

Interactive comment on “Tree water relations trigger monoterpene emissions from Scots pine stem during spring recovery” by A. Vanhatalo et al.

Anonymous Referee #3

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Review of Vanhatalo et al., BGD 12, 7783–7814, 2015

The manuscript represents another interesting and useful contribution from one of the Finnish field sites, here the Scots pine ecosystem. It is a representative, heavily instrumented environment, and the new work is an innovative study relating plant seasonal dynamics to potential atmospheric impacts. The experiment is well described, and a series of relevant auxiliary measurements were conducted to aid in interpretations. The weaknesses of the study lie in the lack of reproduction (only one tree studied), and the associated speculation concerning the results and their drivers. Since this is likely ongoing work, I recommend including another season (spring 2014, 1015 ?) and possibly more trees into the manuscript when ready, and/or reduce the amount of speculation

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by focusing on the most likely reasons for the observations, clearly indicating what is known and what is speculation. The title should be changed accordingly.

Specific comments:

1. I agree that terpene emissions from tree stems of terpene-storing species is a worthwhile study subject. However, it should be more prominently compared to the other, presumably more relevant sources of terpenes to the atmosphere. The authors compare only to the dominant source of emissions, namely foliage. They should include the other identified sources that add/modulate the total terpene source: (i) leaf litter on the soil, (ii) herbivore impacts, and (iii) forest management, aka selective thinning/removing and harvesting. All these have been studied and published works exist. If the current study's findings indicate that stems are minor but significant sources, either via the demonstrated short-term effect or via all-year-round emissions, then this should be related to the other minor sources. The comparisons are, in my opinion, much more relevant here than the yet still speculative nature of the origin and drivers of stem emissions; future work could instead focus on the more relevant sources.

2. Related to #1, above-canopy flux measurements, which have been done at this site in the past, should be included if available to put the observations into context.

3. The results are well summarized but could be combined with the discussion, realizing that some of the discussion is speculative. Comparative evaluations should be considered when discussing the fluxes. The same units of flux should be maintained, and switching like on page 7791, first paragraph, is discouraged.

4. The discussion part is where most issues are. I think most of the discussion in section 4 until page 7795 is reasonable. It stems from the observations and is related to what is known about tree physiology during that time of the season. However, I strongly encourage the authors to consider eliminating, or at least drastically shortening sections 4.1 to 4.3. Temperature is obviously not relevant in the burst other than triggering seasonal sap-flow recurrence / end of dormancy, section 4.2 appears entirely

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speculative, and section 4.3 is so at least in parts. I am not even sure that the offered explanations are exclusive of additional possibilities, such as, I speculate, the reallocation of monoterpenes through sap-flow from roots to other tissue in spring (which could have been tested by an additional enclosure lower on the tree stem).

It appears to me that much more research is needed to evaluate the most likely source and drivers of the monoterpene burst, and I think the authors should be satisfied with having discovered it, and linked it to the physiological changes the tree underwent as it recovered from winter dormancy. I thus recommend shortening section 4 appropriately.

5. The conclusions need to address the relevance of the discovery, such as for spring atmospheric BVOC emissions and/or spring herbivore vulnerability or attacks. If the study can be reproduced, a focus on this relevance maybe useful in improving study design and auxiliary measurements.

Interactive comment on Biogeosciences Discuss., 12, 7783, 2015.

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