

***Interactive comment on “Hygroscopic properties of Amazonian biomass burning and European background HULIS and investigation of their effects on surface tension with two models linking H-TDMA to CCNC data” by E. O. Fors et al.***

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Reply to anonymous referee no. 1.

First of all, the authors would like to thank the referee for good observations and remarks! We have corrected the errors and tried our best to make the paper more understandable were it was vaguely written.

P26931 It basically means that the sample was weighted before it was mixed with water and nebulised. We removed the “known portions” part of the sentence.

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P26931 That is a good point. In principle, yes there could be, since HULIS is only defined through the method of extraction. The problem when dealing with HULIS is that there are a myriad of different molecules that will be extracted in the SPE column, and this basically means that you have to accept that you will get different results from different places (as we show in this paper). Some molecules can be surface active, others may not be, some molecules can potentially have a larger effect when it comes to surface-to-bulk partitioning, and others may not. Since we lack detailed chemical analysis, we have to put all these effects together and in this case we attribute it to surface tension (even though we are aware that it is likely a combination of many different factors). In the same way we somehow accept that all molecules that are retained in the SPE are HULIS by definition.

P26940 It is correct that the solubility of the HULIS can present a problem for these kinds of parameterizations. The following text was added in the chapter 4.3: “CCN modeling”: “In this work, we have not included any limitations in the solubility of the analysed samples. Implicitly, this means that we assume that the samples are completely dissolved at the RH of which GF values were used as input to the respective models.” We have also changed the text in chapter 5.1: “Hygroscopic properties” to the following for clarification: “Determining the  $\kappa_R$  values for all HULIS samples revealed that the K-pusztas samples, as well as the SMOCC D1 and N1 samples, were dissolved and non-ideal to similar degrees throughout the RH range from 90 to 98%. Based on this, we assume that they will not increase in solubility as the water activity increases further, but that any deviation from predicted water uptake can be attributed to surface activity. However, it should be noted that fresh SOA has been shown to increase in solubility starting at RHs of above 98% (Wex et. al 2009). If this would be the case for the samples analysed here, the predicted surface tension suppression would be over-estimated, since limited solubility is not included in the theory used in this paper. For the SMOCC samples from period 3 (SMOCC D3 and N3), an increase in the number of soluble entities per volume unit,  $\kappa_R$ , above 90% was observed with increased RH (Figure 4 and 5, Table 3). Although these are the only HULIS samples in this work to

show such behaviour, this effect has been observed previously for HULIS samples collected in Budapest (Ziese et al., 2008), and can possibly be explained by the presence of chemical compounds gradually dissolving as the RH increases. “

Fig 2 and 3: Yes, these are hydration curves, corrected for restructuring. The figure 2 text has been changed to the following: “Measured hygroscopic growth of K-pusztá winter (a) and summer (b) samples and fitted functions for particles with a dry diameter of 100 nm without pre-humidification of the aerosol. The growth factors are corrected according to efflorescence measurements which indicated a slight restructuring of the particles” and in figure 3: “Measured hygroscopic growth of 100 nm HULIS aerosol particles collected during the SMOCC campaign without pre-humidification of the aerosol. The growth factors are corrected according to efflorescence measurements which indicated a slight restructuring of the particles.”

SMOCC-LBA The acronym is now written out.

P2631. The following references have been added: Kiss et al. (2005), Wex et al. (2007) and Ziese et al. (2008). They all use the same method of extraction (from Varga et al. 2001) and refer to the isolated organic matter as “HULIS”. The Ziese et al. reference was wrongly dated. It should be 2008, and is now corrected.

P26935 We agree that “drawback” is not a very well chosen word. The text has been changed to the following: “For this approach to work, growth factors at three or more RH values are required, in contrast to the other models requiring growth factors at only one RH. While this model is well suited for non ideal and gradually dissolving particles, a lot of H-TDMA data has been collected at a fixed RH of 90% (Swietlicki et al. 2008), where the polynomial approach will not work.”

P26936 The text has been rephrased to the following: “The critical water vapour supersaturation,  $s_c$ , ( $S_c-1$ ) can be approximated by the following equation, which is derived from simplified Köhler theory and similar to that derived in Seinfeld and Pandis (2006):”

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P26937 The symbol somehow disappeared in the pdf-conversion. We will make sure it is visible in the final version.

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