

Interactive comment on “Soil carbon stocks and their variability across the woodlands of peninsular Spain” by E. Doblas-Miranda et al.

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Recommendations suggested by Referee #2 in relation to the discussion section structure were highly appreciated. We think that, thanks to the following modifications, the specified sections have been improved:

“The main variables influencing the spatial distribution of SOC were climate and vegetation cover, in concordance with similar studies in the region (Rodríguez-Murillo, 2001; Chiti et al., 2012). However, this result contrasts with the patterns observed for forest biomass stocks, which were mainly determined by forest structural diversity, with a much lower direct effect of climate (Vayreda et al., 2012a). Also, a slight increase in SOC due to elevation was observed, although the mechanisms and consequences are still less understood (Sjögersten et al., 2011). It could be related to unfavourable

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conditions for decomposition (Baritz et al., 2010), which may change with predicted climate conditions or future upwards shifts in plant species distribution (Lenoir, 2008) and consequent changes in organic inputs.

The influence of climate on soil carbon stocks could be related to the role of soil microorganisms in SOC stability, as the soil microflora is highly sensitive to moisture (Coûteaux et al., 1991). Therefore, climate change may play an important role in the degradation of forest soils (Bellamy et al., 2005) and special attention should be paid to carbon stocks in Mediterranean soils (Rodeghiero et al., 2011). The Mediterranean Basin is one of the most prominent worldwide hotspots of climate change (Giorgi, 2006). Most climate models forecast substantial increases in temperature and declines in precipitation (Gao and Giorgi, 2008; Hoerling et al., 2011), which are exactly the most negative expected effects on SOC storage according to our model. In addition, other indirect effect of climate change could affect SOC reserves. First, recent warming includes the reduction of tree-growth rate and associated carbon accumulation (Vayreda et al., 2012b). Second, the general rise in fire risk in the region due to current warming (Moriondo et al., 2006) could aggravate the consequences of climate change on SOC of Mediterranean ecosystems (Rodeghiero et al., 2011).

Although climate is unmanageable, vegetation cover also showed an important role affecting soil carbon reserves. Differences among the types of forest cover, showing the highest SOC mean under broadleaf forests and high and low SOC values for conifers and evergreen forests, respectively, were similar to previous calculations (Chiti et al., 2012). In concordance, promoting the development of mixed forests associated to higher SOC values in more arid areas could be used to maintain SOC stocks under future climatic conditions. Future land use changes in Spain are difficult to predict due to socio-economic constraints (e.g., although urban intensification is predicted to increase in lowlands, an economic crisis could halt this pattern), but recent patterns reveal likely tendencies in terms of vegetation structure, composition and dynamics. Principally, coastal landscapes are suffering increasing anthropogenic impact (Alados et al., 2004)

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while afforestation of low productive uplands has occurred in the last century due to rural exodus (Hill et al., 2008). Although these novel forests may be essential for the restoration of associated SOC sinks, their relatively unknown structural and functional attributes could be heavily influenced by current impacts under climate change and future fire regimes (Pausas and Fernández-Muñoz, 2012). Management of the type of vegetation cover of such novel forests could thus be a key factor in altering the effects of current global changes, favouring future carbon storage capabilities (Vayreda 5 et al., 2012a).”

We agree with all the minor comments suggested by the referee and therefore suggestions will be included in the revised version of our paper for publication in BG. We would like to thank the referee for the recommendations

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