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The consequences of interpolating or calculating first on the simulation of pesticide leaching at the regional scale

B. Leterme (1), M. Vanclooster (2), A. Tiktak (3), A.M.A. van der Linden (4), M.D.A. Rounsevell (1)

(1) Dept. of Geography, Université catholique de Louvain, Louvain-la-Neuve, Belgium, (2) Dept. of environmental sciences and land use planning - Génie Rural, Université catholique de Louvain, Louvain-la-Neuve, Belgium, (3) Milieu- en Natuurplanbureau (MNP), Bilthoven, the Netherlands (4) National Institute for Public Health and the Environment, Bilthoven, the Netherlands

(leterme@geog.ucl.ac.be / Phone +32-10-472842)

Pesticide leaching deterministic models have been used in the evaluation process and more recently spatially distributed modelling has also been introduced. In this paper we present an analysis of the different approaches to process soil information when simulating pesticide leaching to groundwater at the regional scale.

The first approach, *calculate alone* (CA), was based on the application of the model to point data followed by the aggregation of the results to the regional scale. Two further approaches to generating a spatial output differed by processing the interpolation after or before the model run on point support (*calculate first, interpolate later*; CI vs. *interpolate first, calculate later*; IC). The three approaches were tested with both a linear (modified Attenuation Factor, AF; Rao et al., 1985) and a non-linear (GeoPEARL; Tiktak et al., 2002; 2003) leaching model.

For each model, the output maps of the CI and IC approaches were compared using Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) budget equations. Following the method proposed by Pontius et al. (2005), these equations provide a quantitative assessment of disagreement due to quantity, agreement due to location and disagreement due to location. Monte Carlo permutation tests were also used to compare the cumulative density functions of the results of the CI, IC and CA ap-

proaches.

Results showed that the correlation structure of the model inputs plays a key role in the differences between the CI and IC approaches. For the linear model, the correlation range of input parameters entirely determines the semivariogram range of the output variable in the CI approach. This was not true for GeoPEARL, as the effect of model non-linearity lead to a highly significant increase in the semivariogram range. Also, if some input parameters are cross-correlated, this ancillary information can only be incorporated into the IC approach. However, a lower prediction variance does not necessarily mean that the value retained (the centre of the prediction distribution) is better than with the CI approach. A different argument could be that, as interpolation is a tool to 'fill in the missing information', it should be used as a last resort, i.e. via the CI approach. The results also suggest that the relevance of either CI or IC could depend on the available input information. However, it was shown that the differences arising from the CI or IC approaches are surpassed at the regional level by the non-spatial approach (CA), based on point information.

0.1 References

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