

3.061 Emissions of Biogenic VOCs from major tree species in Japan: Improvement of monoterpene emission algorithm.

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Abstract:

Biogenic volatile organic compounds (BVOCs) are emitted by vegetation. The annual global emissions of BVOCs are estimated to be several times greater than annual anthropogenic VOC emissions. Monoterpenes emitted from trees have important roles in atmospheric chemistry through the formation of secondary organic aerosols and photochemical oxidants. The emission rates and patterns can be affected by changing climate and air quality. We and our colleagues reported that monoterpene emissions from Japanese cedar and Japanese larch depended on temperature. However, several high monoterpene emission rates were observed after rain fall events. To improve a monoterpene emission algorithm, we performed a field experiment and investigated the relationship between monoterpene emission rates and volumetric soil water content (SWC) at Japanese cedar and Japanese larch. In addition, we measured monoterpene emission rates of Japanese cedar under different CO₂ concentrations (control: ambient CO₂ level, elevated CO₂: 1000 ppm). We found a high positive correlation between monoterpene emission rates and SWC at Japanese cedar and Japanese larch. The monoterpene emission rates estimated by considering temperature and SWC better agreed with the measured monoterpene emission rates, when compared with the emission rates estimated by considering temperature alone. Interestingly, degree of SWC effect on the monoterpene emission rates differed by CO₂ concentration. We suggest that the combined effects of SWC and CO₂ concentration are important for controlling the monoterpene emissions.