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Oil palm BVOC emissions and their potential for aerosol formation

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During ambient measurements at oil palm plantation (OP3/ACES projects) which took place from May to June 2008 we recorded by direct eddy covariance technique with proton transfer reaction mass spectrometry (PTR-MS) large emission fluxes of isoprene (mid-day mean 8.6 mg m^{-2} h^{-1}), estragole (0.81 mg m^{-2} h^{-1}), acetone (0.1 mg m^{-2} h^{-1}), hexanals (0.05 mg m^{-2} h^{-1}) and remaining compounds ($\sim$ 1 mg m^{-2} h^{-1}). However, secondary products of isoprene oxidation such as MVK+MACR exhibited high deposition rates (1 cm s^{-1}) which were close to maximal theoretical values. In addition, methanol and, to some extent, other VOC compounds exhibited negative fluxes during the day. Despite several times higher emissions of isoprene from oil palm than from a nearby rainforest, it is uncertain how these differences would impact on the formation of aerosols. There have been recently many speculations about actual contribution of isoprene emissions to aerosol formation, for example whether they could inhibit the creation of aerosols due to scavenging of hydroxyl radicals, in contradiction to an earlier OH-radical recycling hypothesis. Regardless, mass aerosol yields from isoprene have been thought low (up to $\sim$2%), which can however make up significant overall loading at large emissions such as encountered at oil palm. Although oil palm was not found to be a monoterpene emitter, it appears that the largest contributor to aerosol production from oil palms might be floral emissions of estragole with its aerosol yield from photooxidation of this compound being similar to that of monoterpenes ($\sim$40%). In addition, other VOCs might have also an effect. We show the parameterisation for emission and deposition of particular VOCs and relate them to aerosol yields found in literature. Overall, it seems that the net aerosol formation potential with regards to VOCs emitted from oil palm may not be much different to that of rainforest, despite differences in the VOC mix emitted by these land uses.