Dear Ana Iglesias,

We appreciate the time and effort that you dedicated to read our manuscript and for the valuable comments, you have provided. We answer your comments, suggestions and questions below and have incorporated them into the manuscript. Your constructive comments have significantly improved the quality and clarity of our manuscript.

Please find below our point by point response to each of the comments.

Best regards,

Buruk Kitachew Wossenyeleh
On behalf of all authors

Part I: General Comments:

Point 1: The manuscript is very interesting and well written, proposing a method to analyses the propagation of meteorological drought to groundwater recharge, groundwater levels, and groundwater discharge to a wetland. Some changes could make the manuscript clearer and more focused, especially in the Methods section.

Response 1: Thank you for the positive feedback of the paper and your recommendation.

Part II: Specific comments:

Point 1: Title. Since the study focuses in a case study with very particular hydro-geological conditions, the name of the case study may be included in the title.

Response 1: Agree and changes made. We included the case study are in the title as follows:

Title: Drought propagation and its impact on groundwater hydrology of wetlands: A case study on the Doode Bemde nature reserve (Belgium).

Point 2: Abstract: The last paragraph of the abstract is confusing and seems contradictory.

Response 2: In the abstract, we want to show how the drought changes during the propagation in the groundwater system. The drought is attenuated (reduced its severity and event number) when it propagates through the hydrological cycle. We rewrote the paragraph in the revised manuscript to make it more clear.

Line [19-23] The results of this research show that droughts are attenuated in the groundwater system. The number and severity of drought events on groundwater discharge were smaller than for groundwater recharge. However, the onset of both drought events occurred at the same time, indicating a quick response of the groundwater system to hydrological stresses. In addition, drought propagation in the hydrological cycle indicated that not all meteorological droughts result in groundwater drought.

Point 3: paragraph 30. Please revise to include meteorological drought.

Response 3: Agree and changes made in the revised manuscript.

Line [29-32] Drought can be described as a temporary decrease in water availability over a significant period and caused by deficient precipitation. Droughts propagate through the hydrological cycle and affect both surface and groundwater resources (Bloomfield and Marchant, 2013; Calow et al., 1997; Mishra and Singh, 2010; Wilhite, 2000).

Point 4: paragraph 40. First line, what type of droughts? The results in Figure 5 disagree with this statement. This result should be highlighted.

Response 4: Agree and changes made. We included the type of drought in the revised manuscript.

The result in Figure 5 shows the time series distribution of a monthly average groundwater recharge. The statement by Tricot et al. (2015) was about meteorological drought while the figure shows recharge, which might explain the confusion. We added the following explanation to clarify this:

Line [41-42] The meteorological drought periods were defined as the number of consecutive days without significant precipitation (less than 0.5 mm) for the six hottest months of the year.

Point 5: Methods: Add a section on validation of the simulation model with empirical data, and an example by using the time series of Figure 5 (200 Average monthly groundwater recharge).

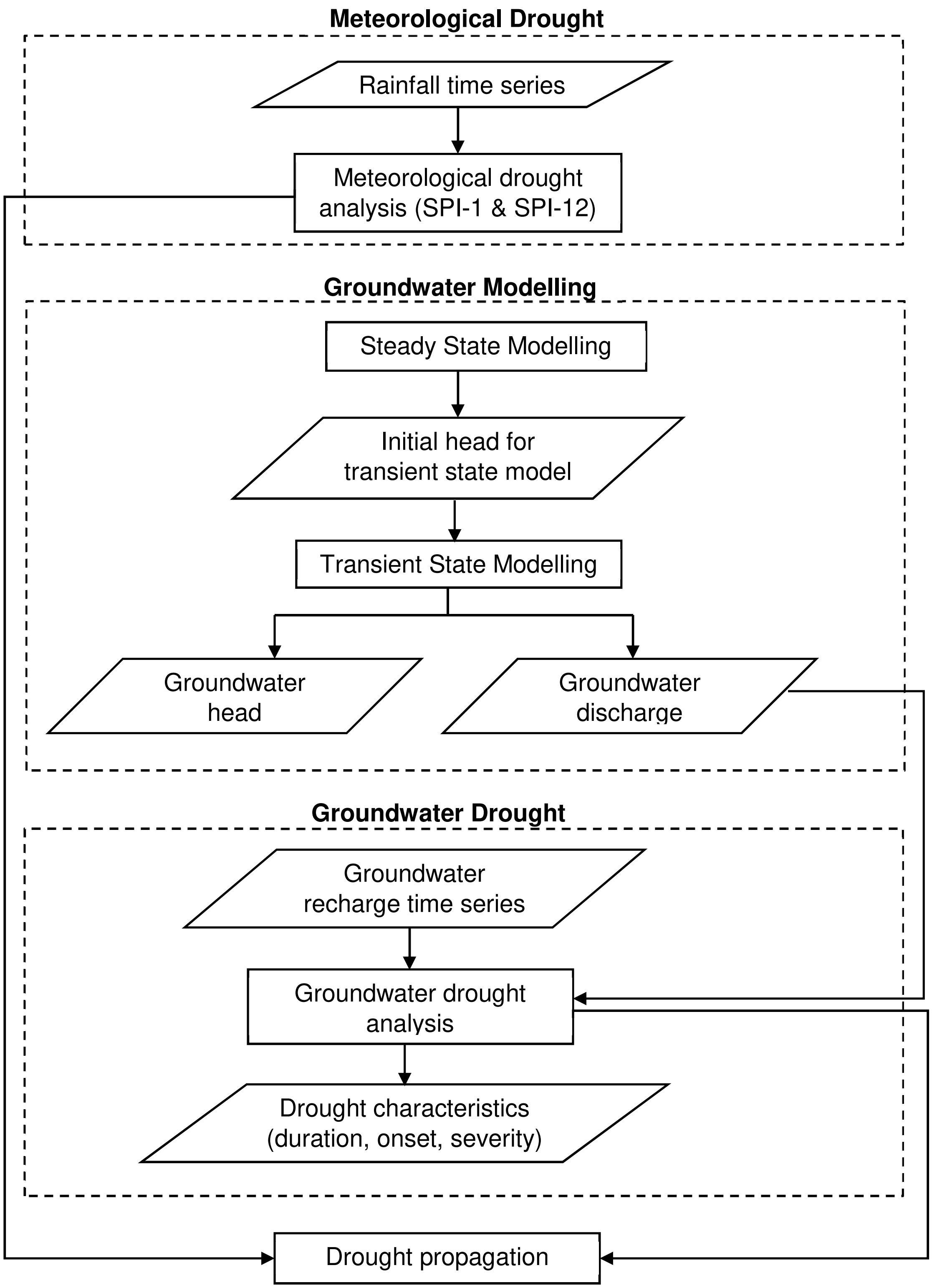
Response 5: No change made because we believe this is already discussed in the current form of the manuscript.

Explanation:

How the model performed during the validation period was shown in the Figures 9, 10, and 11 (Figures 8, 9, and 10 in the old version). These figures include both the calibration period (2006 – 2008) and the validation period (2011- 2013) stated in the manuscript. Therefore, the model simulation result was compared with the empirical data (observed groundwater head and groundwater recharge) during the validation period.

Point 6: Methods: Add a framework figure, linking the modelling components.

Response 6: Agree and changes made. We include the following conceptual framework of the study in the revised manuscript.



Line [130] Figure 4: Conceptual framework of the study

Point 7: Results and discussion: As written now, it is a summary of individual results of the different modelling components. The manuscript will benefit from a more comprehensive text that links the results to the final goal of analysis.

Response 7: Agree and we included the following discussion in the result and discussion part of the revised manuscript.

Line [387-499] During drought propagation in the hydrological cycle, the multi-year meteorological droughts of 1981 – 2013 propagate to groundwater recharge drought. This propagation continues to the groundwater system. The groundwater drought propagation analysis showed that even though the number and severity of drought events observed in discharge to the wetland is lower than for recharge, , the wetland is still vulnerable to groundwater drought. This is also reflected in the lower groundwater level measurements between 2006 and 2008. This vulnerability could be because of the shallow water table and limited thickness of the aquifer in the study area, resulting in a quick response to changes in hydrological stresses such as droughts. The drought propagation towards a wetland studied by Fang and Pomeroy (2008) also showed much lower discharge to the wetland from the basin groundwater and snowmelt runoff developed in drought years. Moreover, Drexler and Ewel (2001) performed a field experiment during the 1997–1998 ENSO-related drought and found that the mean water table level in the wetlands lowered by 12 to 54 cm. This could also be explained by drought propagation from the meteorological to the groundwater system.