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## Objectives PhD

The aim of this PhD is the development of a dynamic model for contaminant fate in surface water at catchment scale. This includes:

- integration of new processes (e.g. sediment-surface water interactions)
- coupling models at catchment-scale
- calibration (parameter estimation)
- validation / evaluation

## Methods

### Selection of the contaminant

- pesticide concentrations in surface water show dynamic behaviour (Figure 1)
- more knowledge is needed about interactions of pesticides with sediments, suspended solids and other components of the surface water system
- new knowledge needs to be integrated in surface water quality models

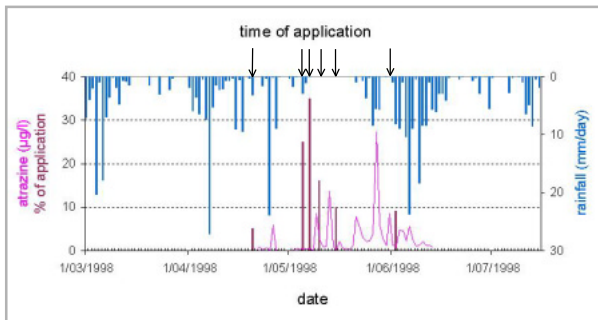


Figure 1. Dynamic behaviour of atrazine concentration in the Nijl (data CODA)

### Selection of models

- different models are coupled to simulate pesticides in surface water

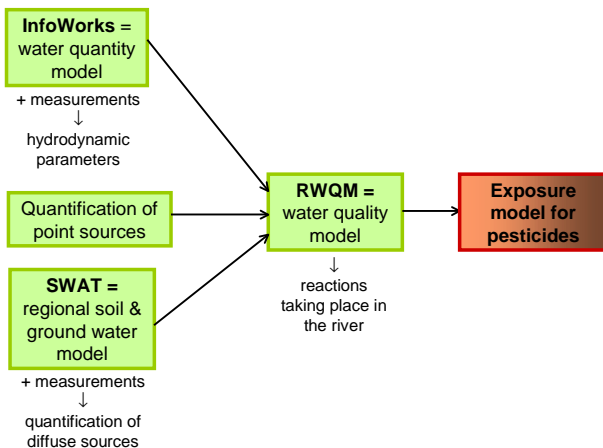


Figure 2. Schematic representation of the coupling of models to achieve an exposure model for pesticides

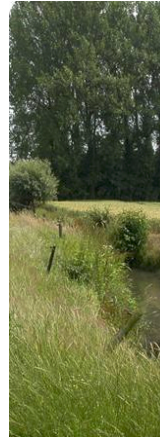
InfoWorks = water quantity model (ISIS, 2002), that will supply hydrodynamic information to RWQM

SWAT = predicts the impact of land management practices on water, sediment and amount of chemicals originating from agriculture, in large complex river basins (Neitsch et al., 2002)

RWQM = developed to describe the behaviour of water quality in a dynamic water system (Reichert et al., 2001)  
 - depending on relevant processes of the selected pesticides which differ slightly from those available in RWQM1, extra modules will be developed which can be added to the RWQM1

### Selection of cases

- The Nijl case



- tributary of the Dijle, Walloon
- length: 14 km
- area: 32 km<sup>2</sup>
- detailed information concerning pesticide application: data CODA: 1997-2003

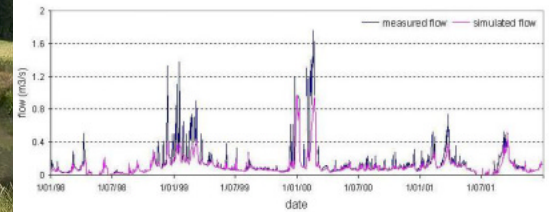


Figure 3. Comparison of measured flow data with flow data obtained after a first rough simulation with SWAT without calibration

- The Demer case



- complete hydrodynamic model in InfoWorks (AMINAL)
- pesticide pollution in surface water and sediment

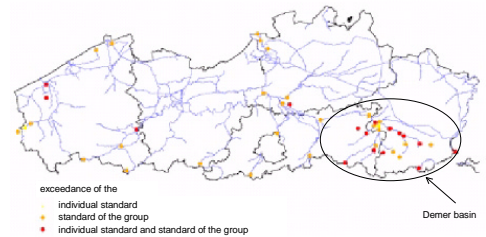


Figure 4. Exceedance of the basic water quality standard in Flanders for pesticides in the surface water (MIRA, 2002)

## Conclusions

- an overview of the development of a dynamic exposure model for pesticides in surface water is given
- 2 test cases were selected, data were collected and the hydrodynamic modelling is started

## References

ISIS. (2002). InfoWorks RS Technical Review: [http://www.wallingfordsoftware.com/products/iwrs\\_tech.asp](http://www.wallingfordsoftware.com/products/iwrs_tech.asp)  
 Neitsch S.L., Arnold J.G., Kiniry J.R., Williams J.R., and King K.W. (2002). Soil and Water Assessment Tool: Theoretical documentation Version 2000. Grassland, Soil and Water Research Laboratory, Agricultural Research Service, Texas & Blackland Research Center, Texas Agricultural Experiment Station, Texas. 458 p.  
 MIRA (2002). Milieu- en Natuurrapport Vlaanderen, MIRA. Achtergronddocument 2002, 2.20 Kwaliteit oppervlaktewater.  
 Reichert P., Borchardt D., Henze B., Rauch W., Shanahan P., Somlyódy L. and Vanrolleghem P.A. (2001). River Water Quality Model No. 1. Scientific and Technical Report No 12. 136 pp.