

Reply on RC1

Chaogui Lei et al.

Author comment on "Influences of land use changes on the dynamics of water quantity and quality in the German lowland catchment of the Stör" by Chaogui Lei et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-476-AC1>, 2021

1. We thank the reviewer very much for this general comment and gladly provide reasoning for the used methodology.
 We agree with the reviewer that a calibration using one static land use map for streamflow was applied. We chose to use the map of 2019 as it provides the most detailed land use classes and is closer to the two periods for which water quality data was available. Moreover, land use is not as static as it seems as crop rotations have been implemented. With regards to water quality, the SWAT model is calibrated for water quality data in 2009-2011 with the land use map of 2010 and validated for measured data in 2018-2019 with the land use map of 2019.
 While we agree that a dynamic implementation of land use changes would be necessary to represent dynamic changes, in this study the model is used to compare the averaged output from three static model runs to the associated changes in land use. We therefore believe that a calibration using a static land use is suitable. We however evaluated the performance of the model with regard to streamflow for the other two land use maps and showed that the parameters derived during calibration are also suitable for these land use maps (using land use map 1987, NSE: 0.75 - 0.80, KGE: 0.82 - 0.88, PBIAS: -1.1 - 12.2; using land use map 2010, NSE: 0.76 - 0.81, KGE: 0.82 - 0.88, PBIAS: -2.5 - 10.3).
2. We thank the reviewer for this helpful comment. We will provide additional information as requested to improve the description.
3. We will clarify how the model has been calibrated. We used an auto-calibration approach based on 8000 model runs for streamflow and 5000 model runs for sediment, TP, and TN. Parameter sets for these runs have been generated using Latin Hypercube Sampling method. A multi-metric approach was used for streamflow including KGE and RSR as objective functions. For sediment, TP, and TN, NSE was used as the objective function. We will clarify this in section 2.3.3.
4. The stars are used to indicate the extreme outliers. We will add a legend for explaining all notations (e.g., circles, stars) in Figure 6.
5. There is not one baseline for all comparisons in Figure 7. The figure shows differences between the model runs (each is performed between 1990 and 2019) with a land use map of the first stated year and the second stated year, i.e. the first stated year in each column may be referred to as baseline (e.g. 1st column 1987-2010, baseline 1987; 2nd column 2010-2019, baseline 2010; 3rd column 1987-2019: baseline 1987). We will add

more details in section 2.3.4 to clarify this point.