Nonpoint pollution by pesticide

- Very dependent on hydrological processes

- Interaction between molecules and soil
  - residence time
  - subtrates natures

  → Pesticide loads in water

- Very low rate in water resource compared to applied amount

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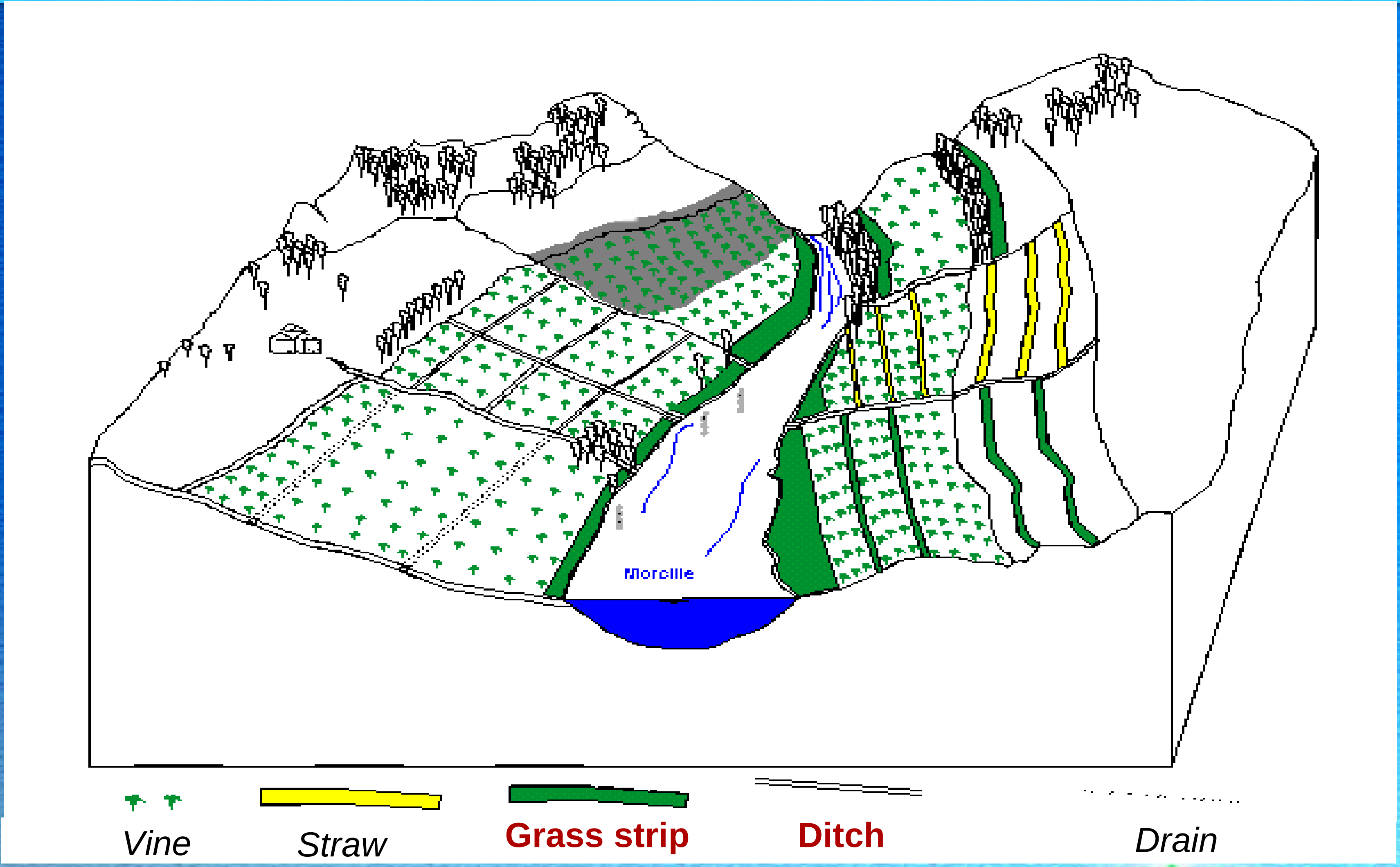
Catchment organisation ...



Pesticide rates in surface water

Pesticide	Site	Scale Km²	Department - crops	Transfer % of application	Nber of values
Diuron	Roujan	field	34 - vine	0.5- 2.1	2
	Roujan	0.9	34 - vine	0.05 - 0.5	3
	Morcille	3.5	69 - vine	0.1	1
	Ruiné	5.5	16 - maïze, wheat, sunflower, vine	0.1	1
Simazine	Roujan	field	34 - Vine	0.9 - 1.2	2
	Roujan	0.9	34 - vine	0.05 - 0.5	3
	Morcille	3.5	69 - vine	0.1	1
	Ruiné	5.5	16 - maïze, wheat, sunflower, vine	0.1 - 0.5	5
Atrazine	Jaillière	field	44 - maize drainage + runoff	0.1 - 0.4	5
	Ruiné	5.5	16 - maïze, wheat, sunflower, vine	0.1 - 0.5	5
Isoproturon	Jaillière	field	44 - wheat drainage + runoff	0.02 – 1.5	8
	Ruiné	5.5	16 - maïze, wheat, sunflower, vine	0.26	1

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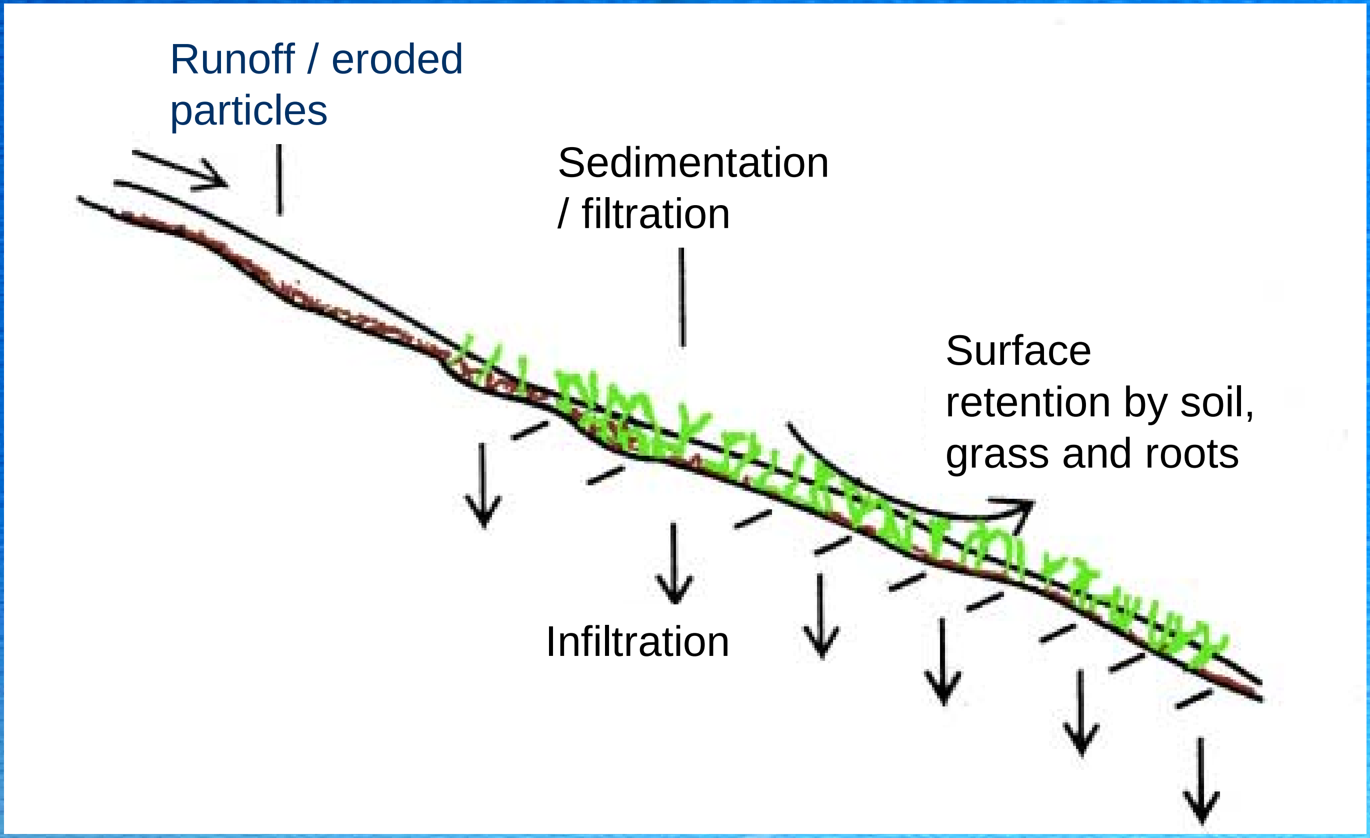
Grassed buffer strip function



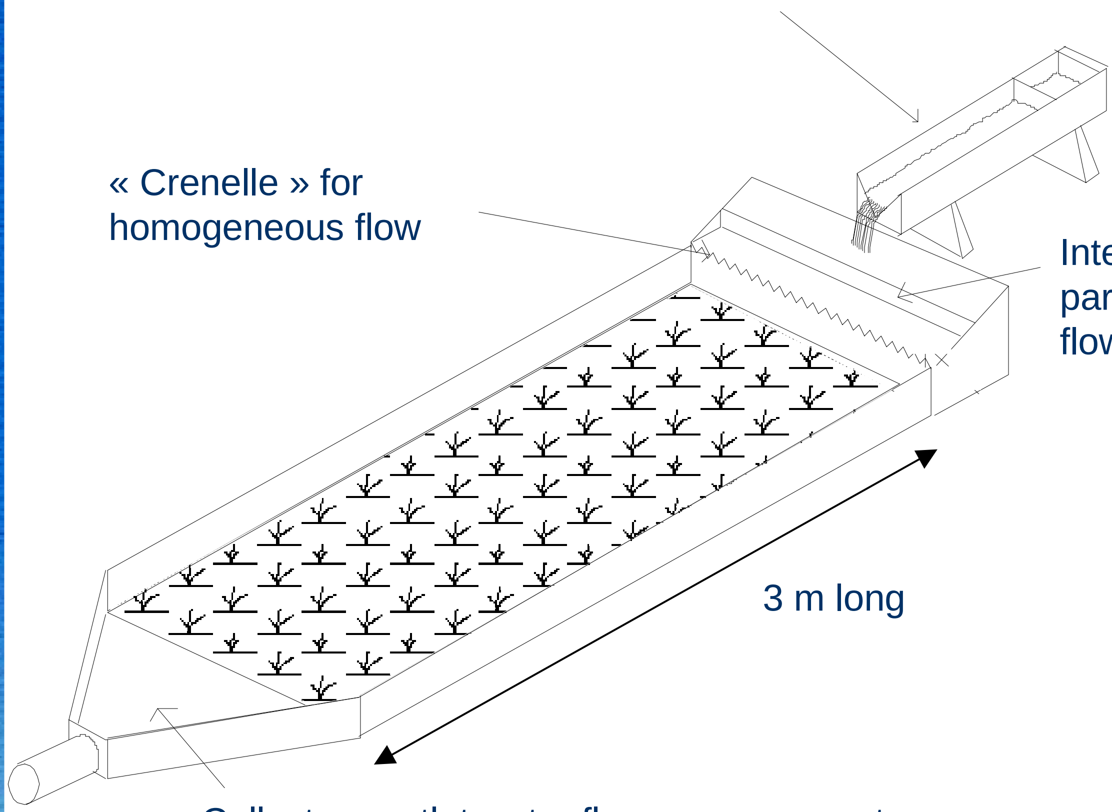
Experimental runoff simulator

Buffer strip efficiency evaluation

La Jaillière, experimental farm of ITCF

Loire-Atlantique, France

Runoff simulator



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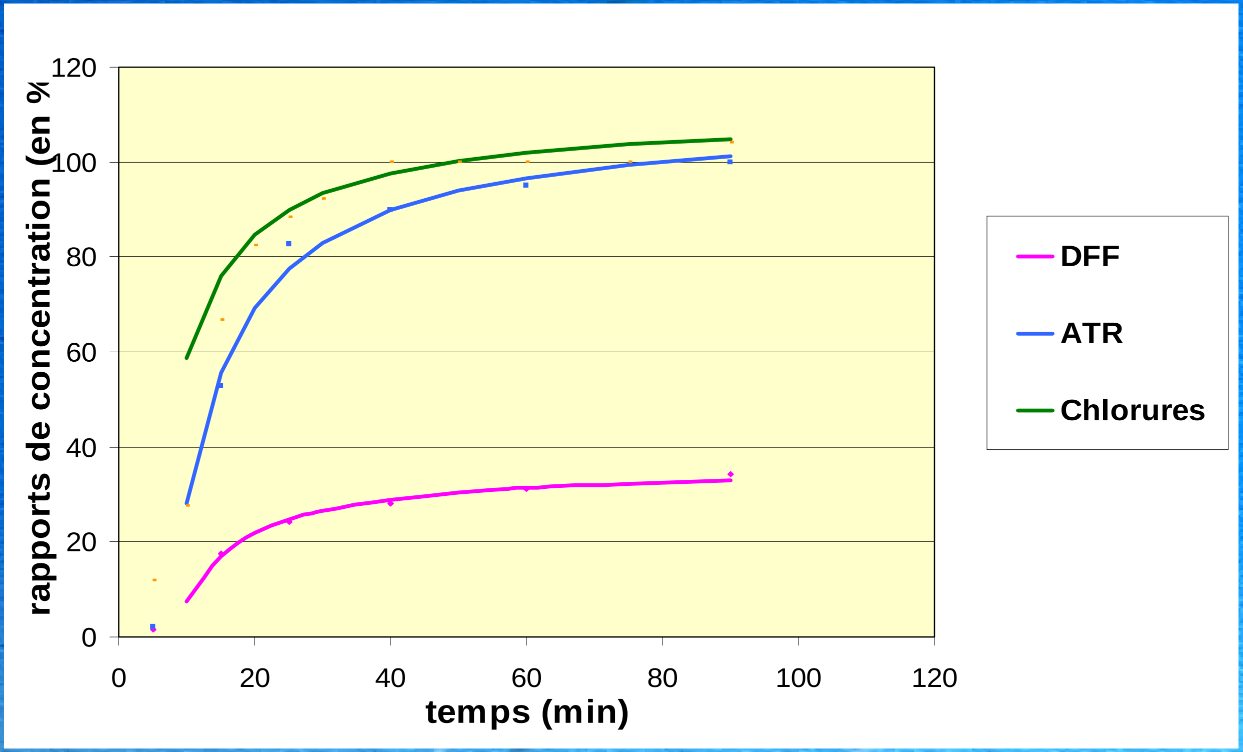
Studied pesticides

Characteristics	Diflufenican DFF	Diuron DIU	Isoproturon IPU	Atrazine ATR
Solubility mg/l	0.05 (25°C)	36.4 (25°C)	65 (22°C)	33 (22°C)
Koc (l/kg)	1990	480	120	100
DT50 (soil, days)	175-294	90-180	12-32	16-77

Pesticide concentration evolution with time



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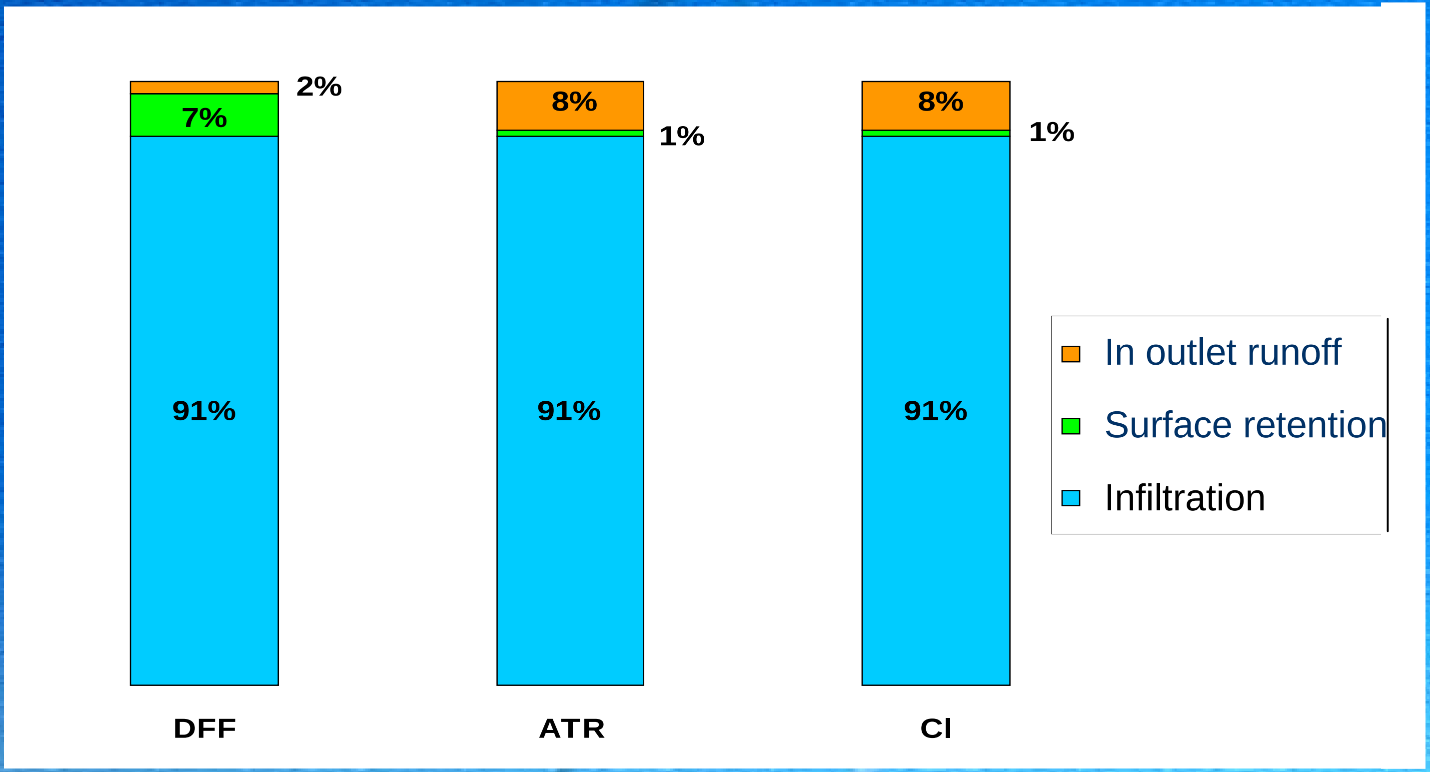
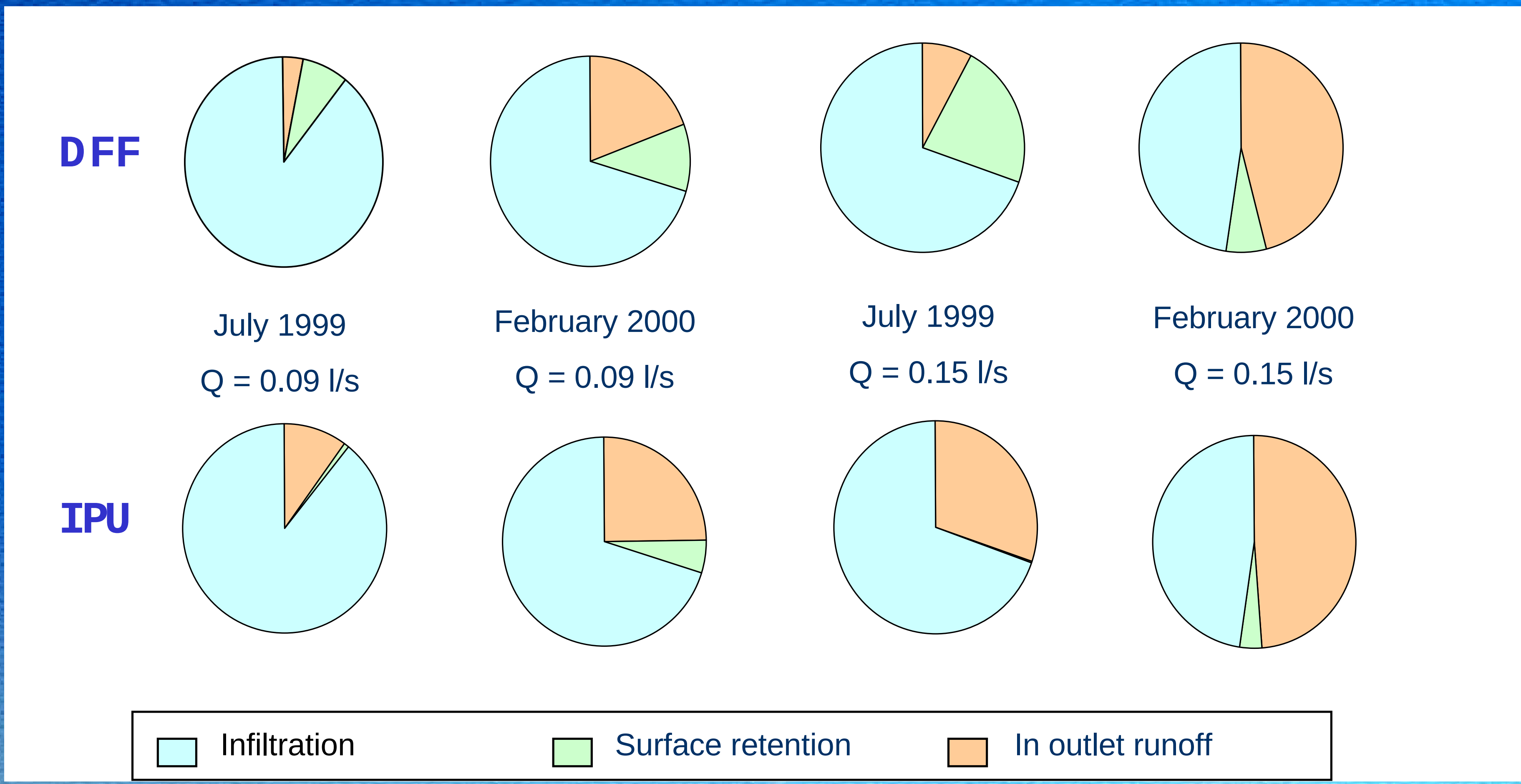
Pesticide distribution in a buffer strip



Pesticide balance in buffer strips for different seasons and water flows



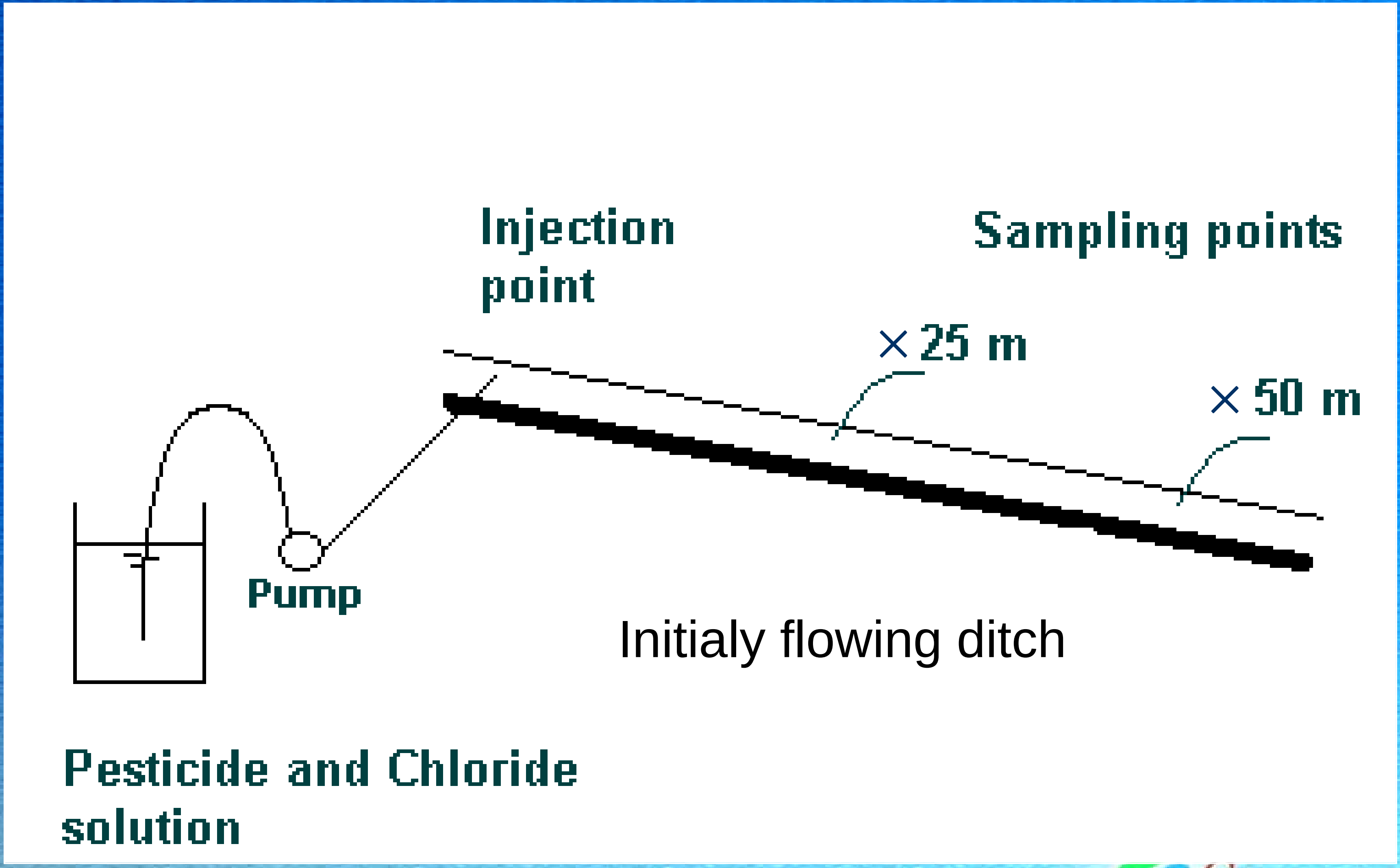
Small agricultural ditches influence on pesticide transfer ?

Experimental farm of La Jaillière, ITCF
(Loire-Atlantique, France)

Froust

Coraux

Experimental pesticide flow simulation



Pesticide retention in agricultural ditches

Ditch/season	Bottom characteristics	Water flow	Distance	Retention DFF	Retention DIU	Retention IPU
CHARME/winter	Very few grasses Coarse sediment	44 L/s	50 m 100 m	- -	- -	- -
CORAUX/winter	Some grasses and Fine sediment	2,5 L/s	50 m 100 m	- 17 %	- 6 %	- <1 %
ERINE/winter	Many grasses Coarse sediment	1 L/s	25 m 50 m	8 % 23 %	- -	- -
DON/winter	with 10 cm of humus	2,5 L/s	25 m 50 m	37 % 54 %	X X	12 % 27 %
FROUST summer	Many grasses from 250 to 300 m Leaves in decay	10 L/s	100 m 200 m 300 m	28 % 30 % 70 %	- 3 % 39 %	- - 34 %

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Conclusion

- **Buffer strips ability to reduce pesticide load and concentration**
  - mainly due to infiltration capacity (+ retention for high Koc pesticides)
  - may concern all pesticides
  - very dependent on soil and climate characteristics
- **Small ditches ability to reduce pesticide load and concentration**
  - very dependent on ditch bottom status (organic matter in decay)
  - mainly concerns high Koc pesticides
  - very dependent on hydrological conditions (water flow and level)
- **Pesticide rates at the edge of the field may be very different from pesticide rates entering water courses**

On going work

- Typology of ditch and buffer strip towards their potential to transfer/retain pesticide
- Complementary laboratory work on an experimental channel to validate hypothesis on major processes and parameters
- Specific lab and field experiments to determine pesticide fate in buffer zones soil
- Modelling work

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