Answers to reviewer I:

We want to thank the reviewer for the insightful and detailed comments on our manuscript. Based on the observation and suggestions for improvement, we have revised our manuscript; the details of the revisions are given below along with answers to the questions the reviewer raised.

The air mass backward tracing is a classical approach, but now gradually becoming outdated due to advancing advection-diffusion modelling techniques (direct and reverse/adjoint) that provides much more detail results. I consider the methodology of this paper still acceptable, but I encourage the authors to switch to new methods in their further research!

Answer: *We used back trajectories calculated from the HYSPLIT model as this approach is well established and scientifically wide used method. We agree with the reviewer that the 3-D modelling would be our next goal, and we are working on the chemistry -transport model named FLAMO which is running offline with WRF-Met-data and is coupled with the emission, chemistry and aerosol dynamic.*

Some specific comments:

1. Page 33316 line 3: how the temperature at trajectory height was estimated – did the HYSPLIT model give it? I suggest to explain that in the text there. One should expect large errors in surface temperature estimations for strong surface-based inversion conditions that are rather frequent in Northern Europe.

Answer: *The back trajectories calculations from the HYSPLIT model can be integrated with meteorological dataset including e.g. Temperature at each trajectory height. The meteorological data in the trajectory calculations was from GDAS (Global Data Assimilation System) archive for dataset after 2004, and from FNL archive for dataset before 2004, provided by the NCEP (National Centre of Environmental Predictions). We will include this information in the revised text.*

We agree with the reviewer that there could be small uncertainty using an average lapse rate to estimate the ground temperature. However, the main purpose of this study is to statistically and empirically discuss the general trend of temperature influence on the aerosol production over the boreal forest with large enough dataset, and we believe that our method can rule out the uncertainty with sufficient amount of dataset. Also, the same approach was applied in Tunved et al., (2008). Thus our results would be comparable to Tunved et al., (2008).

2. Page 33316 line 18: travelling height of the parcel is continuously below the mixing height - what this assumption is based on? Please explain in text!

Answer: *The travelling height of the air parcel confined below the mixing height was not based on assumption. The boundary mixing height was included in the meteorology dataset together with trajectories. Because we have a large enough dataset, we were able to choose only trajectories which travel inside the boundary layer along the whole transportation, so that our modelled monoterpene emissions will not be influenced by the mixing from upper layer. The text will be modified accordingly to explain our method to the readers.*

3. Page 33323 line 19: how the dry deposition loss of particles is calculated? Diffusive deposition (resistance scheme)? Gravitational sedimentation is rather negligible for particles smaller than 0.5 micrometres. Please explain in the text!

Answer: *We simplified the calculation of aerosol losses with an inversed aerosol lifetime measured by Williams et al. (2002). This parameter included all the loss mechanisms of particles in air, which includes sedimentation and diffusion loss, for particles inside the boundary layer. This parameter was measured under similar situation of ocean to land conversion, and over similar terrain. Also, these aerosol lifetime values are similar to another study by Riuttanen et al. (2013).We will revise the text to include above information.*

Reference:

Riuttanen, L., M. Hulkkonen, M. D. Maso, H. Junninen & M. Kulmala (2013) Trajectory analysis of atmospheric transport of fine particles, SO 2, NO x and O 3 to the SMEAR II station in Finland in 1996–2008. Atmospheric Chemistry and Physics, 13, 2153-2164.

Williams, J., M. de Reus, R. Krejci, H. Fischer & J. Strom (2002) Application of the variability-size relationship to atmospheric aerosol studies: estimating aerosol lifetimes and ages. Atmospheric Chemistry and Physics, 2, 133-145.