

Interactive comment on “Effect of UV radiation and temperature on the emission of methane from plant biomass and structural components” by I. Vigano et al.

Anonymous Referee #2

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General comments Two years ago, an original paper from this group was published in which the emission of methane from plants was claimed (Keppler et al. 2006). The paper led to two main controversies: a) how do plants (physiologically) produce methane? b) what does this mean for the global methane budget? In the well-written paper presented here by Vigano et al., the authors show how the emission of methane from plants can indeed occur. They exposed dry and detached fresh plant matter as well as a number of structural plant components to elevated temperatures and UV irradiation, after which they measured methane production by means of a number of very sensitive techniques including isotope ratio mass spectrometry. With a neat set of experiments, they were able to demonstrate methane emissions by heating detached plant matter

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and structural plant components, or exposing them to UV radiation. Irradiation with various levels of UV resulted in almost immediate emissions of methane indicating a direct photochemical process, according to the authors. The significance of this statement will be welcomed by plant physiologists who during the past two years have wondered about a physiological mechanism to explaining methane production in plants. A photochemical process is a great deal easier to deal with than a plant physiological process.

Specific issues The second poignant question remains as yet unanswered, and although it was certainly not the aim of this paper, the scientific world will try to resolve it by means of the results presented here. With respect to this second question, a number of questions arise.

1. According to the citation used from Bernhard et al. (1997), typical UVB irradiances in the tropics are about $4\text{W}/\text{m}^2$, and at mid latitudes about $2\text{W}/\text{m}^2$. The levels used here were 5 to more than 10 times higher than natural levels. In their experiments, the authors observed that the emissions were correlated to UV intensities used (Fig 2). This is in accordance with earlier observations by Lerdau et al (1997), who reported a linear relationship between another VOC, isoprene, and increasing light intensities. If we assume that irradiances in the UV range were included in the term "light" used by Lerdau, we have indirect confirmation of the observations reported in this paper. On the other hand, one might question what effect these elevated levels of UVB might have on living plants. This might well explain the observation that UV irradiation results in significantly higher methane emissions than reported earlier by Keppler et al (2006) from litter, but less than from living plants. Perhaps the authors can comment on this in the discussion.

2. How might UVB irradiances be related to the observations by Wang et al (2007) who also measured methane emissions, but the exclusively from stems of woody species?

3. The authors should elaborate on the statement "in order to exclude potentially complicating factors from living plants...". To which complicating factors do the authors

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refer? And are these factors complicating with respect to their experiment, or to emission of methane under natural conditions, e.g. in tropical forests? I would like to see the authors elaborate on this.

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