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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Prediction of dissolved reactive phosphorus losses from small agricultural catchments: calibration and validation of a parsimonious model" *by* C. Hahn et al.

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Thank you for your feedback and comments.

1. P1474L11. We implemented the WSP-DRP relationship we derived from the sprinkling experiments carried out on field sites located in the catchment area of Lake Baldegg (Hahn et al., 2012): DRP [mg L-1] = 0.0852 WSP [mg kg-1] – 0.3039, with the condition that no negative DRP values can occur. An appropriate time-frame for model use is March/April till October/November, since snow fall and snow melt is not included in the model. Except for that the model can be applied over several years.

Assuming a constant soil-P concentration seems appropriate. Based on a study carried out within the catchment area of Lake Sempach, Keller and van der Zee (2004) showed that despite a reduced P-fertilization it will take a long time (10 to 20 years) till P concentrations in P-enriched soils and the inherent risk of P-losses decrease. If soil-P concentrations are expected to change the model needs to be adjusted to that change in time.

2. P1474L15 The model runs in hourly time steps. This applies for the hydrological as well as for the phosphorus sub-model. In our model the DRP0ipl concentration does not depend on the application rate. Observations from Braun et al. (1993) showed that the initial DRP concentration after manure application varied between 5 and 10 mg L-1. Thus the DRP0ipl concentration was set to 7.5 $\pm$ 2.5 mg L-1. Lazzarotto (2005) also investigated the effect of a linear correlation between DRP0IPL and the P-amounts of manure application. In average smaller DRP0ipl concentrations were calculated with the linear correlation scenario compared to the constant scenario (Lazzarotto, 2005). We agree that models may be more accurate by making the decrease of DRPipl dependent on cumulative rain instead of time, as suggested by Vadas et al. (2006). Therefore we have discussed this option in the discussion section. As the model worked well for our study period and catchments we left the model as simple as possible.

3. P1483L9 The model does not distinguish between different kinds of manure. In our study catchments manure is mainly applied artificially. In the model we only accounted for applied manure, because that was the data we received from the farmers (time and date of manure application) and because grazing is less important for P input than the spreading of manure and slurry. The model is able to simulate situations where manure dominates. It depends on the timing of the manure application and the rainfall events, as well as on the soil-P concentration.

4. P1485L3 h = hours

5. P1487L20 No. We wanted to point out, that (1) despite the low amount of input data,

good model results were achieved and that (2) the separate calibration of urban parameters significantly improved the model results. We will write “urban HRU parameters” instead of “HRU parameters” to clarify that.

6. P1488L20-22 Here we refer to the limitations of the model and state that the model is still appropriate for our study catchments for the named reasons. In the whole paragraph we discuss the limitations of the model and declare where it should not be used (e.g. L7/8). From our point of view, the model can be applied in catchments not located on the Swiss Plateau, as long as the conditions for model application are fulfilled.

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