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# Sensitivity of isoprenoid emissions in forests to leaf area and stand structure

**R. Grote**

Institute for Meteorology and Climate Research IMK-IFU, Forschungszentrum Karlsruhe (ruediger.grote@imk.fzk.de)

Isoprene and monoterpenes are emitted by a large number of plant species, including most of the tree species that are dominant in European forests. The emission depends very much on immediate environmental conditions as well as on the seasonally changing plant disposition. It can be described with a biochemically-based model that has been developed to describe the emission of isoprene and monoterpenes of a number of tree species that lack any particular storage structure (Zimmer et al. 2000). This model describes emission processes on the leaf scale in short time steps, but because it relies on enzyme kinetics that can be described by climate-dependent formation and degradation processes, it can be used to simulate the seasonal development of isoprenoid emissions per foliage area without further empirical adjustments. In order to scale the results from the leaf to the stand scale, the combined seasonal - biochemical model has now been nested into an ecosystem model that provides climatic variables, the seasonally changing foliage biomass, and the precursor molecules from photosynthesis in each of a number of canopy layers. A sensitivity study using this coupled model approach shows that the emission of isoprenoids depends largely on the amount and distribution of foliage within a forest stand. The responds however is not linearly related to leaf area since an increase in emission potential with increasing foliage area is partly counteracted by less favourable conditions for emission inside the canopy. These results indicate that not only leaf area per ground area but also forest structure, both sensible to environmental changes as well as forest management, affect isoprenoid emission at the stand scale.