General comments
This is a modelling study on effects of changes in radiation (quantity and quality) on isoprene emissions from vegetation. The authors introduce absorption of direct and diffuse radiation by sunlit and shaded leaves into the Gunter et al.(1999, 2006) isoprene emissions model. The modified model is then run at a single site during the post Mont Pinatubo eruption period and lower simulated isoprene emissions are obtained when accounting for the above mentioned effects. The main findings of this study obtained from simulations at a single site (without providing any data that confirms the main results or any model evaluation) are presented in the abstract and summary of the manuscript as if they were typical for all terrestrial vegetation types and therefore valid globally.

The aim of this study was to introduce the new idea previously overlooked that qualitative effects that changes in diffuse / direct radiation could potentially exert effects on isoprene emissions from vegetation canopies. Our approach is theoretical because there are no observations (that we know of) documenting how isoprene emissions respond to change in Idiff and Idir. Our MS is the first time (again to our knowledge) that anyone has drawn attention to this possibility. In this context, it is the trends, and the shape of response curves etc that are important. We will certainly revise the text to moderate our conclusions regarding their potential effects on different types of vegetation. Our MS is best viewed as a case study for a North American site where suitable Idiff and Idir data are available (along with NPP responses) to calculate what effects it might have. We would be happy to make this clearer in the text.

The methodology could be clearer for the non specialist in isoprene modelling. It would be good to see how the additions to the model affect the gamma functions, in order to better understand the obtained results for sunlit and shaded fractions of the canopy under clear and dusty conditions. For instance, case 2, if diffuse radiation is higher under a dusty atmosphere, shaded leaves must be receiving higher radiation, why are isoprene emissions then lower?

The radiation received by the two fractions of the canopy is derived from equations in De Pury and Farquhar. Both the radiation in shaded and sunlit leaves depend to some extent on both direct and diffuse radiation. Therefore a significant decrease in direct radiation can lead to a decrease radiation received by the shaded fraction of the canopy and offset the increase from the diffuse radiation. Derivation of the sunlit and shaded radiation on the canopy was reported in detail by De Pury and Farquhar.

Can this result be model dependent on how the response of isoprene emissions to light is described? A change of radiation levels on an hyperbolic light response (steep and linear at low radiation levels, and saturating at high radiation levels (Niinemets et al. 1999)), might have a very different effect on both sunlit and shaded leaves than a non light saturating response (with perhaps not a steep linear increase at low radiation levels).

Clearly a different model with a different light response could give a different result, but we were only considering the routines employed in MEGAN because it is widely used by the community.

According to the gamma P, used in this study, what is the threshold of diffuse fraction at which isoprene emissions start decreasing with increasing diffuse fraction (i.e. plot of isoprene emissions against diffuse fraction, case 2)?

We will explore this interesting sensitivity issue with further analyses in a revised version of the MS.

Most importantly, what are measurements showing? This study would greatly benefit from looking & showing the effects of diffuse radiation on isoprene emissions from eddy correlation at some sites. Just by separating isoprene emissions under high, intermediate and low diffuse fraction conditions, would give an idea of the differences in fluxes under the different conditions and it would potentially confirm the obtained modelling results.

As stated above, we are not aware of such measurements. It is hoped that our theoretical treatment will highlight awareness of the issue and stimulate further modelling analyses, field campaigns and laboratory studies to investigate this issue further.

This is a relevant subject for Earth system science that has not been taken into account in vegetation modelling before. In general, this is a well written and structured paper with proper citations to previous work. The authors need to explain better their modifications to the model in order to clarify their main results to the non expert reader in isoprene modelling, and also they need include some data that can confirm their findings.

Additionally, obtained results from this study, should be presented in their abstract and summary as a sensitivity study on a single site and care should be taken to avoid implying that the obtained results are globally valid.

Specific comments:
-On what time step is the model run for case 1 and case 2?

It is hourly; we will add this to the text in section 2.1

-For a non specialist on isoprene modelling, it is not straight forward to understand what Lai sun, Lai shade, Par sun, Par shade are doing to the given equations. For instance,
in equations 5, 6, and 7, where are sunlit and shaded PAR going? is it the P term? Or
P24 and P240 as well? Some clarification is needed.
For the sunlit isoprene emission we use sunlit PAR for the P, P_{24} and P_{240} terms in equations 5 to 7, and similarly use shaded PAR for all terms for shaded isoprene emissions. We will clarify this in the text.

-Plots of gamma Lai sun and Gama Lai shade, gamma Psun and gamma P shade would be quite useful to understand the effects of the modifications done to the model.

We can produce these plots in a revised version of the MS.

-what is f in equation 3?
f is the sunlit or shaded fraction of the LAI. We will clarify this by using LAI_{sun} and LAI_{shade} instead.

-Legend in Figure 1 mentions 4 panels, however there are only two.
We will correct this.

Figure 3, what are Isun and Ishade used to produce Figure 3? that would help to explain this figure. Do the coloured areas correspond to the total fluxes, i.e. sunlit leaves in black have much higher emissions (total black area) than shaded leaves (total grey area), so, total emissions are shown as the area under the top curve?
We can report Isun and Ishade used to calculate the emissions in Figure 3 Total emissions are the area under the top curve.