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Interactive comment on "Effects of heat and drought on carbon and water dynamics in a regenerating semi-arid pine forest: a combined experimental and modeling approach" *by* N. K. Ruehr et al.

Anonymous Referee #1

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Method: Missing are how soil evaporation (E) was consider by the model. Understory considered by the model as pine layer, have this evaluated? And does the annual GPP and T patterns of the pine similar to the below vegetation pattern? Information on the soil surface coverage by the canopy is missing. Setup of the irrigation water experiment is unclear: what was the irrigation frequency (ies)? was it added under the trees or evenly over the surface? Why SWC level after adding 436 mm was lower that the winter-time (Fig. 4) values? and what was the logic in doubling precipitation in two months? It also unclear how NEE and GPP were measured/inferred in those plots

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? Likely that the sandy soil could not hold all that added water , was it considered? Anyhow, more details for this experimental part are needed in this section.

Results: Water fluxes (Page 563, line 21 onward and Figure 1): From May to August in both years, measured transpiration is lower than simulation, contrary ET measured for the same period is considerable higher than simulated. This requires explanation. Measured T is about 1/3rd ET at least for the season peak activity (assessed from figure 1), likely that most ET is actually E, than it partially explain the low irrigation effect. The T/ET proportion is very low not common to most forest areas. Again the authors should explain this and implications. Tsim is higher by ∼40% than Tobs and the 15% Tsim increase cannot close this gap, it is thus unclear how GPP are the same by the model and observation? And if such WUE should deviated considerable between the two. . . Similarly, with the irrigation/precipitation experiments, although T increases largely due to added water it has minimal effect on GPP (eg., Fig. 4). Need explanation. Discussions: Indeed, percentage of canopy soil coverage effect on soil evaporation is well documented (eg., Raz Yeseef 2010). Likely that this effect is missing and can explain part of the T to ET large deviation (mentioned above). The weak correlation between added water (irrigation plots), the considerable higher T at those plots (likely upper by ∼100% at August then in the non-irrigated trees, fig. 4 c&d), but with low effect on GPP requires explanation. Known in hot semi-arid environments that when conditions easy and some water exist, plants activate at time of the day when VPD is relatively relaxed, such as early mornings and late afternoons (VPD likely to be below∼3500 Pa then, see references in articles already mentioned in the text). Have the trees activity on those hours checked? Regarding the model future simulations; Even without fertilization effect, higher atmospheric CO2 means less water losses per carbon uptake, thus for the same stomata closure possible more carbon will absorb and will increase the GPP. Does the model consider that? Two sentences following page 572, line 6 are unclear.

Figure 1. VPD relevant for trees activity is of the day hours, better to present that and

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not for the whole day.

Interactive comment on Biogeosciences Discuss., 11, 551, 2014.