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Interactive comment on "Modelling day-time concentrations of biogenic volatile organic compounds in a boreal forest canopy" *by* H. K. Lappalainen et al.

Anonymous Referee #2

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The manuscript by Lappalainen et al. correlates measured BVOC concentrations with different driving variables, such as temperature, PAR, GPP etc. While studying the exchange and atmospheric transformations of BVOCs is an important topic, there is no clear hypothesis formulated to be tested with such a simplified correlation analysis. Consequently the main conclusion of the paper seems to be that BVOC concentrations are influenced by these different driving variables (nothing new) and that the presented simplified regression analysis can not capture most of the variability observed in this ecosystem (not surprising - see major comments below). For a high impact journal like ACP I do not think that the current manuscript presents enough novel information that warrants publication.

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In particular I do not think that a correlation analysis based on BVOC concentrations can be used to infer a semi-quantitative description of BVOC emissions. This would require at least a simplified atmospheric chemistry / transport model (e.g. http://www.atmos-chem-phys-discuss.net/10/21721/2010/acpd-10-21721-2010.html). BVOC concentrations are influenced by emission, deposition and chemical transformation, which all contribute to the variability of BVOC concentrations. It is argued that "as long as atmospheric mixing is high and anthropogenic sources can be excluded, the understanding of the behavior of day-time BVOC concentrations is based on BVOC emission biology". I strongly disagree with this statement. In the surface layer the variability of short lived compounds such as monoterpenes is certainly influenced by chemical transformations in the PBL. On the other hand the variability of long-lived compounds such as methanol will certainly be influenced by advective processes, in particular in a heterogeneous landscape such as Finland, which has many lakes and different landuse types. On the timescale investigated here, frontal systems could also play an important role in influencing the variability of VOC concentrations. Thus factors controlling the variability of concentrations can have very different causes, which can not be separated by the current correlation analysis.

A second possibility to draw useful conclusions on ecosystem scale emission variability would have been to perform ecosystem scale BVOC flux measurements. Then the correlational analysis using driving variables such as temperature, PAR etc. would make sense. The way the analysis is presented in the current manuscript compares apples with oranges and does not really allow gaining any new useful insights to what is already known.

Minor comments:

Given the range of variance for the three different regression models it does not appear that there is any statistically significant difference between their performance (ie. 27-66% vs 29-69% vs 30-71%).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20035, 2010.

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