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Sources and Sinks of BVOCs in a Managed Boreal Forest

Ross C. Petersen, Janne Rinne, Thomas Holst, and Meelis Mölder

Lund University, Department of Physical Geography and Ecosystem Science, Lund, Sweden

The ecosystem-atmosphere flux of biogenic volatile organic compounds (BVOCs) has important impacts on tropospheric oxidative capacity and the formation of secondary organic aerosols, influencing air quality and climate. In particular, this is true in managed boreal forests in the Northern Hemisphere, where BVOC emissions often dominate over anthropogenic sources of VOC.

Here we present measurements of BVOCs in a managed boreal forest located at the ICOS station Norunda in Sweden, collected using proton transfer reaction mass spectrometry (PTR-MS). This managed forest consists of a mix of Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*). These long-term PTR-MS measurements were collected at six heights (4m, 8.5m, 13.5m, 19m, 24.5m, and 33.5m) in the forest canopy over several periods during 2014 to 2016. Ozone concentrations were simultaneously measured in conjunction with these PTR-MS measurements. The main BVOCs investigated with the PTR-MS were isoprene, monoterpenes, methanol, acetaldehyde, and acetone. The distribution of BVOC sources and sinks in the forest canopy was explored using several Lagrangian dispersion matrix methods, including localized and continuous near-field theory. The canopy resistance and deposition velocities for ozone and the BVOCs were investigated, and the results for isoprene and monoterpene emissions were found to agree well with several standard BVOC emission algorithms. These results will have importance for constraining BVOC emission estimates from managed boreal forests in the future.