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Spatially distributed pesticide leaching modeling in the Flemish region of Belgium

Nicole Stuber (1,2), Ingeborg Joris (1), Hans van der Kwast (1), Roger Smolders (1), Jan Bronders (1), Piet Seuntjens (1,3,4), Bernhard Jene (2), and Gunnar Kahl (2)

(1) VITO, Environmental Modeling Unit, 2400 Mol, Belgium, (2) BASF, Crop Protection Environmental Fate Modeling, 67117 Limburgerhof, Germany, (3) Ghent University, Department of Soil Management, 9000 Ghent, Belgium, (4) Antwerp University, Faculty of Bioscience Engineering, 2000 Antwerp, Belgium

For the authorisation of pesticides in EU countries the calculation of predicted environmental concentrations are required in the risk assessment. To perform higher tier risk assessments the model GeoPEARL can be used. This model was developed by the Dutch institutions Alterra Green World Research and the National Institute of Public Health and the Environment (RIVM) for pesticide authorisation processes in the Netherlands. It is a spatially distributed model of pesticide fate in the soil-plant system and can be used for a wide range of pesticides on different scales. In this study a spatial schematisation for the Flemish region of Belgium was set up to cover the environmental variability and perform simulations of the spatial pattern of pesticide leaching in agricultural areas, where groundwater depths may well fluctuate within the upper first meter.
Different spatial databases are used. Soil properties were obtained from the Belgian Aardewerk soil database and translated into model parameters by using pedotransfer functions. Weather information on a daily basis were gathered from the MARS (Monitoring Agriculture by Remote Sensing) meteorological database and a gridded CRU dataset from EU-FP6 project ENSEMBLES. For establishing a constant head bottom boundary condition, a groundwater depth map was developed. In areas with deep groundwater a free drainage bottom boundary was imposed.
As the leachate concentration is sensitive to soil properties, the aim was to obtain a high resolution within the spatial soil pattern. For building unique combinations this dataset was combined with the groundwater depth map and resulted in several thousand realistic scenarios. Calculations for maize are carried out for long-term averages of substance and water balances and the 90th percentile of leaching concentrations for each plot. By implementing the results in a GIS, leaching concentrations for all agricultural areas are visualised. Demonstrations of how spatially distributed parameters affect pesticide leaching are performed and areas of high leaching risk are defined.