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Interactive comment on "Stable isotope ratio ($^{13}C/^{12}C$) mass spectrometry to evaluate carbon sources and sinks: changes and trends during the decomposition of vegetal debris from eucalyptus clone plantations (NW Spain)" *by* I. Fernandez and A. Cabaneiro

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Response to Anonymous Referee #2

Comment: "In this paper, a litter decay experiment was designed to examine what difference in biodegradability exist between leaf litter of two eucalyptus clones grown at two parent material sites. During the period litter decomposition, the C:N ratios, weight-loss rates, and δ13C of remained matter, etc., were measured for leaf litter from

two sites, and the difference in these traits was illustrated. This study deals with an important topic in term of biogeochemistry, and the data display important implications for eucalyptus plantation management. However, current status of this paper is not suitable to publication in BG due to problems as follows.

. First, the title of paper did not reflect main results obtained in this experiment. In fact, the patterns of variation in litter δ13C during the decomposition and the significance is only a minor fraction of all data in the paper. Carbon isotope technology is a good approach to illustrate the processes of litter decay, however, its role was not manifested in this study due to some issues in experimental design. For instance, there usually is a distinct difference in δ13C between fresh leaf-litter and semi-decomposed litter because of difference in mobility of 12C and 13C. But, in this study, the sample litter consists of organic matter at different stages of decomposition, resulting in little change in litter δ13C during the period of decomposition.

. Second, in this study, I think, there were very good data (e.g. Table 1-3, Fig. 1-3) for characterizing the processes of litter decomposition for two clones, but the meaning of these data are not well explained in indicating litter decay, e.g., litter C:N ratio.

. Third, the results and discussion are presented in one section (third section) in this study, and this limits to some extent interactive explanations of different results. If the third section, Results and discussion, is divided into two sections, Results and Discussion, and more references are cited in the Discussion, the presentation of the paper will be greatly improved."

Response: We extremely appreciate the referee's constructive and encouraging judgment of our manuscript and his/her comments helped a lot in improving the paper by better explaining the data for characterizing the processes of litter decay and by enhancing the discussion of some of our results. Entirely, all the 3 suggestions indicated in the referee's comment were taken into account and, accordingly, the following changes were applied to the original version of the manuscript:

. First, as very appropriately suggested by the reviewer, the title of the article was not only modified to better reflect main results obtained in this research (in a simpler and more straightforward way) but also reduced to be more concise.

Former title: “Stable isotope ratio (13C/12C) mass spectrometry to evaluate carbon sources and sinks: changes and trends during the decomposition of vegetal debris from eucalyptus clone plantations (NW Spain)”

Adapted title: “Potential biodegradability of eucalyptus litter from northwestern Spanish forests planted with a different clone: F0 or F1 generation”

. Second, we thank the referee for his/her positive evaluation of the data presented in this manuscript and for leading us to include a more detailed characterization of the litter decomposition processes, since this triggered an in-depth re-examination of the different changes observed during litter decay. Accordingly, new sentences and explanations were added within the section “3.1 Biodegradability of eucalyptus debris” and some additional references were cited.

Added text: “The fact that litter samples exhibiting the lowest C-to-N ratios also showed the highest weight losses during the biodegradation seems to agree with the results found by some authors, who associate litter decay to labile C and N availabilities during the initial decomposition phases (Berg et al., 2007; Berg and McClaugherty, 2008), when labile compounds such as carbohydrates, proteins, and other simple compounds are rapidly degraded by fast growing microorganisms requiring high N concentrations (Fioretto et al., 2005).“

. Third, the suggestion given by the reviewer to improve the presentation of this research paper by including more interactive explanations related to the different results obtained in our experiences is deeply appreciated by the authors and with this idea in our mind, in the new version of the manuscript (at the end of the section “3 Results and discussion”) we added another whole section “3.3 Factors influencing eucalyptus litter biodegradation“ where our findings are summarized and discussed in an more in-

tegrated or interactive way, more bibliographical references being also cited within this new section. Finally, even though the second version of the manuscript is now substantially (3 pages) longer than the former, we are also totally willing to divide the "Results and discussion" section into two separate sections "Results" and "Discussion" if the publishing policy and journal’s editor can indeed consider that the notable additional increase in the number of publishing pages that this would imply (due to the enforced duplication all the 5 different subdivisions included in the current section “3 Results and discussion”) would not only improve the paper presentation but also that, after this suggested strong expansion, the future proposed manuscript will fully fulfill the specific requirement for the article’s length stipulated by this journal.

Added section: “3.3 Factors influencing eucalyptus litter biodegradation Taken as a whole, after a general scrutiny of all these results, the integrated outcomes of the research including all the different parameters studied during eucalyptus litter decomposition support the hypothesis of the existence of some biochemical heterogeneity between the litter collected from the duff layer of the two studied types of Eucalyptus globulus clonal plantations (with F0 or F1 clonal plants) and allows to deduce that, for these kind of forests from northwestern Spain, the biodegradability of the aboveground litter seems to be strongly influenced by the following two key factors: i) The litter decaying stage. The results of eucalyptus litter decomposition illustrates that two differentiated decaying phases during the biodegradative process can be clearly described: a relatively brief more active initial phase (first weeks/months), when the greatest weight losses, CO2 releases, or isotopic 13C shifts occurs, and a later or delayed second less active phase, when all these variables show a posterior progressive stabilization and remain practically constant until the end of the incubation. Two or more decomposing phases during litter decay have already been reported by many authors for different tree species (Melillo et al., 1989; Aber et al., 1990; Guillon et al., 1993; Coûteaux et al., 1995; Rovira and Rovira, 2010; Castellanos-Barliza and León, 2011; Patricio et al., 2012). ii) The clonal origin or intrinsic characteristics of the litter. Some dissimilarities in the promptness or slowness of the degradative process can be also distinguished

between both types of aboveground residues collected either from the F0 (1st generation) or from the F1 (2nd generation) eucalyptus clonal plantations. More to the point, the influence of these above mentioned two factors appear to be firstly related with the initial chemical composition or quality of the litter (N content, C-to-N ratio, and 13C signature) mainly determined by its genetic origin that seems to have a certain influence on its biodegradability and on its C mineralization kinetics. However, although to a lesser extent, it seems to be also moderately affected by the underlying bedrock type. “

On behalf of both authors, sincerely

Irene Fernandez

(The new revised version of the manuscript was uploaded as a "Supplement" pdf file)

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/11/C1047/2014/bgd-11-C1047-2014-supplement.pdf

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Interactive comment on Biogeosciences Discuss., 11, 2823, 2014.