2.009 Long-term measurement of isoprene in a South East Asian tropical rainforest. Initial results and conclusions .

Early Career Scientist

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Abstract:

Isoprene, dominated by emissions from tropical forests, contributes the largest source of reactive carbon to the atmosphere, resulting in changes in surface ozone and secondary organic aerosol. Isoprene thus has important impacts for climate, air quality and human health and is the dominant chemical-biosphere-atmosphere interaction. Quantifying the magnitude and impact of these emissions is important for understanding atmospheric chemistry.

Given the importance of isoprene, long-term measurements of its concentration in tropical forests are surprisingly sparse. Here we present the first results from a long-term project to measure isoprene mixing ratios at the Bukit Atur Malaysian Global Atmosphere Watch site on the island of Borneo using both a conventional in-situ GC-FID instrument and a new smaller portable unit. Concentrations from both systems range from 0 to ~3ppb, consistent with previous observations at the site made as part of the OP3 project. However, the shape of the diurnal variation in concentration differs from other (OP3) observations made at the same site.

We investigate the magnitude and variability of our data and the OP3 measurements using the GEOS-Chem model, which uses MEGAN version 2.1 for biogenic emissions. We find that the model significantly overestimates both isoprene concentrations and fluxes. We attribute much of this overestimation to the model emissions algorithm, which assumes tree characteristics are the same in all tropical broadleaf forests around the globe, despite the Borneo forest being dominated by dipterocarps unlike the Amazon. We update the emissions algorithm for this change and investigate the impact.

Overall we conclude that there are significant continental scale differences in the emissions of isoprene, which need to be considered when evaluating the impact of this important species.