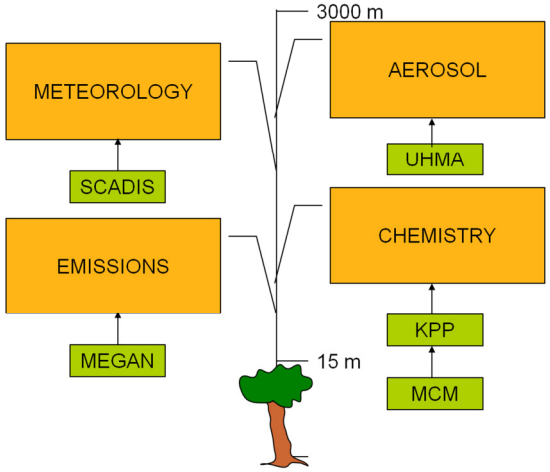
Estimations of the emissions of BVOCs from the boreal forest in Finland

Michael Boy[1], Qingyang He[1], Luxi Zhou[1], Ditte Mogensen[1], Anton Rusanen[1], Sampo Smolander[1], Jaana Bäck[2], Janne Rinne[1], Markku Kulmala[1]

[1]*Department of Physics, PO Box 64, FI-00014 University of Helsinki, Finland*
[2]*Department of Forest Ecology, PO Box 27, FI-00014 University of Helsinki, Finland*

Biogenic volatile organic compounds (BVOCs) are essential in the atmospheric chemistry because of their reactions to produce and destroy troposphere ozone, effects on aerosol formation and growth and their potential influence on global warming. Regional measurements and estimates are urgently needed to research carbon budgets and global climate. However, since various factors such as vegetation type, temperature and radiation have complicated impacts on BVOC emissions; comprehensive inventories are not so often reliably defined.

In this study, the new model SOSAA (model to simulate the concentrations of organic vapors, sulphuric acid and aerosols, Boy et al., 2011) which is a combination of meteorological transport, BVOC emissions, chemistry and aerosol dynamic is applied to investigate Scots pine (*Pinus sylvestris*) tree emissions in a boreal coniferous forest in the SMEAR II at Hyytiälä, Finland. To evaluate the reliability of the model, simulation outputs are compared with measurement data collected from on-line chambers analyzed by proton-transfer-reaction mass spectrometry (PTR-MS) analyzer.



SOSAA model structure

Results indicate that modeling and observations agreed reasonably well. The predominant species emitted from these coniferous trees is monoterpene with the main composition of α–pinene and Δ^3–carene. Diurnal and seasonal variations are demonstrated in both quantity and quality of emitted compounds. Another significant phenomenon for BVOC emitters is the discrepancy between branch scale emissions and above-canopy concentrations. In order to reduce uncertainty in measuring and modeling, a more detailed chemotype characterization of BVOC blends needs to be constructed. In this research, SOSA is also used to estimate the contributions of different BVOC emissions especially monoterpenes and sesquiterpenes to the total OH reactivity.

Reference:

Boy, M., Sogachev, A., Lauros, J., Zhou, L., Guenther, A. and Smolander, S. (2011) *Atmos. Chem. Phys.* **11**, 43-51.