of the results achieved can only be determined after the relationships of HULIS with the other aerosol constituents are considered. We indicated in the Conclusions that "studies on the interactions between pure HULIS and other water-soluble aerosol constituents are also very desirable to assess the role of HULIS in real atmospheric aerosol particles". Nevertheless, pure HULIS are already extremely complex mixture of interacting substances, and, therefore, we think that it is an advantageous and reliable methodology to study the pure HULIS as the first step of the research, and that their external interactions are to be incorporated in a later stage. We elaborated our research plans in this sense.

Our specific responses to the detailed comments are as follows.

Response to Comment P1987, L14-24 The solubility data for HULIS could be derived from the conductivity measurement series in principle only. The uncertainty of the experimental data were determined mainly by the micro-chemical sample preparation steps, and, therefore, the detailed realization of the two sample handling procedures had to be optimized differently for the two measurement series. For instance, the volume losses that occurred on purpose by rinsing the electrochemical measuring cell before the actual filling could distort the solubility data in a systematic and accumulative way. That is why we decided to devote one aliquot for the solubility measurements and to spend the other aliquot exclusively for the conductivity measurements.

Response to Comment P1985, L25 The expression "mean" used for the atmospheric concentrations representing one week was found to be redundant and was removed from several location in this section and from the abstract.

Response to Comments P1991, L12 and L28 The UV/Vis spectra for the SRFA standard was measured in the organic carbon (OC) concentration range from 32 to 201 mg C/l, and the spectra were shown in Fig1b. It is seen from it that the three more diluted solutions did not exhibit absorbance overloading, and, therefore, the further data were derived from the molar absorptivities measured for these three solutions. This was also indicated in Table 1. As far as the concentration plateau for HULIS is concerned, we haven't had enough material to prepare more concentrated ($>$107 mg C/l) solutions in relatively large volumes required by the spectrophotometer. Naturally, it doesn't imply that there isn't such an absorption plateau for HULIS. We extended a related sentence on page 1991 of the discussion paper to clarify all these.

Response to Comment P1992 We are aware of the limitations and weakness imposed

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by the empirical correlation relationship between the molar absorptivity and molecular mass utilized for HULIS. They were discussed in the text on page 1992 lines 10-21 of the discussion paper. Nevertheless, we prefer to keep the method and their results in the paper for several reasons. An average molecular mass is required intermediately to derive the dissociation degree of HULIS, and we think that an average molecular mass determined for the same HULIS sample as that used in the conductivity measurements with a less accurate optical method is still better than adopting an average HULIS molecular mass obtained for diverse environments. There are several results - available also in the ACP - that were obtained by the same optical method, and that were referred in the present discussion paper. The overall results which are subject to the same systematic uncertainty are coherent and can contain useful information on the regional or seasonal variability of HULIS that may be later concluded by evaluating the possibly increasing data set for different environments. The molar absorptivity of HULIS changed with concentration monotonically (see Table 1), and, therefore, all molar absorptivity data were adopted in the evaluations. This may be related to the hydrolysis or other interactions between the HULIS and solvent. As a consequence, a relative standard deviation of 31% (a molecular mass range from 373 to 763 Da with an overall mean and standard deviation of (556+-170) Da) was obtained. This uncertainty indeed represents a substantial spread but can be still regarded to be acceptable considering our present knowledge on the molecular mass (the estimates vary from about 220 to 700 Da). At the same time, the mean and standard deviation of molecular mass for SRFA standard was very much different from the former data. We revisited and reformulated the questioned part of the discussion paper to make the limitations and approximation character of the optical method and our purposes clearer now.

Response to Comment P1994, L8 In the text, we cited the papers that contain the mathematical expressions utilized to calculate the aromatic carbon abundance from the molar absorptivity data. The exact equations were given (and their references were repeated) in Table 1 on page 2006 of the discussion paper. A sentence was added to specify this realization.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 1981, 2008.

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