Biogeosciences Discuss., 6, S107–S109, 2009
www.biogeosciences-discuss.net/6/S107/2009/

Biogeosciences Discussions

Interactive comment on "Drought reduced monoterpene emissions from *Quercus ilex* trees: results from a throughfall displacement experiment within a forest ecosystem" *by* A. V. Lavoir et al.

Anonymous Referee #2

Received and published: 13 February 2009

This paper investigates the impact of drought stress on monoterpene emission from Quercus ilex (holm oak) leaves. Holm oak is considered a strong monoterpene emitter and drought is a recurrent stress in the Mediterranean area. Monoterpene emissions may be important for the chemistry of the atmosphere and also for communication within the biosphere. The study is timely and of interest to this journal.

The message of the paper is not clear. It is concluded that drought negatively affects monoterpene emission, and that drought reduces the overall flux of monoterpenes from Mediterranean forests. The second allegation (e.g. last sentence of the abstract) is not

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

supported by experimental results and may only be advanced as a speculation. But I have problems also with the first conclusion, as some results do not show clearly show a negative effect of drought on monoterpene emission. For instance, when data in control and drought stressed plots are compared in Fig. 1 (emission) and 3 (standard emission) no clear evidence of an effect of drought can be seen. When standard emission from the irrigated plot is compared with the other two plots (Fig. 4 and 3), the emissions of the 2005 drought-stressed samples appear to be similar to those of the irrigated plot.

I think that the authors should re-analyze their data, clearly stating what Fig. 5, and the overall data-set, probably reveal; monoterpene biosynthesis and emission are relatively insensitive to drought when this is mild, or even rather heavy (see abstract 14-16), but monoterpene biosynthesis and emission drop when the stress reaches a threshold. This is reminiscent of what has been observed with isoprene, the other volatile hydrocarbon that is commonly emitted by trees. In a recent paper, Brilli et al. (New Phytol 2007) came across similar results with drought-stressed potted poplars, and concluded that a threshold of transpirable soil water exists after which isoprene is considerably inhibited. I think the results of this paper could valuably expand the indications of the paper by Brilli, which is not even mentioned in the current version. The existence of a threshold is mentioned in the discussion (page 880) but it should be brought about as the core result of this paper, and adequately supported with pertinent literature. The paper by Brilli also offers a valuable insight of alternative carbon sources for terpenes in drought-stressed leaves, while the two mentioned papers (page 882 – 11) do not directly refer to drought stress.

The paper unfortunately also shows several methodological problems and unclear writing. The emissions are clearly affected by a combination of effects, including seasonality, leaf age, and the attack of pests. Discrimination of the drought stress effect is attempted but not clear. The data-set reduction to summer values in Fig. 5 should be justified more quantitatively than it has been done. In Fig. 5 legend, the data-set

BGD

6, S107–S109, 2009

actually used for the plot is not even mentioned, and it appears that all data are plotted.

Many more data should be shown. The result section opens with a paragraph non of whose data is shown. Some of those data are of interest and should be shown. For instance it would be interesting to see that emissions reflect activation of corresponding enzymes. Is this true also in stressed leaves? It should not, as stomatal closure could affect some of the more soluble monoterpenes. The coefficients for light and temperature-dependent correction of emission to calculate the standard emission should also be shown. Incidentally, the presentation of the determination of the standard emission is cumbersome and unclear (873). The discussion about possible causes of monoterpene drop is speculative. For instance, it is speculated that photosynthesis drops earlier than monoterpene emission because of stomatal closure (page 882). How do we know? With the available data, calculation of intercellular CO2 concentration should be possible. Data about the 2007 comparison between one-year and current-year leaves (879-10) should be shown.

Some other important references are missing and some are misquoted. For instance, the first paper addressing the possible role of drought stress on volatile terpenes (Sharkey and Loreto, Oecologia 1993) should be quoted on page 866. It is not true that all studies quoted on page 866 have been performed with young potted plants.

Some definitions are inexact and other are missing. For instance, reference to BVOC (page 865 and following) is misplaced here. The paper only deals with monoterpenes and this should be made clear since the very beginning. It is unclear what - basal emission rates -, - instantaneous emission rates – are (866). It is also unclear how weather effects on monoterpene emissions were minimized by the measurement routine (869-27).

Interactive comment on Biogeosciences Discuss., 6, 863, 2009.