Response (in blue) to comments by Anonymous Referee #3

The main idea of this study is to assess how extreme the drought was in the year 2018 in Netherlands and Germany. They used Hydrus-1D model to simulate soil moisture, actual ET. Based on this and together with the meteorological station data, they calculated SPI, SSI, PPD and ET deficit to analyze the drought.

This topic is interesting and the manuscript is well-written. However, this manuscript needs some revision before publication. There are some questions to the authors:

Response: We very much thank the reviewer for the comments, which helped to improve the manuscript. We will revise the manuscript taking into account the comments.

1) Data and Methodology

Q1: Do you have insitu measurements to do validation about the HYDRUS 1-D model simulation? If not, how could you be sure the simulation results (actual ET, soil moisture) meet the evaluation requirements in statistics, for example, RMSE, pearson correlation coefficient. In lines 90-96, you mentioned in situ measured soil moisture data and remotely sensed soil moisture are not available for such long time series and are in general strongly affected by measurement uncertainties. But at least you should have some in situ measured soil moisture and actual ET to do the validation of the HYDRUS 1-D model simulation.

Response: Thanks for the suggestion. This would have been good, but as explained in our response to reviewer #1 our aim is a standardized model-based comparison where we cover many different soil types. Covering very different soil types guarantees us that we account for the different possible soil types at and around the measurement sites. We will clarify this further in the paper, and also stress that our objective is a model-based comparison between droughts in different years which covers different possible conditions. The objective is not to reproduce as precisely as possible the specific soil moisture and evapotranspiration at a site for a given year. With the (very) different soil types we cover the different soils which are potentially available around the sites.

Q2: In lines 174-177, please give the equation and explain how did you derive the parameters of Penman-Monteith equation.

Response: Thanks for the suggestion. We will add new text and include the equation to calculate potential ET and the different parameter settings used.

Q3: Why the pasture is assumed for all these stations? For these 31 stations, do you have the vegetation types information? You should use them in the simulation.

Response: Thanks for pointing this out. All meteorological stations are located on pasture, which is standard for meteorological stations operated according WMO (World Meteorological Organization) regulation. We will clarify this in the paper.

Q4: In lines 85-87, you used five different soil types out of 12 textural soil classes. How did you determine these five soil types? Do you have the soil types information of these 31 stations?

Response: Thanks for pointing this out. The studied five soils cover well the soil textural triangle, so that we cover very different soil hydraulic parameters. Unfortunately, we do not have soil information for the climatic stations. However, covering very different soil types guarantees us that we account for the different possible soil types at and around the measurement sites. We will clarify this further in the paper, and also stress that our objective is a model-based comparison between years which covers different possible conditions. The objective is not to reproduce as precisely as possible the specific soil moisture and evapotranspiration at a site for a given year.

2)Results

Q1: The trend analysis of each variable should be more in-depth. The summary of part 3.1 is one sentence. The in-depth analysis and summary should be done based on the trends of multiple variables, combined with physical processes. For different sites, you should analyze the potential causes that may cause severe drought based on the specific local geographic environment. Probably you can put it in the discussion part, but at least you need to analyze it.

Response: Thanks for this constructive suggestion, which will help to improve the manuscript. We will extend the discussion in the revised manuscript covering this.

Q2: For the trend figure, I did not see the significance test result although you mentioned MK can do it in lines 250-252.

Response: Thanks for this suggestion. We will include confidence intervals for the trend lines for all figures.

Q3: Logically, I did not understand the connection between the section 3.1 and section 3.2. You need to strengthen the logical connection.

Response: Thanks for the suggestion. We will add new text to the beginning of section 3.2 in the revised manuscript to provide a more logical connection between the two sections.

Q4: To be honest, I do not understand what do you want to say in figure7. The description needs to be improved.

Response: Thanks for the comment. We wanted to introduce this section with a general overview on how exceptional the year 2018 was from a meteorological point of view. We made the analysis on the basis of the ranking of the year 2018 in the complete time series of 55 years, for the different meteorological variables which influence drought. We will improve the description of Figure 7 in the text.

3)Discussion

You need to analyze more in this section.

Response: Thanks for the suggestion. We will add discussion.

Firstly, for the model set up, you need to point out the potential for further improvement.

Response: Thanks. We agree that we could discuss this in more detail. We will add additional discussion for the model setup and the limitations of it.

Secondly, for the analysis part, you used precipitation, potential ET, actual ET, soil moisture, and four drought indices for drought trend analysis. There are other variables could be considered as well from the physical process point of view, please describe more about the future improvements.

Response: Thanks for the suggestion. We think that the most important variables are already included here. An extension could be a coupled soil hydrological-crop model, with the assessment of crop yield. For the assessment of other hydrological variables discharge and groundwater levels also need to be simulated with an integrated hydrological or coupled land surface-subsurface model. We will add additional discussion in the manuscript.