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Hydrology and Earth System Sciences Discussions

Interactive comment on "A multi-objective optimization tool for the selection and placement of BMPs for pesticide control" *by* C. Maringanti et al.

Anonymous Referee #3

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The paper addresses an interesting problem, namely how to efficiently implement best management practices (BMPs) in a heterogeneous watershed to reduce downstream pesticide concentrations.

The paper basically follows a simulation-optimization approach, whereby effects of BMPs on pesticide concentrations are quantified with a simulation model, and multi-objective optimization is used to find BMPs that minimize pesticide concentrations at minimal cost. Computational efficiency is maintained by using the simulation model 'offline' to develop simplified relations between BMPs and resulting pesticide concen-

trations. The approach in itself is not innovative; however the real-world application for pesticide control at the watershed scale is potentially suited for publication.

There are however several issues that need to be resolved before publication.

1. Simulation part

- Application and calibration of the SWAT simulation model should be much better documented. Which parameters were calibrated, what were initial and final values, how were other parameters estimated? Practically no information is given.

- Calibration results for streamflow in figure 5 indicate that the simulation model is not very accurate, which casts doubt on the rest of the analysis in this paper, which relies on a proper simulation of watershed processes.

- Calibration results for pesticide concentrations on the other hand look comparatively good (figure 6), even though flow is not simulated well, and even though annual average pesticide concentrations were used as calibration target (it seems to me that the model should be calibrated to peak concentrations).

- Results of the simulation model are summarized into a simplified BMP tool. In general, this is a good approach; however the description on page 1836 makes it sound like only homogeneous BMP scenarios were evaluated (see assumption 1 on page 1836). That does not make sense, and it should be fixed or clarified.

2. Optimization part

- The most important step in any optimization problem is specification of an appropriate objective function. I have two questions in this respect. First, since maximum pesticide concentrations are federally legislated, why not use that as a constraint and minimize cost in a single-objective formulation? Second, the pesticide control objective measures annual average pesticide concentrations. I think this is flawed, as one is interested in peak concentrations, rather than averages.

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Interactive Comment

- section 2 (theoretical background on the optimization algorithm) should be summarized and significantly shortened, and then included as a subsection under 'methodology'. That should generate space for a more extended description and discussion of case study, calibration, and results.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 1821, 2008.

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Interactive Comment