

Interactive comment on “Patterns of plant rehydration and growth following pulses of soil moisture availability” by Andrew F. Feldman et al.

Anonymous Referee #1

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Summary This study assesses the temporal pattern of soil moisture and plant water content derived from SMAP to understand plant responses to precipitation pulses, which have shown significant lags in field studies. The comprehensive spatial scale of this analysis is impressive and timely. Importantly, the authors use a daily LAI product for Africa to account for the combined growth and rehydration signal inherent in VOD interpretation. I have some concerns about the correct use of Kruskal-Wallis tests and found the comparison between spatially average temporal VOD trends and results of a 1D SPAC model somewhat spurious. Major comments Ln 282 - 287: This section is throwing me off because I cannot easily distinguish between rapid responses and short VOD increases; they sound the same to me. Adding the actual t_p lengths would help. More importantly, the boxplots of Fig. 5 do not convey distinctions based on

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the KW tests. Is there some kind of non-parametric post-hoc test, equivalent to Tukey HSD, which can be used to put labels on the boxplots? As far as I am aware, the KW tests only indicate that at least one group is significantly different but does not indicate which ones. This may require pairwise Mann-Whitney tests. I don't think the spatially averaged time series shown in Fig. 3A and B are comparable to a 1D SPAC model result in Fig. 6A and B. Rather, both kinds of modeled drydown patterns might be found in the actual data if not aggregated spatially. The relatively occurrence of immediate versus lagged rehydration may additionally depend on antecedent soil moisture conditions. Minor comments Ln 160: Does this refer to the empirical probability mass function? Probably more clear/accurate to refer to as the histogram and described as a zero-inflated Poisson. Ln 176-184: This section could use greater clarity. Make clear that non-parametric ANOVAs are to compare the covariates of Δ LAI, antecedent soil moisture, antecedent VOD, etc. between the three groups of VOD pulse responses. Ln 231: "... aboveground biomass requires water uptake ..." Ln 238: "co-occur" Ln 238-241: I suggest "Seasonal detrending of VOD isolates plant rehydration response to moisture pulses, which show multi-day increases and eventual decreases following moisture inputs." Current phrasing is difficult to understand. Section 3.3: Is this section also limited to Africa? Make clear at the outset, rather than in Ln 278-280. Otherwise, "growth-influenced VOD" is not supported. Ln 299-306: This uncertainty analysis should be at least mentioned in the Methods section and lead with the purpose of this approach before referring the reader to the supplement. Ln 326: Plant hydraulic capacitance, or something else? Ln 332: "... pulse, which may indicate sufficiently well-watered conditions..." Ln 336-337: This sentence may not be necessary. Is the emphasis on parallel soil moisture and VOD decreases following the pulse? What is "plant-storage water potential"? Ln 339: Redefine RC time constants again at the beginning of the Discussion Ln 380: Again, I suggest introducing the SPAC model and its purpose in the Methods section before referring the reader to the supplement. Ln 406-408: This seems in direct contradiction to the above citation of Kramer and Boyer 1995. There is also the component of fine root growth after soil rewetting. Is the SPAC

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model able to represent the soil-root conductance or potential growth of new roots? Ln 409-414: Please clarify the thoughts presented here. Is it related to VOD to water potential as well as water content? This paragraph seems out of place in this section and is not well-prefaced by the introduction. Ln 433: “. . .demonstrating spatially-extensive evidence for. . .” Ln 440: Use commas in the list Ln 444: “show” is used twice. Perhaps “We demonstrate. . .ecosystems exhibit . . .”

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