Geophysical Research Abstracts
Vol. 12, EGU2010-6455-1, 2010
EGU General Assembly 2010

Development of a Dutch Drainpipe exposure scenario

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In the new Dutch pesticide authorisation procedure, the leaching of pesticides to surface waters will be evaluated. The 90th percentile of the peak concentrations in all Dutch ditches will be used for the exposure assessment of aquatic organisms The peak concentration in surface waters is primarily affected by fast transfer routes (amongst others by macropores). For this reason, we developed a macropore version of the pesticide leaching model PEARL. The macropore version of PEARL describes transport of pesticides through the soil matrix and through two preferential flow domains, i.e. a bypass domain and an internal catchment domain.

The drainpipe exposure assessment will be done for a single field site. We selected the Andelst field experiment (Scorza Júnior et al., 2004) for this purpose, because at this site sufficient data is available to parameterise and test the model. To assess the effect of weather variability on drainpipe concentration, the model is run for a 20-years period. Hydrological boundary conditions for the 20-years period were taken from nearby weather stations and ground water observation wells. Application of PEARL to this field site showed that the model adequately describes the peak concentration and the later decline of the concentration for two different pesticides.

The exposure assessment at the Andelst field site results in 20 annual peak concentrations, that need to be compared with the 90th percentile of the peak concentration in all Dutch ditches, so we performed simulations with a spatially-distributed version of PEARL. This assessment resulted in 20 times n concentrations, with n the number of locations. A contour diagram was used to assess which weather year corresponds with the 90th percentile of all 20 times n peak concentrations. The X-coordinate in the contour diagram corresponds with the percentile of the cumulative distribution of the predicted concentrations due to spatial variability that is obtained for a median weather year. The Y-coordinate corresponds with the percentile of the cumulative probability density function resulting from the 20 weather years at a given location. The contour lines correspond with the overall percentiles taken from the frequency distribution of all 20 times n peak concentrations.

GeoPEARL results showed that the Andelst field site corresponds to the 82.5th percentile of the cumulative distribution of the predicted concentrations due to spatial variability. Application of the contour diagram showed that the 87.5th percentile weather year had to be used in order to obtain the overall 90th percentile.

Scorza Júnior, R.P., Smelt, J.H., Boesten, J.J.T.I., Hendriks. R.F.A., and van der Zee, S.E.A.T.M. 2004. Preferential flow of bromide, bentazon and imidacloprid in a Dutch clay soil. J. Environ. Qual. (33):1473-1486.