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On-line field measurements of VOC emissions from a spruce tree at SMEAR Estonia

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We have investigated VOC emissions from a Norway spruce tree (Picea abies) in a hemi-boreal mixed forest in September and October 2012, using Proton Transfer Reaction Mass Spectrometry and Gas Chromatography – Mass Spectrometry techniques, applied in a dynamic branch enclosure system that was automatically operated with an electrical compressor. Parallel to BVOC measurements a vast amount of atmospheric (CO_2, CH4, H_2O, CO, particles) and meteorological (temperature, relative humidity, photosynthetic active radiation, wind speed and direction, precipitation) parameters were measured in the ambient atmosphere and inside the cuvette enclosure (temperature, relative humidity, O_3). Prior to the measuring period, an innovatory experimental setup was built at Järvselja forest station, in order to accomplish the detection of BVOC and minimize sampling losses. Therefore, a new inlet line, consisting of 19.4m of heated and isolated glass tube was constructed. The new inlet system applied, allowed the on-line detection and calculation of sesquiterpene (SQT) emission rates for the first time in a hemi-boreal forest site. It total, 12 atmospheric relevant BVOCs were continuously monitored for a three week period and the emission rates were derived. Along with diurnal profiles and continuous timeless, some interesting observations showed the possibility of ozone effect on SQT emissions, the possibility of radiation effect on MT emissions, the higher induced emissions due to mechanical stress and the possibility for a valid intercomparison between different spruce trees located in mountain Kleiner Feldberg (Germany) and in Järvseja forest station (Estonia).