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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Isoprene suppression of new particle formation in mixed deciduous forest" *by* V. P. Kanawade et al.

Anonymous Referee #1

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General Comments

In this study the authors describe the results of a field study of new particle formation (NPF) carried out in a Michigan forest. Measurements were made of key species including OH, H2SO4, NH3, NOx, SO2, particle size distributions, and VOCs, especially isoprene, monoterpenes, and sesquiterpenes. The data were used with modeled VOC emissions to attempt to explain the relative absence of NPF in this forest compared to boreal forests in Finland. A few NPF events were consistent with events of high anthropogenic H2SO4 pollution leading to ion-induced nucleation, but it was proposed that high isoprene/monoterpenes ratios suppressed NPF in most circumstances. This explanation is consistent with results of recent plant chamber experiments, but this is the first time it has been demonstrated in a forest. No clear mechanism for suppres-

sion was proposed, although it did not appear to involve a reduction in OH concentrations by isoprene as had been proposed in the plant chamber studies. The results have important implications for understanding the effects of future changes in forest species composition, which will be influenced by changes in global temperature, on atmospheric aerosols and cloud formation. The manuscript is well written and is worthy of publication in ACP.

Specific Comments

1. Pages 11049-11051: I suggest that in addition to comparing the relative rates of reactions of OH radicals with isoprene and monoterpenes (as was done here) that you perform the same calculations for the relative rates of reactions of monoterpenes with O3 and OH radicals. I suspect that from the information given that monoterpenes react to a much larger extent with O3 than with OH radicals in Finland than in Michigan and the Amazon. Monterpene reactions with O3 tend to form more SOA than those with OH radicals, and so these less volatile products could be a reason for the effect of R on NPF events.

2. It seems that one possible explanation for the effects of R on NPF events is that organic acids play an important role in nucleation by clustering with sulfuric acid, as was suggested by Zhang et al., Science, (2004). Organic acids formed from isoprene oxidation will be more volatile than those formed from monoterpenes, and if they compete with and prevent larger organic acids from clustering with sulfuric acid, NPF could be suppressed.

Technical Comments

There are a few grammatical errors that can be fixed with another careful reading by the authors.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 11039, 2011.