Authors: We thank the reviewer for the time dedicated to revising our manuscript and for all the comments and questions raised which undoubtfuly contribute to a better understanding of the paper and the work done by clarifying some important points.

We reply here to the major questions only (reviewer's questions in italics), while minor comments and suggestions have been considered directly in a revised version of the manuscript.

On the general comments:

I like the topic presented by the authors as it is indeed one of the rare studies focusing on the effects of soil erosion and deposition on organic carbon (OC) stocks and mineralization on a small catchment scale. This is the type of study which should help to close the gap in process understanding of the interaction of soil erosion and C fluxes. However, two major aspects of the paper must be improved before publication:

1) The description of the isotopic approach is weak and hence the results and their discussion are very difficult to review and interpret. Starting in the introduction a short state-of-the-art regarding the methodical approach is needed. More information in the methods section should be given, e.g. are the percent modern carbon data measured with an AMS 14C approach? In detail what kind of mass spectrometry is used for 14C/13C analysis? What is the uncertainty in these data? Precision of measurements etc.

Authors. We have included in the introduction a more detailed description of the state-of-the-art regarding the use of carbon isotopes both as tracers and related to carbon dynamics.

We have included as well more information on the methods section regarding carbon-13 and carbon-14 measurements as well. Just briefly here: $\delta^{13}C$ was measured on CO_2 using a gas chromatograph coupled with isotope ratio mass spectrometer (IRMS) (Finnigan Delta Plus) while the $\Delta^{14}C$ was determined by accelerator mass spectrometry (AMS) on graphite.

2) The calculation of the C input / replacement by plants and C storage is not clear and hence the interpretation of replacement of eroded C is unclear.

Authors. We agree with this comment and have addressed it in more detail in the revised manuscript. Please see below for specific responses that relate to this issue.

Methods: the described approach is not very well elaborated and/or important information is missing, e.g. is a constant input is assumed over the years with a constant 14C signature? Is one C decomposition rate (expressed by the coefficient k) assumed in all soil layers?

Authors. We have revised the manuscript to more clearly explain this approach, in accordance with the suggestions that were made by the reviewer. As a response to the questions posed: 1) yes, this approach does assume that the 14C signature did not change over the years. 2) a profile integrated decomposition rate is used for all soil layers.

Results/Discussion: If the method used to estimate the net C input by plants is correct it would indicate that the soils are heavily depleted in C due to earlier erosion or C loss via intensive harvest and/or grassing. To some extend the importance of different erosion and C loss via harvest might be indicated by the more pronounced replacement at the formerly cropped areas in C24. However, an 11- or 4-time over compensation of lateral C loss seemed to be somewhat unrealistic. Assuming that the catchment C51 is more or less in a C input/output equilibrium this would lead to higher C contents at eroded sites compared to all other sites. Hence, I strongly suggest re-thinking the net C input calculation. At least a comparison with a calculated C input for a reference site (no erosion and no deposition) is needed.

Authors. We understand the concern. On the one hand, the particular sites where the soil profile for 14C analysis were taken had been under forest and shrub cover for the previous half a century, at least. Both have a ~30% slope. It seems plausible, and there is field evidence, that the soils in these slopes will have lost C through erosion. However, the fact that the organic carbon content in the topsoil is still very high suggests that C inputs have to be high as well to replace for the C lost.

The concern that the 11 and 4 time over replacement of eroded C may be unrealistic is noted. But it is actually plausible if one considers how these numbers are derived - by comparing a mean carbon input rate over a very long time period with an erosion rate that is an estimation of the mean erosion in a 30 year long period. As we have noted in the discussion section, the more recent rates of erosion could be different than historic rates. These numbers, in our opinion, are the best values that could be derived with available data. As the reviewer correctly noted, we do not have a reference “non-eroding” site to compare our findings with. But, for this study, that issue is not very crucial since our aim in this study was to look for a connection between eroding soil profiles and depositonal sites. Although a reference profile would certainly help to understand replacement rates and put them into context, we do think it is not so necessary in the case of tracing sediment sources. Further, at these very dynamic and eroding sites, it is difficult to find a reference profile as such since the whole catchment consists of relatively steep slopes with very little flat terrain under vegetation cover. Moreover, various other studies in similar environments have showed that in these Mediterranean environments with a very long history of human impact, even after land abandonment or reforestation it takes a very long time for soil organic carbon to reach equilibrium again (Almagro, 2011, PhD Dissertation, University of Murcia, Spain). But the concern is noted and we have attempted to discuss these findings in the proper context – likely indicating complete replacement of eroded C, or indicating dynamic replacement of C at our sites.

The C input by plants should be also discussed for the depositional sites. It is somewhat unclear how the vegetation behind the check-dams looks like. If this is different from the eroding sites or if there is more or less no vegetation due to regular flooding it seems to be difficult to compare the soil C pools of both sites without taking the potentially different inputs through vegetation into account. If the vegetation is less dense or there is more or less no vegetation the depositional sites must be C sources as the deposited C will be (slowly) mineralized without being replaced by plant C inputs. Again a comparison with a reference site would be very helpful.

Authors. We understand the concern over differences in vegetation between eroding and depositional sites, and the possible implications for in situ carbon generation at depositional sites.

The depositional sites are partially vegetated and we have included information on the vegetation at the depositional sites. We hypothesize that during the first years of sediment accumulation, very little vegetation cover could be expected to be found on the depositional site, as we have observed in recently constructed check-dams in the same study site. However, once the check-dams fill up, stabilizing the upper slopes and decreasing the stream slope at the end of the catchment, we observe vegetation encroachment and establishment of grasses and eventually shrubs in a non-homegenous cover. While at our two study sites, there are currently annual grasses and some shrubs covering parts of the depositional sites, the sampling of sediments was done in bare areas or with very little vegetation cover within the wedge. This is explained now with detail in the methods section. We assumed, thus, that C input at these depositional sites originates mainly from the redistributed sediments coming from upslope eroding sites. In addition, the fact that the vegetation at both depositional sites is alike indicates as well that authoctonous C input probably does not differ between subcatchments and it cannot explain the differences we observe between OC concentration and stocks at the depositional sites.

Authors. Regarding the second part of the comment: yes, indeed, it seems plausible that the depositional sites act as C sources, since C input is little and losses by mineralization continue taking place. In our discussion on the implications for the C balance, we discuss on mineralization in relative terms. It is known how the rates of C oxidized can be higher or lower depending on many factors and here we want to emphasize the importance of sediment sources on C composition and fate at depositional sites.

On the specific comments:

P 8354. L 1: In general decomposition rates at depositional sites are in most cases not smaller (e.g. see Van Hemelryck et al. 2010. The effect of soil redistribution on soil organic carbon: an experimental study, BG 7, 3971-3986.) but the buried soil is protected from decomposition.

Authors. We are aware that decomposition rates at depositional sites can be higher than those in reference soils, especially in a short time scale, but since this takes place mainly in the uppermost layer of the deposited sediments, the burial effect may compensate for the increased initial decomposition (Van Hemelryck et al. 2009; 2010). We have revised our text accordingly in this line and in the conclusions.

P 8368. L 4 ff: See general comments. These conclusions are due to my opinion all based on a somewhat questionable approach to estimate soil C inputs by plants (without giving data from a reference profile without erosion and deposition). Hence, before drawing such conclusion the C input at erosional and depositional sites must be re-evaluated.

Authors. This approach, in our opinion, is the best available to consider dynamics of SOM in such dynamic environments where there is no available reference profile and for which we know that even in the currently non eroding sites there is often no equilibrium condition found. We believe the concerns of the reviewer in relation to this issue are addressed above. We would also like to point out that the rate of C input derived from the model here is not representing rate of plant productivity, ex explained in Berhe et al 2008 and here, this input rate is the actual input to SOC pool after the quick decomposition of most of above ground input. We believe this approach is the only way input to the SOC pool can be estimated in a reliable way since previous results have already shown that more than 90% of NPP likely decomposes within the first year after it arrives in the soil and doesn't actually contribute to soil C storage over annual or longer timescales.

P 8354. L 9-14: I suggest to focus here on the main aims (i) identify sources and fate of OC as affected by soil erosion processes in two Mediterranean catchments and (ii) analyze the implications of OC redistribution on C sequestration at different landscape positions. The rest of the paragraph should be omitted as it is more confusion and weakening the aims (especially the questions are partly not included in the aims which is confusing, e.g. if the question of importance of land use change is raised it should also part of the aims). In general I suggest to address the land use change aspect more under the view of two systems one in a more or less equilibrium status regarding C sequestration and mineralization (C51) and the other not in an equilibrium (C24).

Authors. We agree that the questions placed after the aims can lead to confusion to the reader as to which the objectives of the work are. We accept the suggestion of focusing only on the main aims. In relation to the land use change issue, we consider it important in relation to a change in sources. Throughout the text it is already emphasized that one system has had an important land use change (through reforestation) while the other has had a more gradual vegetation densification, and that these differences are important to explain the differences in sediment sources that we currently observe. Moreover, we would like to stress again that neither of these systems really represents equilibrium status regarding C sequestration.

P 8357. L 3 and 4: How was the dispersion of the samples done? Which diffractometer was used (give specification of instrument, company and country with all important equipment)

Authors. Samples for particle size distribution were oxidized with oxygen peroxide and later chemically dispersed using a mixture of sodium hexametaphosphate and sodium carbonate anhydrous. The diffractometer used was a Coulter LS200 from the Coulter Corporation (Miami, USA). The Coulter device has an Optical Module containing a diffraction detector with 92 size channels. The laser has a power of 5mW and a wave length of 750 mm, and it is able to measure particles in the range 0.4 to 2000 µm. We included this detailed information in the revised version of the manuscript in the methods section.

P 8357. L 14: The enrichment rations calculated are very sensitive to the reference taken from the catchment. If the upper 0-30 cm are used as standard the enrichment, especially in case of interrill erosion as C source, might be strongly overestimated. This should be at least discussed or if possible the associated uncertainty in enrichment should be later on calculated.

Authors. We initially decided to use the 0-30 reference depth because soil is eroded not only by interrill erosion, but also by other erosion processes affecting deeper soil layers. Thus, we thought it would be more close to the observed situation to refer to the upper 30cm. Nonetheless, responding to your suggestion we have calculated the values taking 0-10 cm depth, which is more commonly used as reference when calculating ER values, and observed mostly small differences (average of 5% and maximum differences of 30% in a couple of cases). We can provide the range in the final text to compare the values obtained with both approaches and to better understand the uncertainty associated to the ER.

P 8357. L 22: Give more details regarding the removal of roots (e.g. was this always done for a defined time by the same person?), as this is very important for the isotopic composition of the samples.

Authors. The removal of roots was done during a fixed period of time by the same person in all cases.

P 8361. L24 ff: Are there any reason for the difference between the different A profiles?

Authors. The reasons that, according to all our indicators (geomorphology, sample characteristics and land use analysis), account for the differences in the A profiles between both subcatchments are explained in the first section of the discussion (4.1). As a brief summary: we understand by our data that the profile in subcatchment 51 contains organic carbon with higher turnover rates in general due to sources of sediment derived from deep soil layers and even material from the streambed. A change in sediment sources over the last fifty years, probably leading to a decrease in sediment supply from the slopes, could have induced erosion in the stream bed. This is not so evident in subcatchment 24, where slopes continuously deliver sediment to the stream bed. The small range of 14 values observed at the sediment profile in depth (compared to that in the soils of the same subcatchment) indicates that carbon sources at this subcatchment are not likely to have changed in the same magnitude as those in C51.

P 8363. L 10-15: not as obvious as indicated here.

Authors. The data on C (isotopes, concentration and fractions) and observed current sources of sediment does suggest, to our best knowledge, that a link between sources and C at the depositional site can be established at these sites, as explained above and in the first section of the discussion.

P 8363. L 16 ff: OC characteristics might be also affected by different or missing plant C input (see general comments).

Authors. We have addressed this issue above, with the general comments.

P 8365. L 19ff: See general comments. Moreover it might be interesting to estimate the time necessary to replace all carbon lost by erosion compared to a reference site.

Authors. Thank you for the suggestion. It would certainly be very interesting to estimate the time needed to replace all C lost by erosion but we think that too many assumptions would have to be made to do this with our available data, mainly regarding temporal variation of C erosion rates and C input to the soil.