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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Terpenoid measurements at a Northern wetland revealed a strong source of sesquiterpenes" *by* Heidi Hellén et al.

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Terpenoid emissions from high latitude wetland ecosystems have been poorly characterized, but important for understanding biological functions and atmopsheric impacts as environmental drivers change.

The study by Hellén et al., 2020 provides valuable data on both biogenic emissions of terpenoid compounds and their ambient concentrations at a sub-Arctic wetland in Finland (Lompolojänkkä). Observations were made using an in-situ thermal desporption-GC-MS which is ideal for studying terpenoid volatile emissions as other sensitive atmospheric techniques (e.g. PTR-TOFMS) have a limited ability to distinguish isomers. The study confirms previous work that isoprene is one of the most abundant terpenod emit-

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ted by the wetland ecosystem. Consistent with many ecosystems across the world, monoterpene emissions appeared at roughly 10% of isoprene emissions. However, while many ecosystems show significant sesquiterpene emissions, they are generally low relative to isoprene and monoterpenes. In contrast, in Lompolojänkkä, higher sesquiterpene emissions

Abstract: The abstract is highly qualitative, lacking quantitative data (with uncertainties). Simply stating that something is higher or lower is not acceptable, especially without statistical tests.

Which monoterpenes and sesquiterpenes were observed? How did their composition change with the growing season?

"Isoprene, MT and SQT emissions were dependent on temperature." What is the correlation? Positive, negative? Were there emissions at night? Are they light-dependent or independent?

"Isoprene emission rates were also found to be well-correlated with the gross primary production of CO2. Even with the higher emissions from the wetland, ambient air concentrations of isoprene were clearly lower than MT concentrations. This indicates that wetland was not the only source affecting atmospheric concentrations at the site, but surrounding coniferous forests, which are high MT emitters, contribute as well." The authors need to consider uptake by the soil of isoprene, how can they rule this out? There seems to be a number of other possible scenarios to explain the findings.

"In May concentrations of SQTs and MTs at Lompolojänkkä were higher than in earlier boreal forest measurements in southern Finland. At that time the snow cover on the ground was melting and soil thawing and VOCs produced under the snow cover, e.g. by microbes and decaying litter, can be released to the air." Not clear which site the authors are referring to here and seems there is too much speculation.

"Daily mean MT concentrations were very highly negatively correlated with daily mean

ozone concentrations indicating that vegetation emissions can be a significant chemical sink of ozone at this sub-Arctic area." Please provide statistics!

This is fascinating, can the authors look further into this and estimate atmospheric terpene ozonolysis rates?

What is the relationship between the emission rates and the atmospheric concentrations?

Introduction: The introduction needs to be expanded to include background on the atmospheric and biological roles of terpenes. Especially the later as there is no mention of this here. I would like to see some sort of introduction on isoprene, monoterpenes, and sesquiterpenes.

Methods: Please cite references for the liquid standards in methanol. If only SQTs were present in the calibration solution, how were MTPs and isoprene calibrated?

Graphs: Please use different colors for alpha-pinene and other MTPs, they look the same!

Why did 2/07 show huge atmospheric concentrations of isoprene >150 ppb but the other days did not? That does not seem like a reasonable isoprene concentration.

Figure 7 with the diurnal patterns is beautiful data. I would be very interested to know if the composition of the terpenes changed across the day as previously observed in other sites.

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