

Modeling biogenic secondary organic aerosol formation in the subarctic

E. Hermansson^{1,2}, P. Roldin^{1,2}, A. Rusanen³, D. Mogensen³, S. Madronich⁴, A. Hodzic⁴, E. Swietlicki^{1,2} and M. Boy³

¹Department of Physics, Lund University, Lund, SE-221 00, Sweden

²Centre for Environmental and Climate Research, Lund University, Lund, SE-221 00, Lund, Sweden

³Department of Physics, University of Helsinki, Helsinki, FI-000 14, Finland

⁴National Center for Atmospheric Research, Boulder, Colorado, 80307, USA

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Presenting author email: emilie.hermansson@nuclear.lu.se

Biogenic volatile organic carbon (BVOC) compounds, such as α -pinene, are emitted by the vegetation and oxidized in the atmosphere to form less volatile compounds. These compounds can take part in the formation and growth of secondary organic aerosols (SOA) and thus increase the aerosol load and also the concentration of cloud condensation nuclei which will affect climate.

We have modeled the formation and growth of secondary particles along an air mass trajectory over the northern European boreal forest and compared the results with size distribution measurements from three stations the air mass passes close to (Abisko, Pallas and Värriö).

The model used is an updated version of the aerosol dynamic and particle phase chemistry module from the ADCHEM model (Roldin *et al.*, 2011), coupled with the Master Chemical Mechanism version 3.2 (Jenkin *et al.*, 1997; Sanders *et al.*, 2003). The emission of BVOC (represented by α -pinene in our model) is estimated using a method described in Tunved *et al.* (2006). The model then considers the gas-to-particle partitioning of the 42 most important oxidation products. Liquid saturation vapor pressures of each oxidation product are decided by using the method proposed by Nannoolal *et al.* (2008).

During the first 54 hours of the trajectory, the air mass is over the Atlantic Ocean, while it spends the remaining hours over land where the particle mass starts increasing (see Figure 1). The modeled growth is mainly caused by organic gas-to-particle conversion and seems to be a bit slower than the measured growth. Despite this, the model seems to be able to handle SOA formation relatively well at realistic BVOC-emissions and low primary particle concentration.

These are preliminary results which will be analyzed further and compared to results achieved by the model MALTE-BOX (Boy *et al.*, 2012) which uses the University of Helsinki Multicomponent Aerosol model, UHMA (Korhonen *et al.*, 2004). To test how well MCMv3.2 can describe the gas phase oxidation, a fully explicit gas phase oxidation scheme, called GECKO-A (Aumont *et al.*, 2005), will also be applied.

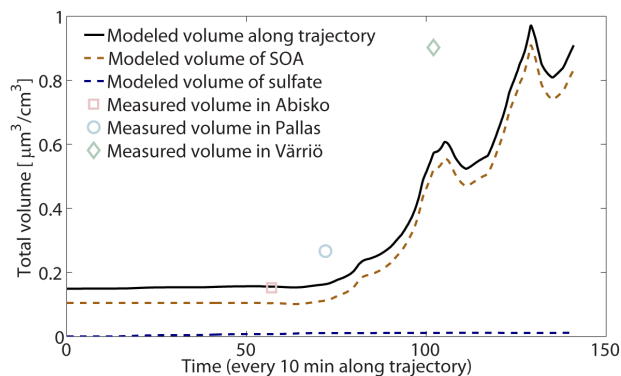


Figure 1. The solid line represents the total modeled particle volume along the trajectory, which consist mostly of SOA (dashed brown line) but also a small fraction of sulfate (dashed blue line). The modeled results are compared to size distribution measurements.

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