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Interactive comment on "Quantifying environmental stress induced emissions of algal isoprene and monoterpenes using laboratory measurements" *by* N. Meskhidze et al.

Anonymous Referee #3

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General comments: This paper describes laboratory experiments on the stress induced by rapid changes in radiation and temperature on the emissions on isoprene and terpenes by phytoplankton cultures. It is a very interesting experiment worthwhile to be published and only minor changes are required. A main issue to my opinion is the choice and the representativity of the experimental conditions used here to induce a stress in the phytoplankton cultures. Indeed, due to the seawater absorption coefficient, PAR is rapidly attenuated with depth and reach only 10-20% of the surface irradiance at several tenths meter depth , i.e. at the isoprene maximum level usually observed in seawater (close to the chlorophyll or fluorescence maximum) . Therefore irradiances of 420 and particularly as high as 900 μmol m-2 s-1 does not seem to

correspond to ambient reasonable figures, their choice should be better justified and discussed (i.e. lines 19 to 22 page 13538.

Specific comments: Page 13536 Line 7, I don't think that Shaw et al., 1983 were the first to suggest a relationship between gas emissions and climate. To my knowledge J.E. Lovelock was a pioneer in this matter and could be referenced. Authors could also refer to the well-known (and somewhat controversial) CLAW hypothesis of Charlson, Lovelock Andrea and Warren: Charlson, R.J., et al., Oceanic phytoplankton, atmospheric sulphur, cloud albedo and climate. Nature (326), 1987. Page 13543 Line 26, the MDL is determined as 2.7 to 140 pptv, it would be helpful to precise in which range of isoprene or monoterpene emissions these value correspond. More generally give the MDL and accuracy for the emission rates and not only for the concentrations in the head space. Paragraph 2.3- It is announced that some compounds have the affinity to stay in the aqueous phase: what are the compounds concerned precisely. I assume that the Henry Law constant is relatively low for most of the species, what are the species concerned, and what is their Henry law constant . At least the Henry law Constant is relatively low for most of the considered compounds of the order of 2 to 5 10-2 M L-1 Atm-1(isoprene, limonene, alpha pinene (see for example: Leng et al., Temperature-dependent Henry's law constants of atmospheric organics of biogenic origin, J Phys Chem , 2013. and http://www.henrys-law.org/henry.pdf) Consequently a volume of 14 liter (line 8 in §2.3) of air for the extraction of the dissolved gases in 250 ML of the aqueous phase seems to be more than enough for a 90% efficiency of recovery. Can the authors be more precise on the expected extraction efficiency and the comparison with the measured experimental values. The experimental set up for the head space analysis is simple and classical, I don't think that a figure (such as Figs 1a ad 1b) brings any useful information since it is relatively well described in the text. On the opposite the full procedure for phytoplankton cultures preparation, conditioning, transfer, is relatively hard to follow, a schematic diagram or a table showing the different steps would be useful. In general, the font sizes for Figures 2 to 5 are too small , also it is difficult to be convinced that the variations are not in the range of the uncertainties,

Y scale should be changed i.e. 2 x 10-19 instead of 2E-19

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