A study of the impact of land use change in Borneo on atmospheric composition using a global model

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A high resolution version of the Cambridge p-TOMCAT model has been used to analyse results from the recent NERC-funded OP3 measurement campaign in Borneo. By using the chemical transport model at 50 km resolution, we have begun to understand the impact of emissions and other physical processes on regional chemistry. In particular, we have run several model scenarios looking at the potential impact of land use change of forest to oil palm in Borneo, and the corresponding change in isoprene emissions, on local and regional atmospheric composition. Oil palm is one of the World's most rapidly expanding equatorial crops, with Indonesia and Malaysia being the two largest producing countries.

Several model emission scenarios are run for the OP3 measurement period, including emissions from global datasets and local flux measurements. Isoprene fluxes observed during OP3 at a forest site were considerably less than fluxes based on the global GEIA dataset. Using the OP3 observed fluxes in the model substantially improved the comparison between modelled and observed isoprene mixing ratios, and had a significant impact on modeled O_3 and OH over Borneo. Further model scenarios performed show that replacing forest with oil palm has the potential to significantly alter the atmospheric oxidizing capacity over Borneo.