Response to comments of the referees:

Ian Moeller:

The authors wish to thank the referee for his efforts in reviewing our manuscript and for the helpful and constructive comments provided. Below are our point by point responses to all issues raised by the referee. The manuscript has been revised accordingly.

General Comments
In this manuscript the authors describe experiments designed to test whether methionine can be a source of methane production in plants. The experiments appear to have been well carried out, the presentation is clear and the results are convincing – when plants are incubated with labelled methionine the label does appear in released methane and more so during stress. The authors are also careful to make the point in the discussion that free methionine does not have to be the source in vivo, it could be protein-bound methionine (or probably both depending on conditions?) as previously suggested by Bruhn et al. (2012).
Specific comments
There is an unfortunate tradition to use the units ng, mg or g when talking about amounts of greenhouse gases. The only unit that makes chemical and biological sense, especially when comparing the amounts of two gases (e.g., CO2 and methane) is moles. I can accept that the data are also given as ng or mg. The authors have recognized this as they use molar ratios when comparing CO2 and methane emissions, but even here the results are given as “a pmol/ï Ą mol” (picomoles/micromoles) where it should be “a x 10-6“ (and no unit), which I suppose could be called “molar ppm”?
Authors’ response: We fully agree with the referee to use the unit mole when comparing the amounts of greenhouse gases. However, to ensure the comparability of our emission rates with other publications where the amount is often given in ng, we decided to give the emissions in both units (mol and ng). We have changed the CH_4:CO_2 ratio unit from pmol:µmol to mol:mol x10^6 in the results section (line 228), the discussion section, and in Fig. 2.

Technical corrections
Page 16088 line 20 lavender should be written with lower case
Authors’ response: Correction made.

Page 16093 line 21 5-fold should be 4-fold
Authors’ response: Correction made.

Page 16094 line 20 “increase of CH4 emissions” should be “increase in CH4 emissions”
Authors’ response: Correction made.

Page 16095 line 18 5-fold should be 4-fold
Authors' response: Correction made.

Page 16097 line 25 "we did not to scan" – delete "to"
Authors' response: Correction made.

Anonymous referee #3:
The authors wish to thank the referee for his/her efforts in reviewing our manuscript and for the helpful and constructive comments provided. Below are our point by point responses to all issues raised by the referee. The manuscript has been revised accordingly.

General Comments
Plant-derived methane emissions have been controversially debated in the past years. On the basis of previous studies, clearly, plants are a source of non-microbial methane in nature. In this study, the authors used stable isotope techniques to verify methane production and to identify the carbon precursor. The authors found that the amino acid L-methionine acts as a methane precursor in living lavender (Lavandula angustifolia). This study should be of strong interest to readers. I found that this manuscript was clearly presented and largely recommended its publication in Biogeosciences subject to a minor revision.

Specific comments
(1) Page 16089, Line 4-5; Page 16102, Table 1: Different words were named for the different experiments, such as the initial experiment, the second experiment, consecutive treatment experiment, and parallel treatment experiment. Please elucidate them and use identical names throughout the whole manuscript.
Authors' response: Corrections made.

(2) Page 16090, Line 2-3: This procedure took approximately one minute for all leaves or six leaves of each plant? Please elucidate.
Authors' response: We have added information to make this point clearer (lines 131-132).

(3) Page 16093, Line 18: In this manuscript, the different units were used for the CH4 (pmol) and CO2 (mol) to calculate the CH4 :CO2 ratio. In general, the ratios were more than 1 but absolute emissions of CO2 were much more than CH4. If possible, please provide additional remind information in the manuscript.
Authors' response: We have changed the CH_4:CO_2 ratio unit from pmol:µmol to mol:mol x10^6 in den results section (line 228), in the discussion section, and in Fig. 2.

(4) Page 16094, Line 24-27: In Wang et al. (2011), CH4 emission rates were for intact leaves, not for intact plants. Please correct them.
Authors' response: Corrections made.

(5) In the section "4.3 Methionine as a precursor of CH4 in plants": If possible, please add the discussion on the precursors of CH4 in plants. The methyl group or its analogue is ubiquitous in organic compounds (Wang et al., 2013, Earth-Science Reviews 127, 193–202). Methionine could be only one of many precursors.
Authors' response: We have added a paragraph dealing with potential precursor compounds of methane in plants (lines 320-324).

(6) Figure 1: The latter half of the figure legend can be removed to the result section.
Authors' response: As suggested by the referee we deleted the second half of the figure legend, as the information was already included in the results section.