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Interactive comment on “Biogeochemical factors contributing to enhanced carbon storage following afforestation of a semi-arid shrubland” by J. M. Grünzweig et al.

Anonymous Referee #2

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General Comments: The authors present results of a well conducted and detailed study of carbon stocks in an arid forest plantation in Israel. Soils were collected from the plantation and from surrounding shrublands, which represented pre-afforestation vegetation and soils. The soils were assayed for total C and N, $\delta^{13}\text{C}$, inorganic and organic C, and fractions of labile and recalcitrant C. All soil assays were conducted at 0-5, 5-10, 10-20 and 20-50 cm soil layers. In addition, litter decomposition was assayed with surface and buried litter bags containing either local or standard (wheat straw) litter. Tree and shrub biomass was quantified using non-destructive measurements and allometric equations. Plant tissues were collected and analyzed for total C and N and $\delta^{13}\text{C}$. Both shrubland and forest were apparently grazed during the

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period of study, leaving little herbaceous biomass to sample.

The primary findings were of substantially increased carbon stocks in the forest than in the surrounding shrublands, due to greater standing stocks of plant biomass in the forest. $\delta^{13}\text{C}$ analysis indicated that the forest vegetation (*Pinus* sp) was the source of increased soil C, and this was reinforced by slower litter decomposition in the forest. Mean residence time for the original shrubland C was 56 years, with 53% of the original native SOC still present in the forest soils. C:N ratios were much higher in forest, and suggested that increased carbon stocks were associated with higher NUE of the forest vegetation.

Specific comments: The introduction could be strengthened by a more concise statement of the primary research question. It is alluded to but not spelled out. In the Materials and Methods, the grazing regime needs to be clarified. Were both shrublands and forest grazed during the period of study? Have shrubland and forest experienced roughly similar razing regimes since afforestation? In addition, the rationale for use of two mixing models for SOC analysis wasn't clear- this could be better justified. In the results lines 283-287 there appears to be a discrepancy between the text and Table 4 values for harvested woody biomass. Also in Table 4, are the soil C and N stock values averages of shrub + intershrub values?

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