Review of manuscript HESS-2019-329

General comment

This study analyses plant water source partitioning in a coffee agroforestry system along seasons with contrasting soil moisture conditions. For that, the authors applied stable isotope techniques and Bayesian mixing models (MixSIAR) in order to test for the complementary use of soil water in space and time by coffee plants and shade trees. The importance of the study comes from the fact that ecohydrological relations in this type of traditional agroforestry systems are completely unknown, in contrast to those of intensive monospecific plantations. A novel aspect of the study is the inclusion of root and nutrient distributions within the framework of stable isotope mixing models, which is a usually underestimated capability of such models. That should improve their accuracy since plant water source partitioning is obviously constrained by root distribution and soil profiles of nutrient availability. Overall, this is a well-designed, rigorous study, that is also clearly presented and well-written. Methods and results are concisely described and figures and tables are easy to interpret. Similar studies of plant water source partitioning are numerous, so it could be said that this study is not especially original. However, I find valuable to report this type of data from regions where they are scarce (*i.e.* Central and South America or Africa, see Barbeta & Peñuelas, 2017; Evaristo & Mcdonnell, 2017).

Although my general assessment of the manuscript is highly positive, I miss some caution regarding stable isotope techniques. While this is a well-established approach, recent studies pointed to methodological issues linked to fractionation processes within the soil matrix (Orlowski *et al.*, 2018; Gaj *et al.*, 2019; Oerter & Bowen, 2019; Oerter *et al.*, 2019), along the soil-plant continuum (Vargas *et al.*, 2017; Barbeta *et al.*, 2019) or within plant tissues (Zhao *et al.*, 2016). Not all ecohydrological systems may be affected by those fractionation processes, and oxygen isotopes seem to still be highly reliable (Zhao *et al.*, 2016; Vargas *et al.*, 2017; Barbeta *et al.*, 2019). Still, in Fig. 3, I observe that xylem water isotopes do not match very well with soil water isotopes from either depth. This is clearer for shade trees. A similar pattern arises in the deuterium excess boxplots. A thorough consideration of potential fractionation processes would require extensive additional analyses, which I think that it is not realistic to ask the authors to do. A more plausible solution is an explanation on why the authors think that fractionation processes are not relevant for their study. It might also be considered to run MixSIAR models separately for oxygen and hydrogen isotopes to check if there are significant discrepancies between them (as in Evaristo *et al.*, 2017; Barbeta *et al.*, 2019). As I said, it is known that fractionation processes do not affect in the same proportion oxygen and hydrogen isotopes. In any case, I believe that these emerging issues cannot longer be ignored by plant water source studies using stable isotopes.

Minor comments

L38 It is not completely clear what does ‘precipitation conditions’ mean.

L65 Species name (Cedrela odorata) should not be in capital letters.

L191 The high clay content is likely to produce soil water isotopic fractionation (Oerter *et al.*, 2014).

L218 The sampling of different plant parts in coffee plants and shade trees (cores VS branches) could have led to a different proportion of internal plant water pools in the xylem water samples of each group.

L223 I assume that bark was peeled off from coffee shrubs, too.

L298 Recent precipitation, especially in periods with relatively wet soil conditions, could in fact percolate faster towards deeper layers. So, rainfall is not necessarily representative of near surface soil water.

L304 The use of prior information is a very interesting point of the study.

References

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