



Extension of the River Water Quality Model N°1 with the fate of pesticides

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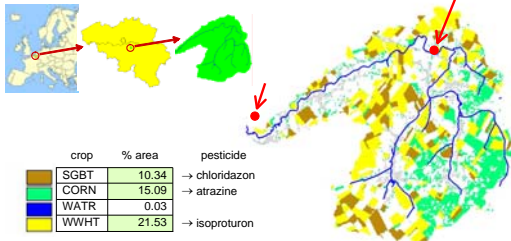
Content

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- model development
- determination of sorption coefficients
- results
- conclusions



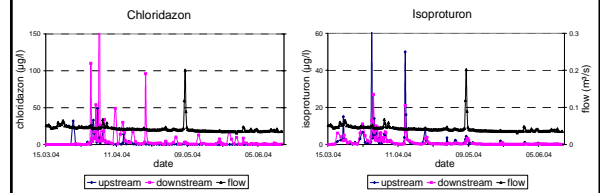
Problem statement

- intensive monitoring campaign spring 2005



Problem statement

- in the water column

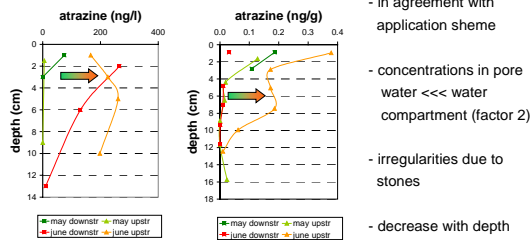


→ highly dynamic system with hourly variations



Problem statement

- in porewater
- on sediment



- in agreement with application scheme
- concentrations in pore water <<< water compartment (factor 2)
- irregularities due to stones
- decrease with depth



Problem statement

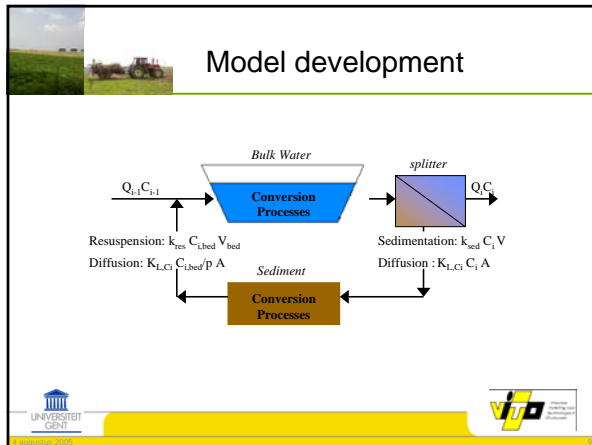
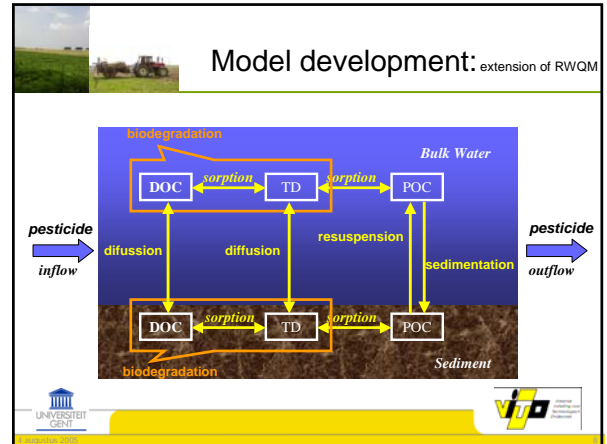
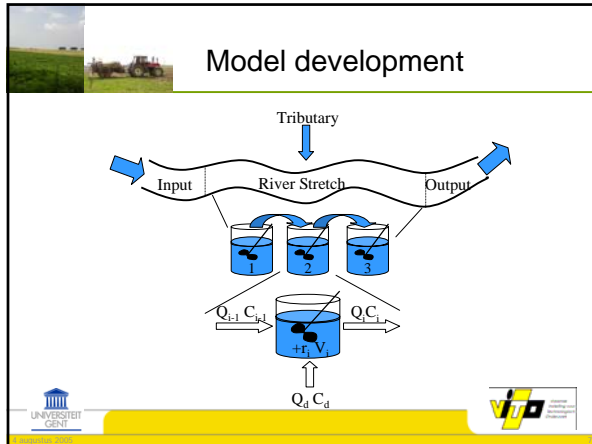
- explanation observations: combined
 - diffusion
 - biodegradation
 - chemical processes
 - sedimentation – resuspension



dynamic model:

- gain insight in the importance of each of these processes
- realistic predictions (K_{oc} M_{oc} K_{ay})





Model development

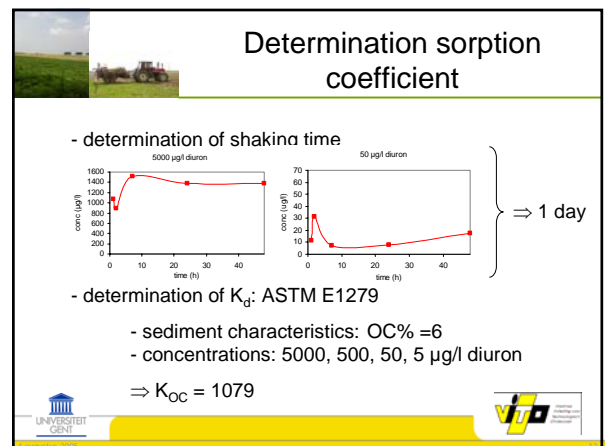
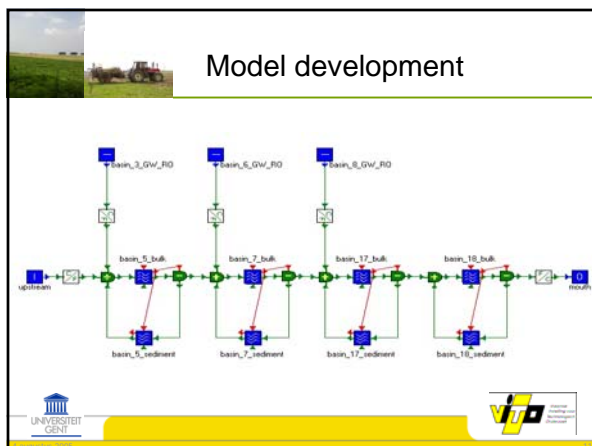
flux in flux out biodegradation sedimentation

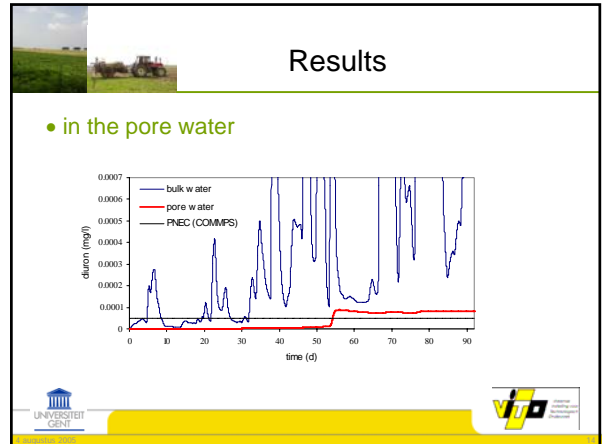
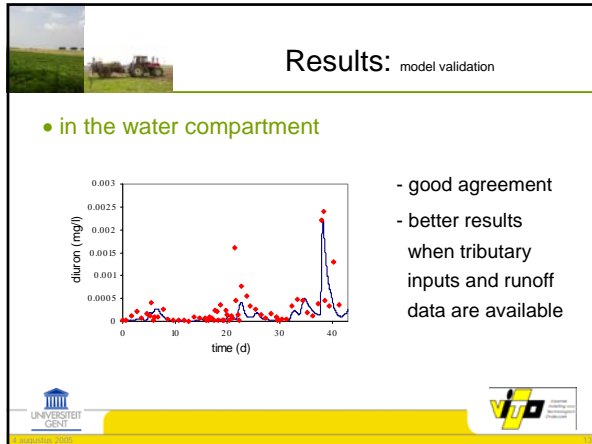
$$\frac{d(V C_T)}{dt} = Q_m(t) C_{T,in}(t) - Q_{sed}(t) C_T(t) - k_b (1 - f_p(t)) C_T(t) V(t) - k_{sed} f_p(t) C_T(t) V(t) + k_{res} f_{p,bed}(t) C_{T,bed}(t) V_{bed}(t) + K_{L,OC} \left[(1 - f_{p,bed}(t)) \frac{C_T(t)}{P} - (1 - f_p(t)) C_T(t) \right] A$$

resuspension biodegradation sedimentation

$$\frac{d(V_{bed} C_{T,bed})}{dt} = -k_b (1 - f_{p,bed}(t)) C_{T,bed}(t) V_{bed}(t) + k_{sed} f_p(t) C_T(t) V(t) - k_{res} f_{p,bed}(t) C_{T,bed}(t) V_{bed}(t) - K_{L,OC} \left[(1 - f_{p,bed}(t)) \frac{C_T(t)}{P} - (1 - f_p(t)) C_T(t) \right] A$$

resuspension diffusion





Results

- in the pore water

compartment	pesticide	downstream	
		measured	simulated
Pore water (ng/l)	chloridazon	910	759
	diuron	1540	75
Sediment (ng/g)	chloridazon	1,2	4,2
	diuron	4,9	11

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- ### Conclusions
- the water-sediment is a dynamic system
 - dynamic model is necessary for realistic predictions
 - extension of the RWQM1-model with pesticide behaviour
 - use of literature values for model parameters
 - + Kd sorption experiment
 - model validation:
 - bulk water: reliable results
 - pore water factor 1 overestimated → needs better input
 - on sediment: same order of magnitude
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