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Interactive comment on "Controls on the development and persistence of soil moisture drought across Southwestern Germany" *by* Erik Tijdeman and Lucas Menzel

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(1) The paper by Tijdeman and Menzel investigated the spatial and temporal variability of soil moisture drought in southwestern Germany using a distributed hydrological model. They analyzed the environmental controls on drought development and duration. Some interesting results are presented in the paper. For example, they find that drought stress tends to occur in warmer and drier locations. This raises an important question, i.e. how did and will climate change affect drought occurrence and severity? Some researchers have conducted some attempts to answer this question at a large scale, e.g. Samaniego et al. (2018). I would suggest the authors do some work on

this question in the future. For example, the authors may simulate the drought stress at different warming and precipitation change scenarios, and see what land covers will be affected most. I know that this analysis is already beyond the scope of this paper. The authors do not need to add this analysis in this paper. I have some other comments below, which may be helpful for the authors to improve this manuscript.

Samaniego, L., Thober, S., Kumar, R. et al. Anthropogenic warming exacerbates European soil moisture droughts. Nature Clim Change 8, 421–426 (2018). https://doi.org/10.1038/s41558-018-0138-5

(2) L102. Figure 1a. I would suggest clipping the elevation map and only reserve the Baden-Württemberg. Then you may add a small panel at the corner which indicates the location of Baden-Württemberg in Germany.

(3) L169. In this paper, the SM drought threshold is set to 30% of AWC. Then a binary time series of SM drought stress occurrence becomes the basic data of this study. I am thinking it might be helpful to further classify the SM drought to different levels, for example, moderate, severe and extreme SM droughts. In this case, Figure 4 may demonstrates the temporal variations of cell counts for different drought severity. It may provide some information like whether climate warming has increased the drought severity in this region.

(4) L170-175. SM drought stress occurrence (Socc) was computed in the basis of calendar year in this paper. Normally, most of the soil moisture droughts in Germany happen between spring and autumn. However, was there some winter droughts over 1989-2018, which began at the end of a year and ended in the following year? If yes, these special circumstances may overestimate the drought occurrences in the successive two years. In addition, how did you calculate the development time and duration for these special droughts? I assume these events are very rare in this region.

(5) L225-227. This sentence is confusing. What does "the latter" refers to? What I see is that drought tends to develop at warmer locations for all prominent drought years,

but not for all the other years. Please make it more clear.

(6) L255-258. It would be helpful to add the significance test of the rank correlations in Table 1.

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