

Quantification of terpenoid emissions and impact of terpenoid emissions on climate change in a Japanese main coniferous tree

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Terpenoid such as isoprene and monoterpenes is major compounds emitted from plants, and contribute to the formation of photochemical oxidants and secondary aerosols in the troposphere. In the present study, we measured terpenoid emission fluxes above a Japanese larch forest (*Larix kaempferi*) from spring to fall (every month) to produce terpenoid emission inventory across Japan. The study was conducted at the Fuji-Hokuroku site near Mt. Fuji, Japan.

First, we identified terpenoid species with GC-MS and found that major species emitted by the tree were isoprene, α -pinene, sabinene, myrcene and β -pinene. We confirmed that isoprene was emitted from a forest floor plant (*Dryopteris crassirhizoma*) and all the monoterpenes from the Japanese larch.

Second, we sampled the terpenoid using a relaxed eddy accumulation (REA) method. We used a portable REA sampling device that we developed last year. The high monoterpene fluxes were observed from late spring season to middle summer. Monoterpene fluxes in fall were relatively low except for the fluxes measured just after strong typhoons No.12 and No. 15 passed over this area. Monoterpene fluxes were found to increase exponentially with temperature. To estimate effect of the physical disturbance by typhoon on monoterpene emissions from larch tree, we investigated the effect of swing vibration and heavy rain on monoterpene emissions from larch saplings in a laboratory experiment. Monoterpene emissions were monitored with a proton transfer reaction mass spectrometer. As a result, soon after Japanese larch was swung or wetted by the heavy rain, monoterpene emission rates increased by several times compared with that under normal conditions.

The isoprene flux was highest from late July to August and almost zero in late fall, winter, and spring.

In conclusion, we have obtained terpenoid emission fluxes across a year to estimate the annual terpenoid emission rates of the Japanese larch.