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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Understanding the anthropogenic influence on formation of biogenic secondary organic aerosols via analysis of organosulfates and related oxidation products" *by* Q. T. Nguyen et al.

Anonymous Referee #2

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This paper reports on a field study conducted at two sampling sites in Denmark with an overall goal to characterize and quantify organo-sulfate (OS) constituents of atmospheric organic aerosols in specific geographic area of the study. Samples of the field collected particulate matter were systematically analyzed using HPLC-ESI-TOFMS and ion chromatography. A number of OS compound were detected and quantified in the samples. Variability of OS concentrations between two sites, during day and night periods, and as an overall function of time was examined. Correlations between OS species, complementary real time measurements, and meteorology records were

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analyzed using statistical methods. The authors present and discuss their analysis results in a context of the plausibility of regional versus local sources of VOC and atmospheric chemistry leading to formation of OS. The paper is a logical continuation of authors' previous work and reports an unpublished data set from a new geographic location. Overall, the OS measurements are of good quality and relevant to the scope of the ACP journal. However, I think the paper would benefit from significant revisions and shortening before its final publication in ACP.

My major reservation is that the manuscript in its present form is very descriptive of all the aspects of analytical chemistry and details of statistical analysis, but its scientific discussion and data interpretation is fairly ambiguous. 1) I find it misleading that Figs 4, 5 and associated discussion present meteorology and emissions data on the scale of a few thousand kilometers while the field measurements were limited to two field sites ~30 km apart. Furthermore, a single pixel size of Fig 5 is about half of the entire Denmark. Drawing conclusions on the 'regional impact' from this type of data is not very convincing and need to be revised. For instance, Fig 4 shows lower VOC emissions in Denmark, but no clear arguments are presented that would rule out impact of the local VOC sources with lower emission rates. 2) Figs 3 and 6 show time resolved records of total concentrations of organic acids, OS, NOS, and of selected individual OS and NOS species that show close correlation between measurements at two sites. Total PM mass measurements at two sites are not presented, but I suspect they might be correlated too. Then, the overall conclusion that both sites were engulfed by the same air mass is logical, but I see no reason to believe that OS compounds were necessarily transported from a long distance. Again, why local sources are ruled out? 3) Clarity of the manuscript can be improved by substantial shortening of the descriptive text and by placing some excessive Figures and Tables into supplemental file. For instance, Figs. 4, 5, can be either simplified to show smaller areas or moved to the SI file. Table 5, Figs 7 and 8 can be moved to the SI file. 4) Perhaps a bar chart plot would better present data of Table 4.

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