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Evaluation of pesticide trapping efficiency equations for vegetative filter strips (VFS) using additional experimental data

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Vegetative filter strips (VFS) are widely used for mitigating pesticide inputs into surface waters via surface runoff and erosion. To simulate the effectiveness of VFS in reducing surface runoff volumes, eroded sediment loads and pesticide loads the model VFSMOD (Muñoz-Carpena and Parsons, 2011) is frequently used. While VFSMOD simulates infiltration and sedimentation mechanistically, the reduction in pesticide load in surface runoff by the VFS is calculated with the empirical multiple regression equation of Sabbagh et al. (2009). This equation uses the following inputs: predicted reduction of surface runoff volume and eroded sediment load (deltaQ and deltaE, respectively), absolute surface runoff volume and eroded sediment load entering the VFS, linear adsorption coefficient Kd of the pesticide, and the clay content of the field soil (as a proxy for the clay content of the eroded sediment). The regression equation of Sabbagh et al. (2009) has not been widely accepted by regulatory authorities, because its reliability has not been sufficiently established yet. Bach et al. (2016) concluded that the equation does not seem to be fundamentally flawed, but that evaluation against additional experimental data is necessary. In particular, the equation needs to be tested against cases with low deltaQ and high deltaE, which were not present in the calibration and validation data sets used by Sabbagh et al. (2009), but are predicted frequently by VFSMOD. Recently Chen et al. (2016) proposed an alternative regression equation, derived from the same experimental data as used by Sabbagh et al. (2009).
The objective of the present study was to improve the validation status of the Sabbagh et al. equation by testing it against additional validation data. For this aim, a number of experimental VFS datasets not used by Sabbagh et al. (2009) were compiled from the available literature and checked for their suitability for testing. Many datasets had to be discarded in this process because suspended sediment loads in surface runoff had not been measured. Both the equations of Sabbagh et al. (2009) and Chen et al. (2016) were tested against the experimental datasets that were found suitable. The presentation will discuss the main findings of the evaluation study.