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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Combined effects of boundary layer dynamics and atmospheric chemistry on aerosol composition during new particle formation periods" *by* Liqing Hao et al.

Anonymous Referee #1

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The manuscript by Hao et al. investigated the effects of boundary layer dynamics and chemistry on aerosol composition during new particle formation (NPF) periods in Finland. The authors found that sulfate showed a much slower decrease than organics as a result of rising boundary layer during before the NPF period, which was likely due to the mix of residual layer with new boundary layer. During the growth period, they found the simultaneous increases in semi-volatile OOA and highly oxygenated organic molecules, suggesting a link between them. This manuscript is overall well written and I recommend it for publication after addressing the following comments.

Major comments:

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1. The interpretation of slower decrease in sulfate than organics can have athird reason. As the boundary layer rises, organics can be diluted more because of evaporative loss associated with gas-particle partitioning, while the non-volatile sulfate does not. This points to another question of the PBL model.

2. The PBL model only considers the vertical dilution. In fact, as shown in Figure 2, the wind speed also has a significant change before the new particle formation period, increasing from $\sim$0.3 m/s to 1.5 m/s. Although the wind speed is overall low, such an increase can have a big impact on horizontal dilution.

3. The quantification of AMS is a bit strange. The author used a collection efficiency of 0.85 according to the comparisons with DMPS measurements. However, AMS reported 9% higher mass concentrations than those of DMPS. It seems that the AMS CE was underestimated. Typical values of 0.5 or 1 are used in field campaigns. In addition, which size ranges of DMPS the authors use for comparisons, 3 – 1000 nm?

4. The authors identified three SV-OOA factors with different time series. I am wondering if HOMs correlates one of them or the combined one?

5. This manuscript missed the very important size-resolved chemical information from SP-AMS.

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