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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Insight into naturally-charged Highly Oxidized Molecules (HOMs) in the boreal forest" *by* Federico Bianch et al.

Anonymous Referee #1

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This manuscript presents measurements of naturally charged highly oxidized molecules (HOMs) by the APi-TOF and their neutral counterparts by the CI-TOF. HOMs were recently found to play important roles in new particle formation (NPF) and their exact formation mechanisms are still poorly understood. Ions on the other hand also play a role in particle formation especially in the free and upper troposphere. It is hence important to evaluate the roles of the charged and neutral HOMs in the process of forming nuclei. Since HOMs are primarily from oxidation of organic species in the atmosphere, considering the significant amount of organic species emitted to the boreal forest and the low abundance of sulfur species in the region, it is reasonable to relate particle formation with those HOMs. In addition, recent studies also pointed out

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Discussion paper

the potential dominant roles of HOMs in NPF in forested area such as Hyytiälä. The paper present interesting results and will potentially improve our understanding of NPF in forest where biogenic hydrocarbons are dominant VOCs in the air. The following issues need to be resolved before it goes to final publication.

1. The concentrations of naturally charged highly oxidized molecules (HOMs) are much lower (several orders, depending on the charging efficiency) than their corresponding neutral counterparts. Compared to the neutral HOMs, charged HOMs might exert little effects on NPF or if indeed they play important roles, the mechanisms will be likably very different from those of the neutral parts. Figure 1 shows the measured signals in cps which do not reflect the real concentrations. Did the authors convert those signals to concentrations i.e. number concentrations in cm-3? It is difficult to calibrate the instruments to give accurate concentrations but at least estimated concentrations can be obtained provided that a few assumptions were made. 2. The daytime and nighttime formation of organonitrates (ONs) was different, resulting probably in distinct chemical composition of the ONs between the two formation mechanisms. Can the authors provide further evidences of differences between the daytime and nighttime chemical compositions of the ONs? 3. According to the paper, there are at least four categories of HOMs: HOMs that contain only C,O,H or ONs that contain N in addition to C,O,H, and their corresponding NO3- or HSO4- clusters. The relationship between the naturally charged and neutral HOMs however has not been explored in details. Are there any correlations between them? i.g. the equilibrium or dynamic partitioning between them.

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