Comment on egusphere-2022-104
Anonymous Referee #1

Referee comment on "Dynamic root growth in response to depth-varying soil moisture availability: a rhizobox study" by Debora Cynthia Maan et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-104-RC1, 2022

The authors investigated soil moisture-driven root growth using a rhizobox experiment. Their results confirm that vertical soil moisture distribution regulates the root growth profile, while at the same time, the soil moisture dynamics are impacted by the root growth. This study is mainly supported by the parsimonious one-dimensional water balance model they developed, with the functional relationship between the soil moisture and the root density growth rate being its key. The manuscript is well organized and well written. However, despite this reviewer's great interest in this study, he found there is still some room to extend this study for real case applications (if not at the global scale, then at the regional scale, or at least using a range of in-situ sites). This reviewer will motivate his comments as below:

- This reviewer agrees with the authors that the current LSM should consider the dynamic root growth model, which should take into account the impact of soil moisture. The parsimonious model as the author developed sounds ok, and the current toy example is good for raising the awareness of LSM community on this point. Nevertheless, this is not new. For example, NoahMP\(^1\) has a dynamic root growth module, which considers its dependence on soil moisture and soil temperature. The recently published STEMMUS-SCOPE\(^2\) model also considers the dynamic root growth as a function of air temperature, soil temperature (via water stress factor) and net assimilation.

With the above, this reviewer is trying to search for the unique contribution from this study. Perhaps the functional relationship between the soil moisture and the root density
growth rate could be one significant contribution. On the other hand, this reviewer is not clear or the authors did not show how the current approach can be applied elsewhere in the field. Particularly, the most important parameters (e.g., $u_2/u_3$) are determined via sensitivity analysis, which makes this reviewer wonder how to obtain these parameters in the field, and further at regional/global scale?

- Please find attachment with some minor comments.

References:


Please also note the supplement to this comment: https://eguscience.copernicus.org/preprints/eguscience-2022-104/eguscience-2022-104-RC1-supplement.pdf