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Biogeosciences Discussions

Interactive comment on "Leaf isoprene emission in a subarctic wetland sedge community" *by* A. Ekberg et al.

Anonymous Referee #1

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General:

The Authors present in this paper measurements of isoprene emissions from two subarctic wetland sedge species. Together with measurements on leaf level a comparison of two emission parametrisations are reported. The data itself are an interesting contribution to the overall knowledge of BVOC emission sources in high latitude ecosystems. However, the data set is rather small, which is pointed out by the authors themselves several times within the paper. That leads to difficulties in a clear assessment of generalised model parameters that can be used in a broader model study of emissions from such ecosystem. I would have split the paper into two parts and emphasised in one of them the measurements of photosynthetic parameters and isoprene emissions as well the leaf nitrogen relations. Then it would be also possible to include the many left

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out data sets. The other part could focus on the modelling and approximations of the emissions that can be drawn form parametrisations such as Guenther et. al. and the Niinemets algorithms.

Specific:

Materials and Methods: What have been the advantages of using 'estimated mean ambient temperature' instead of tracking ambient temperature and let the device follow that? Given that temperature changes are not too large over the period of measure one can always relate afterwards also to the mean temperature during measure. The measurement time per C_a step of the A-C_i curves is very short, in 2-3 minutes there is usually no stabilisation on the whole leaf level to achieve as stomata have reaction times of more then ten minutes usually. How many steps have been measured? Later in the paper, the term A_{sat} appears, as light saturated A, it would be helpful, to introduce this in that section and give the criteria when the light saturation have been reached. Was it always the same threshold, did that move? In terms of modelling, as for the Guenther et. al. the temperature to parametrise the base emission rates have been set to 20 C, which make sense for colder areas, have you also parametrised the Niinemets empirical factors such as ϵ to the reference temperature to 20 C?

Results: In line 3, p5071, the specific leaf area (SLA) is given, why you use the unit g m^{-2}? As I understood, the SLA is defined as ratio between the leaf area per dry mass, by that the unit have to be m^2 g^{-1}. Why you are correlating the emissions to the previous 48h average? It's clear, that enzyme activity is increased or decreased by temperature and light availability and that the days before are crucial to that regulation, but it should be also possible to correlate to the short term events. Almost same question as above, can you give the values and estimates for the empirical factors (ϵ, a_x) in the Niinemets equations? p5073, line14, i am not a real fan of many values throughout the text, it would be nice to have these numbers compiled together into a table as that helps to easier compare them.

BGD

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Interactive Comment

Discussions: On p5073, lines 23ff, you report the measures at 20 C, and then that these correspond to 4051 μg C m^{-2} h^{-1} at 30 C, which is about factor of 3.6 higher than the measure at 20 C. As there is also cited the work of Guenter et.al. 1993, i assume that you did use that algorithm for the 'normalising' to 30 C. This is, in my opinion, a general problem in many studies as at really 30 C measured these sedges might already have temperature stress and maybe the photosynthetic capacity would be not sufficient to sustain a isoprene emission rate as calculated and by that these numbers will not be comparable to measures at 30 C. There are a quite many discussed topics, on the acclimation of the emission capacity due to temperature changes within the last days and as well about seasonal effects of temperature changes, photosynthesis versus temperature controls, nitrogen availability, and more. These could support the message that could be given by a paper that is focused more on these physiological processes if there would not be so many data left out. On the other hand, as the algorithms used are both parametrisations that allow inclusion of such processes only in a rudimentary way that leads to a somehow unstructured and overloaded discussion in terms of the modelling task. As pointed out before, it would make sense to organise the paper in two parts, one with measured results and implications that could be drawn thereof for the physiologigal and environmental properties and a modelling part using these.

Interactive comment on Biogeosciences Discuss., 5, 5061, 2008.