

## ***Interactive comment on “Decreased summer drought affects plant productivity and soil carbon dynamics in Mediterranean woodland” by M. F. Cotrufo et al.***

**Anonymous Referee #4**

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This manuscript presents an interesting study of a 4-years precipitation manipulation experiment in Mediterranean woodland (Italy). The work described in this paper is of great interest to the readership because it addresses an important question about impact of precipitation changes on soil carbon dynamic with a focus on and plant productivity in this kind of ecosystems. Results highlighted stimulation of below-ground C input and soil respiration due to an increase of soil water content during summer months. These are worthy for publication in Biogeoscience but only after considering several remained queries that should be addressed. About throughfall manipulation experiment, irrigation was performed in the wet treatment to maintain soil water content above the threshold of 10%. According to table 1, irrigation represented more

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than 70% of annual rainfall and twice of the amount of growing season rainfall in 2008 and 2009. Are these amounts expected according to precipitation shifts induced by climate change in Mediterranean areas? Another point is how irrigation was conducted in terms of duration, intensity of water input. Was water added like an intense rain event or like a gentle rain? This is particularly important to take into account to understand and discuss soil CO<sub>2</sub> fluxes recorded in the wetted plots. Indeed soil CO<sub>2</sub> pulses could be expected in case of heavy rain. This is illustrated in the figure 5 by high stimulations of soil CO<sub>2</sub> fluxes recorded at the beginning of 2009 during rainy period but also during summer months when irrigation was performed. Thus another query concerns the modelling of soil CO<sub>2</sub> efflux. The authors used a multivariate regression for soil temperature and soil water content to estimate soil C output by fluxes. Did the authors used the same equation for all treatments (dry, control and wet)? Was the equation used for simulation of soil CO<sub>2</sub> fluxes suitable for the range of soil water content recorded in any treatments? We can also observe that modelled values of soil respiration were underestimated compared to the highest data measured in 2009 during periods of high water inputs (soil CO<sub>2</sub> pulses). According to the number of measurements, it is not clear how this modelling approach improved results of this work. Soil respiration rates recorded in experimental plots exposed to 20% reduction of throughfall were sometimes higher than in control plots. For instance in summer months in 2008, SR reached 8  $\mu\text{mol}/\text{m}^2/\text{s}$  in dry treatment compared to 6  $\mu\text{mol}/\text{m}^2/\text{s}$  in the control one. This observation should be discussed according to higher soil water content recorded in the “dry” plots compared to “control” plots. Could drains installed for throughfall exclusion affect soil evaporation because of shading? In the manuscript, there is a lack of a discussion of the impacts of drains on results: the interception of litter fall by drains must be taken into account to avoid bias in plant-derived C input to soil for dry treatment and should be addressed. For soil measurements (temperature, humidity, fluxes), the spatial sampling method according to drains localization should be described also. According to figure 9, there was a strong link between water input per year and litterfall changes among treatment. For “dry” treatment, litterfall decreased by 10 and 40% compared to

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control plot. But this throughfall manipulation experiment began in April 2004 and litter production could change from the beginning to the end of experiment, i.e. after 4 years of precipitation exclusion treatment. In general, a potential of interannual effects of water manipulation on results should be discussed according to results found in literature even control plots were installed two years after throughfall manipulation started, and even results were obtained after one-year measurement (plant productivity, net annual below-ground C input to soil). Using soil cores containing C4-soil to quantify soil C input derived from roots was innovative but this method presents limitations. Indeed exogenous soil was different from native soil, presenting a lower N content. This could affect root re-growth to the soil cores, which was actually not measured in this study. We can expect a difference of turnover rates among 3 treatments (higher rates in “wet” plots). Then quantifying new root biomass allows better estimation of root-derived C input in soil.

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