

## ***Interactive comment on “Soil carbon dynamics during secondary succession in a semi-arid Mediterranean environment” by A. Novara et al.***

**Anonymous Referee #3**

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This study deals with the soil C dynamics during secondary succession in a Mediterranean environment. This is an important and not widely studied topic. The study presents a sound and interesting data base which takes advantage of the transitory presence of a C4 grass in the secondary succession. This data base would be good to address the contribution of C4 grasses on the soil organic matter accrual during a secondary succession and would be also suitable to discuss on the distribution and permanence in the soil particle size fractions of the C4 carbon pulses occurring in the secondary succession. However, I think that these issues are only partially addressed in the manuscript, and its discussion is rather weak. To properly discuss the observed changes I think that information on the C inputs should be presented and analyzed. Net primary production is a very important driver of the SOC dynamics and this particular hardly is considered in the paper. Some quantification of the contribution of C4

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grasses during succession relative to C3 plants should be presented and its significance should be discussed quantitatively or semi quantitatively. I would find difficult to interpret the pulses of new C occurring in the soil without knowing the productivity of the C4 grasses community and its relative abundance throughout the succession. Perhaps some rough estimates would do. C4 and C3 sources may also differ on its quality because of its grassy or woody origin. Thus, information on plant litter and root quality (e.g. C/N ratio or Lignin/N content) would be also desirable.

Specific comments

The title is too general. It should be more focused on the accretion and stability issue. I think the paper should focus on the second objective. I do not think that the information required for the third objective is available in the paper. I would not bother much about aggregate formation and stability but rather on organic matter incorporation and stabilization in each particle size fraction.

Introduction

Page 1109 line 25. Need to mention that changes in plant productivity can occur during secondary succession. Page 1111 line 12. Second objective. What do we learn by describing the differences in SOC turnover along succession. Please try to specify. Page 1113 line 6. herb or grass. Please use always the same term. Line 23. Clarify the sizes of the pores. Page 1114 line 4. Why soils were sieved through 1 mm instead of 2 mm? Page 1114 lines 21 and 22. The term new crop is not clear to me. The soils analysed are all after abandonment, so no crops are expected. Page 1115 line 5. Which are the new species. More information on species composition, plant productivity and litterfall should be given throughout the manuscript. Line 7. What are the species shrub and wood that occur in the succession. A brief description of vegetation dynamics and growth should be given. Line 11. Please explain more. Page 1116. Line 17. Why use polynomial curves? Polynomial fitting are highly adaptable to most datasets.

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## Discussion

Page 11118 lines 21-26. Too general. Page 11119 line 10. Statement not clear. Lines 13-20. Why do you think the drivers are the size of the aggregates. Please be more specific. Explain the details if you think there is a relevant process behind it. Line 28. What do you really mean when you say replacement of C. C stabilizes and remains or decomposes. Page 11120 lines 5-8. Did you measure primary productivity? Plant productivity may well be the main driver. Lines 11-16. Too speculative.

Fig 6. There is no legend showing the correspondence between figures and soil fractions.

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