Hydrol. Earth Syst. Sci. Discuss., 10, C2918–C2920, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C2918/2013/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Statistical analysis and modelling of surface runoff from arable fields" *by* P. Fiener et al.

P. Fiener et al.

auerswald@wzw.tum.de

Received and published: 1 July 2013

Salvatore Manfreda raised three important questions that we can answer as follows:

1. Comparison with the SCS-Curve-Number Method: We compared the quality of the our predictions with predictions derived following the classical curve number approach. To this end, the hydrological soil groups of the CN approach were assigned based on the soil descriptions and the CNs for fallow, row crop and small grain depending on the crops were assigned following Mockus (1972). Furthermore, CNs were estimated with an alternative approach following Auerswald and Haider (1996) that predicts CN from soil cover. Using the CN approach according to Mockus (1972) increased the RMSE of runoff volume by about 50% (RMSE = 7.7 mm). The same was true when using

the CN approach by Auerswald and Haider (1996) (RMSE = 7.9 mm). It is remarkable that the CN approach by Auerswald and Haider (1996) did not perform better than the original version by Mockus (1972) although Auerswald and Haider (1996) had used a subset of our data to develop their equation, which predicts CN from soil cover. Within their subset of data, soil cover mainly changed due to early plant growth and hence it had statistically a similar power as time since tillage. For the entire data set, time since tillage was superior to soil cover because it also described the changes immediately after tillage before the onset of plant growth. And, time since tillage can also serve as an indicator for long-term changes while soil cover approaches its final value usually two months after seeding.

2. List of parameters: In principle, we share the scepticism of the reviewer that other physical parameters (including errors) must be responsible for the unexplained variation. Among those parameters listed by the reviewer we can exclude the phreatic surface (it was always far below the soil), convergence (the plots were small and positioned on straight slope segments), antecedent soil moisture (it did not explain the variation), soil texture (we had examined 17 different texture parameters) and likely also LAI (it should correlate with plant cover that had been tested; there is no justification why LAI should be a better predictor than cover). We have not examined rooting depth, soil permeability and macropores simply because these data are difficult to measure in a sufficiently standardized manner. Hence they are rarely measured in rainfall simulation experiments and they were not available for several of our rainfall simulations. They would also not be available in the prediction case. Likely, there are many more influences that could influence runoff in certain cases (e.g., soil layering) but unlikely this can be described in a general equation. The intention of our work was not to explain fully all possible cases (which seems to be impossible) but to examine how much we can predict with data that usually could be obtained for runoff prediction.

3. Why do stones influence initial abstraction but do not enter in the runoff equation: Stone cover > 10% also (indirectly) enters the runoff equation because initial abstrac-

tion is used in the equation to calculate runoff.

4. Contradiction between page 3673 lines 17-20 and page 3679 lines 1-4. This is no contradiction. The first statement is an illustration of the continuously decreasing susceptibility for runoff and the second statement explains, which processes could be at play during the early part of this continuous function (while the later processes are explained on the following lines).

We will include the comparison of the CN approach with our model in the final version of the manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 3665, 2013.