

Interactive comment on “Variation of soil organic carbon, stable isotopes and soil quality indicators across an eroding-deposition catena in an historical Spanish olive orchard” by José A. Gómez et al.

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We would like to express our appreciation to the Reviewer for the careful assessment of the manuscript and the helpful suggestions, which has help us to improve our work.

We detail below each of the reviewer’s comments and how we plan to address those suggestions in a revised version of the manuscript that we have not uploaded by the time of closing the period for posting comments due to the lack of time to prepare a convenient review. For the shake of clarity, the original comments by R3 are between

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quotation marks.

“General comment: This study examines changes in selected soil properties (SOC and SOC fractions, P available P and organic N) related to soil quality and explores the application of stable isotopes as indicators of soil degradation (^{13}C and ^{15}N) in an Calcic Cambisol under different land uses (open Mediterranean forest and orchard) in the southwestern region of Spain. Further, authors evaluated changes in the mentioned soil properties and water stable aggregates due to soil redistribution processes comparing eroded vs depositional sites within the olive orchard (areas previously identified by ^{137}Cs technique). Please see below some comments: “

“Comment 1: Line 23 deposition is non degraded?” Yes, that is our hypothesis. We will clarify this in a revised version of the manuscript.

“Comment 2: Clarify Lines 22-25 I miss results concerning ^{13}C ” We will add one line concerning $\delta^{13}\text{C}$ results in the revised version of the manuscript.

“Comment 3, Line 31 Although is a text extract with meaningful information. I suggest “which seeks to increase global soil organic matter stocks by 0.4 percent per year as a compensation for the global anthropogenic C emissions” Lines 33-34 split the paragraph into two sentences.” Yes we will edit and split this section into two sentences in a revised version of the manuscript.

“Comment 4: Line 41 This part seems disconnected from the previous one (soil degradation & soil quality). I suggest move this part to line 41 “Olive cultivation has been linked to severe environmental issues including the acceleration of erosion and soil degradation (e.g. Beaufoy, 2001, Scheidel and Krausmann, 2011). In fact, soil degradation is ... (Gómez, 2014).” We agree with the comment. We will edit this section in this way which looks more straightforward.

“Comment 5: Line 51 what is the reason for?” It also combined cultivation in very steep slopes and areas of high rainfall erosivity. We will edit this sentence to include this

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evaluation in the revised version of the manuscript.

“Comment 6: Lines 58-59? Please rewrite to improve the readability of the text Line 85 It would be very illustrative to include the 137Cs reference value and sd Line 109 State exactly the plant species (shrubs and annual grasses).” We will include the 137Cs reference value and include a list of the most common shrubs and annual grasses in the study site.

“Comment 7 Line 120 Specify number of soil profiles deeper than 20 cm; excavation method is diddretn than mechanical method for soil sampling? Please include type of core sampler (automatic or manual soil core sampler).“ We will revise the manuscript to clarify the sampling method and the number of soil profiles. In the reference area the sampling was made through manual excavation while in the olive orchard the sampling at 10 cm interval was performed using a hydraulic core sample which gently rotates and push the core. Soil moisture content was the adequate to avoid hard drilling the soil. This minimizes the compression of the samples. The sampling was made checking that the whole sample was taken for each given depth abandoning the point and starting a new one if some problem arose (like a sample being only partially taken). The bulk density values shown in Table 5 were obtained using the hand cylindrical core sampler with a volume of 100cm³. Regarding the number of samples and depths, there is a mistake in lines 119-120. The reference area was sampled until reaching bedrock which in same case was above 60 cm. In the case of the pits used for the carbon and isotopic analysis, 4 out of 13 were used, while all the 13 pits were used for the Cs137 analysis. In all cases these 13 pits reached 40 cm depth. Therefore, for the carbon and isotopic N and C analysis there were, for each soil depth (0-10, 10-20, 20-30, 30-40 cm) four replications in the reference area and 8 replications in the olive orchard.

“Comment 8: Line 125 A similar table for the two reference transects could be included (137Cs inventories since SRR are not applicable in ref site).” We will add a Table in the supplementary material indicating the elevation of the transects (which were in a flat area) and their 137Cs inventory.

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“Comment 9: Line 139 with sodium polytungstate “ This misprint will be corrected in the revised version of the manuscript.

“Comment 10: Line 145 Explain in detail acid hydrolysis procedure: acid attack (acid concentration, time, temperature) and preparation for carbon analysis. Include a reference of the method.“ As we mentioned in the material and method section (Physicochemical analysis) we have applied the method of Six et al. (2002) and modified by Stewart et al. (2009). Acid hydrolysis, described by Plante et al. (2006) consisted of incubating the samples (The silt+clay-size fraction from both the density flotation of the 53 – 250 μm fraction and the initial dispersion and physical fractionation of the < 53 μm fraction) at 95 oC for 16 h in 25 ml of 6 M HCl. After hydrolysis, the suspension was filtered and washed with deionized water over a glass-fiber filter. Residues were dried at 60 oC and weighed. These fractions represent the non-hydrolyzable C fractions. The hydrolysable C fractions were determined by difference between the total organic C content of the fractions and the C contents of the non- hydrolyzable fractions. We have added this information in material and method section.

“Comment 11; Line 163 Clarify the number of soil samples at similar soil depth and considered for statistical analysis Line 174 fractions Line 206 topsoil is 0-10 cm?” It will be clarified in the text, clearly stating that for the carbon and isotopic N and C analysis there were, for each soil depth (0-10, 10-20, 20-30, 30-40 cm) four replications in the reference area and 8 replications in the olive orchard. In line 206 top-soil means 0-10 cm, this will also be clarified.

“Comment 12: Lines 212-216 This part should be extended and explained in depth.” We will expand this section to provide an explanation.

“Comment 13: Line 294 I consider there is no evidences from results for this statement (indicate selective deposition of soil aggregates). Please revise”. We will edit this section to indicate that this still as a plausible hypothesis rather than a fact demonstrated by our results.

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