Interactive comment on "Using Respiration Quotients to Track Changing Sources of Soil Respiration Seasonally and with Experimental Warming" *by* Caitlin Hicks Pries et al.

Anonymous Referee #2

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This paper reports on a soil warming experiment in a forest in California and its effects on soil respiration processes using stable isotopes and an index of the ratio of CO_2 to O_2 in soil air (ARQ) that accounts for differences in diffusivity. The paper explores patterns in these values, rather than presenting a hypothesis testing framework. The results show a nice time series with interesting seasonal patterns that are interpreted to indicate changing substrate source for respiration. Asserting that different organic compounds with different oxidative states are the main explanation for the observed patterns is speculative. The discussion and conclusion should acknowledge the sources of uncertainty more explicitly, specifically that the RQ can be quite variable for different organic compounds. L 151-152, where were ambient CO_2 samples collected

(what height above soil surface)? Please provide a reference for O_2 concentration of the atmosphere. L 190, L 250, L316, L318, and throughout, please refer to delta values as higher or lower rather than enriched or depleted, because the latter terms refer to the relative differences of 13C in molecules whereas delta values are ratios. The rest of the discussion paragraph on L 251-258 uses enriched/depleted terminology correctly. L. 197-205. This paragraph would be easier to understand if you could use more consistent sentence structure for each sentence. Please provide the ANOVA table so readers can just see the results all in one place. L. 197 has a mistake in the table number. L 207-213. Did you look for an effect of treatment on the relationships between soil climate and ARQ or ïĄď'13C? Since there was a treatment-by-date interaction for ARQ this might indicate that warming is altering the temperature sensitivity (hint of this in Fig 2a for 30 cm). I understand that you didn't report on treatment-by-date interaction for ïĄď'13C due to the significant autocorrelation but there might also be some effect of treatment on the temperature and moisture relationships shown in Fig 3. Why not just run regressions for the warming and control treatments separately? This seems to be a missed opportunity for a potentially stronger paper. L. 215-218. What is the sample size for the ARQ measurements in roots and root-free soil? What were the ïĄď'13C values in these samples? L 242, greater RQ's than what? L 296-299, increasing ïĄď'13C values with decreasing soil water content might be associated with larger advection of atmospheric CO_2 into the soil which is not accounted for by the diffusion correction. This is probably also the reason for having to throw out the data from 15-cm depth (effective diffusion fractionation is <4.4 permille due to advection effects, so applying the diffusion correction equation leads to values that are unrealistically low).

Data availability: please provide a more specific url for the data or provide it in a supplement.

Table 1. If possible, provide estimated ranges of these values for all compounds for both ARQ and ïĄď'13C, using a wider lit review if needed. This variability is a major source of uncertainty in the interpretations of the ARQ results but is not mentioned in

the text.

Table 2. Provide sample size (n) for the values, including more information in the caption (presumably these were collected over the duration of the study).

Fig. 1. Give sample sizes for ARQ and ïΑ̨ɗ'13C in caption (I think it's n=6 plots * 4 depths for ïΑ̨ɗ'13C, and n = 6 plots * 2 depths for ARQ per date?). Great to have so many samples! But it's important to readers to appreciate the number of samples that went into the SE calculation. Connecting the points in the ARQ plot is not very meaningful considering the sparse sampling dates. Provide fitting statistics for the regression in part c; even though these are given in the text, it's nice to have this info in the figure so readers don't need to scour the text to find out the important details.

Fig 2. This figure is a bit odd because it plots time series data for the two constituents using means for ARQ and raw data for ïΑ̨ɗ'13C. It's nice to see the datapoints in part b of this figure. Please include actual data in part a also, and plot them on the same time scale.