

# ***Interactive comment on “Modelling studies of HOM and its contributions to growth of new particles: comparison of boreal forest in Finland and polluted environment in China” by Ximeng Qi et al.***

## **Anonymous Referee #2**

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This paper compares the new particle formation and growth processes in two contrasting atmospheric environments, a clean boreal forest and a polluted suburb with dominance of biogenic and anthropogenic emissions respectively. The results show that the MALTE-BOX model tended to significantly underestimate the particle growth at the polluted SORPES site. Sulfuric acid and HOMs produced from the oxidation of aromatics play a significant role in the particle growth at the polluted site, compared to the boreal forest site where the oxidation of monoterpenes is dominant. Overall, this study presents very interesting results regarding the new particle formation and growth, and

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demonstrates the complexity and diversity of particle formation and growth processes at different atmospheric conditions. The manuscript is concisely organized and well written. Thus I suggest that this manuscript can be considered for publication after the following comments are addressed.

Specific comments:

Abstract: although the authors present a lot of interesting results in this paper, the abstract is too simple to cover all of the important results/findings of this study. The abstract should be informative enough and self-contained, and the readers can get all of the key points from only reading the abstract. The current abstract needs a significant revision to summarize the major results and conclusions of this study.

Section 2.1: some basic information is missing from the description of the measurement techniques. For example, what trace gas species and aerosol properties were specifically measured at both sites? What instruments were used for the aerosol size distribution measurements and what are the size ranges for them? What time periods of data were used in the analyses? It would be also helpful if the authors could provide a table to summarize the detailed observations including the species, measurement techniques, periods, etc. This will help the readers better navigate and understand the presented results.

Section 2.2: although the MALTE model has been described separately in some previous studies, a detailed description of this model is still needed for the present paper. The authors are suggested to provide further details about the model configuration, including chemistry mechanism, aerosol dynamic processes, mechanisms for HOM formation from monoterpene and aromatics oxidation, coagulation process, dry deposition and dilution processes, in the supplementary materials. Such a detailed description will help the readers better understand and reproduce the present study.

Typographical corrections and minor comments:

P1, L24: This study highlights. . .

P2, L9: define the “HOM”.

P2, L13-14: a strong source of HOM and these. . .

P2, L28: one of the “flagship” stations. . .

P3, L1: the SORPES is defined as an urban site here, which is inconsistent with the sub-urban site as defined in the abstract and site description.

P5, L7: occurs even more frequently. . .

P5, L9: at SMEAR II is. . .

P5, L13-22: this paragraph compares the difference in the environmental conditions observed at the two study sites. It would be also helpful if the difference in the BVOC concentrations is mentioned here. The reviewer presumes that the BVOC levels at SMEAR II should be higher than at SORPES, although its concentrations of anthropogenic species are much lower.

P6, L31 – P7, L1: this statement seems to be not true as a simplified mechanism for the HOM formation from oxidation of aromatics was still included in the model.

P7, L24-27: the same to the above comment. The HOM formation from the oxidation of aromatics has been parameterized in the model.

Figure 1: provide the sources of the emission inventory data.

Figure 4 captions: it should be Figs. 4b & 4d?

Table 1: it would be helpful if the observed data for the other relevant species, such as VOCs, HOMs and meteorological parameters, were provided here, if the data are available.

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