COMETE project Valensole: lavender and water quality - spatiotemporal characterization of impacts of waters to agricultural pollution

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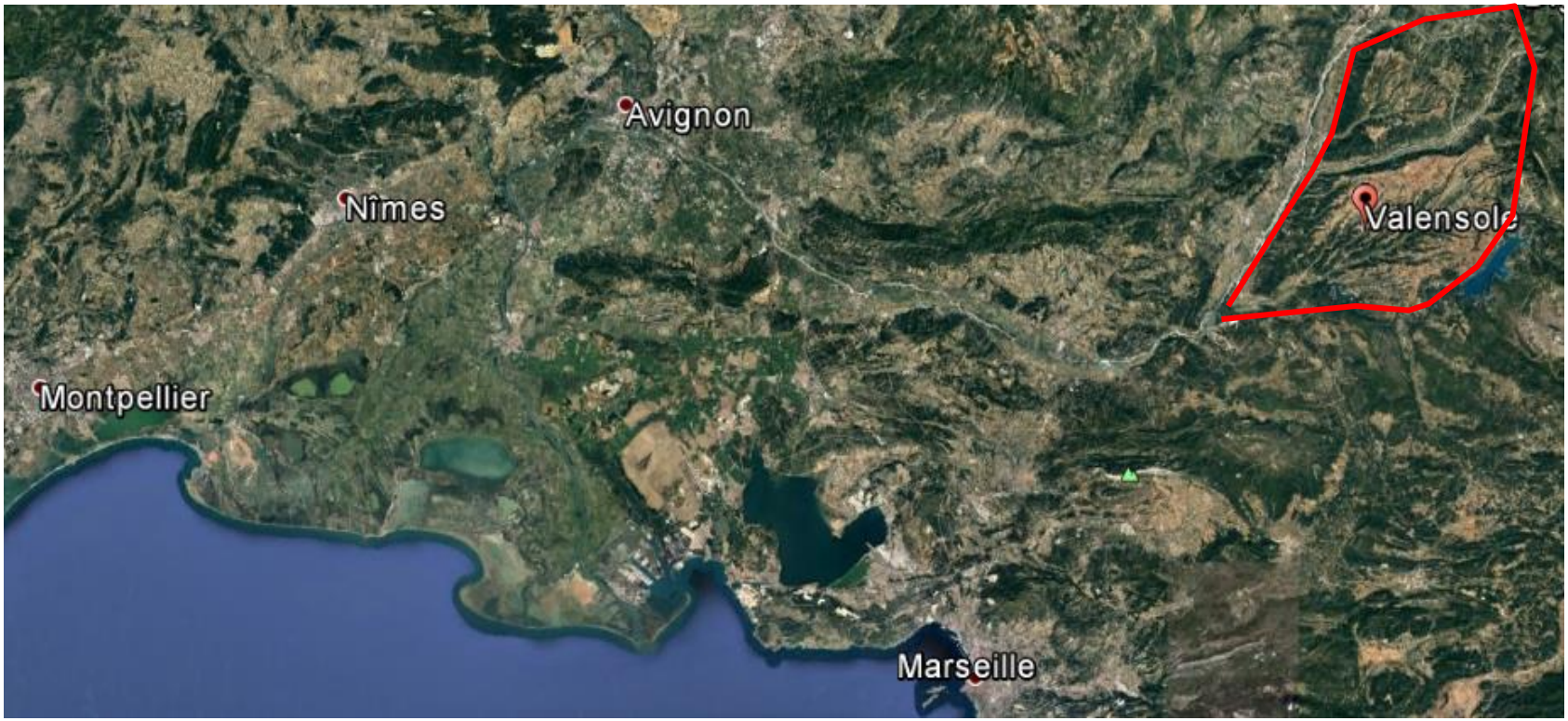
Context of the Valensole plateau

Located at the South of France, in Alpes de Haute-Provence, 220 km from Montpellier



Plateau dominated by cereal crops and growing lavender

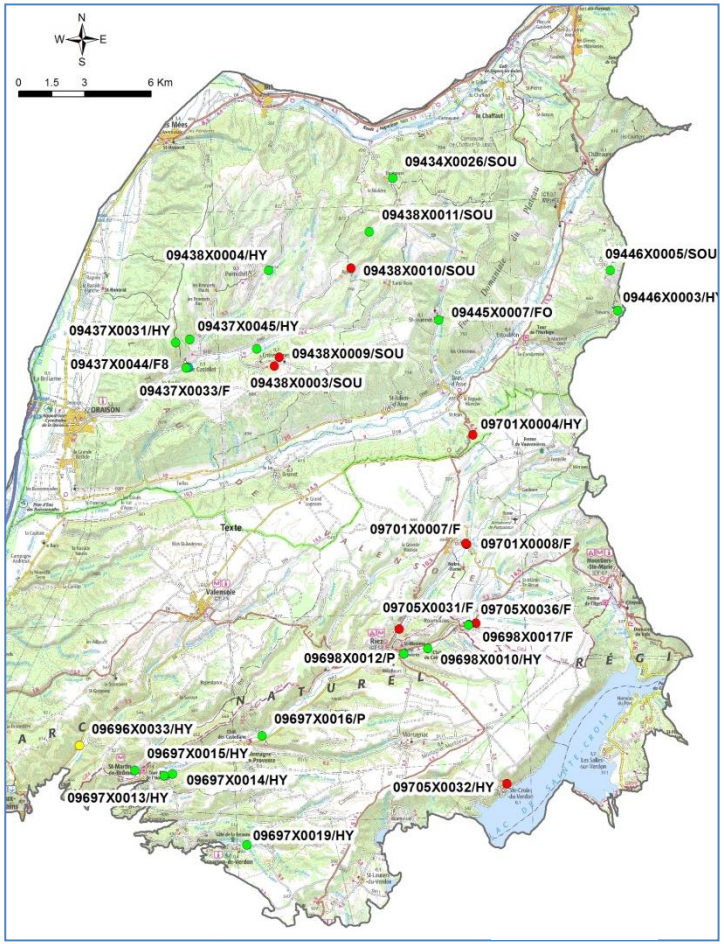
Represents nearly 80% of global cultivation of lavender

Real tourist attraction

Water uses

Small aquifers are used by producing principally drinking water

But about a third of the drinking water wells have been shut down since 2006



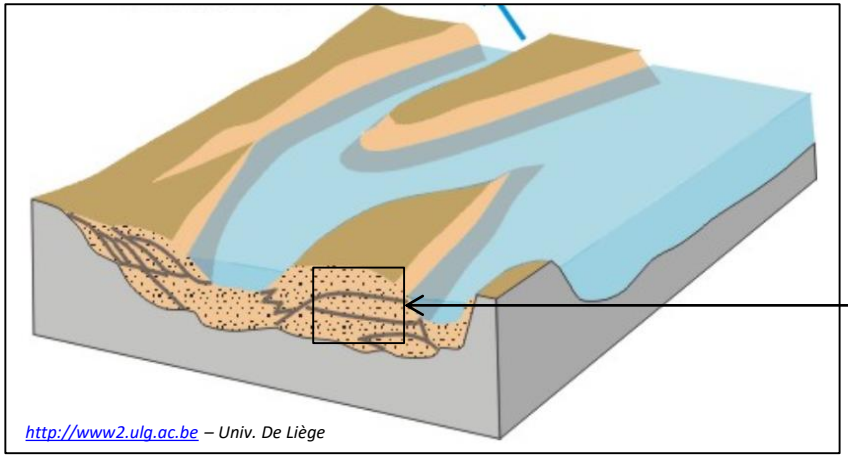
Due to a large contamination of groundwater by BAM a metabolite of 2 substances previously used in lavender production

- Operated catchment
- Abandoned catchment

State catchments in May 2015 (from regional health Agency)

Context of the Valensole plateau

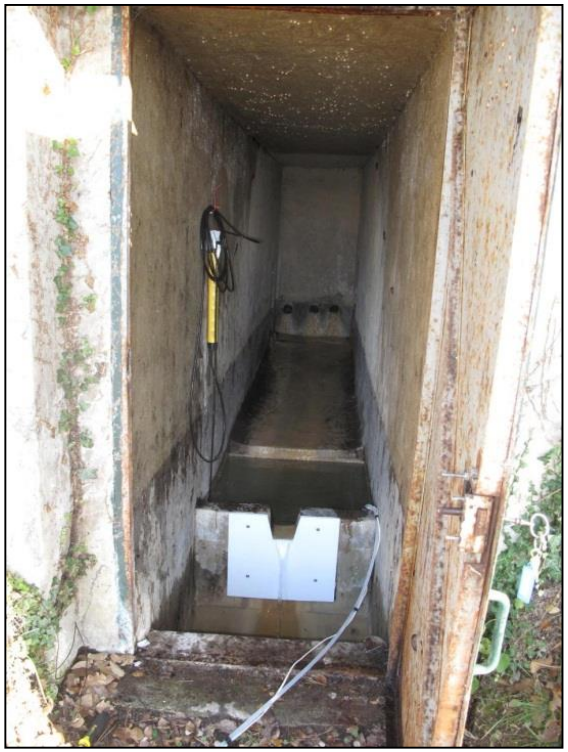
Diagram of a fluvial system braided channels



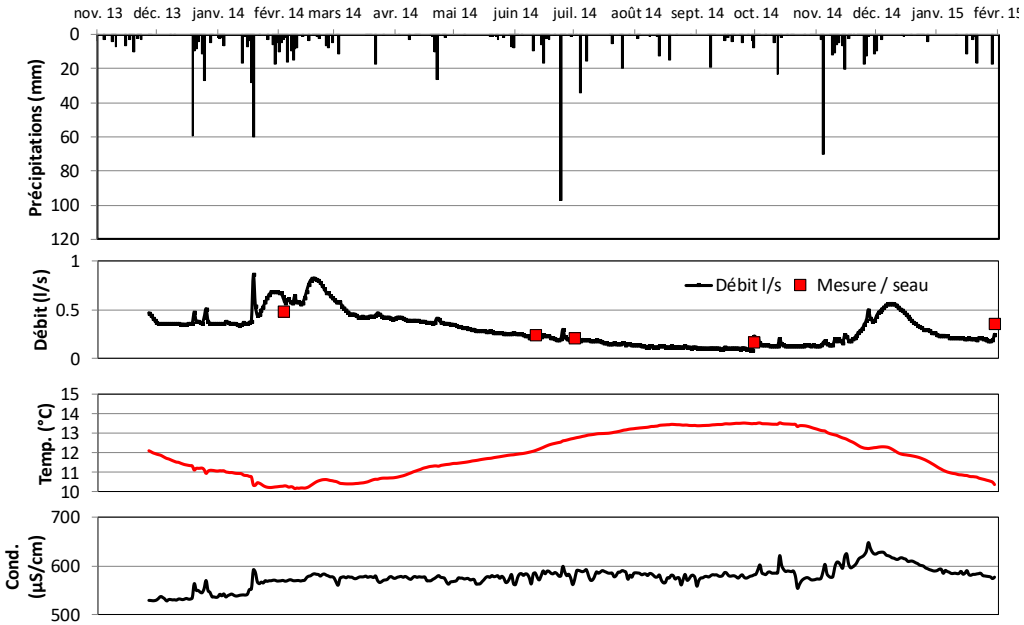
Aquifer compartments
Deep drainage by large valleys devices that define the base level

Saturated conglomeratic formations below the base level - limited quantitative interest (low productivity, greater depth, heterogeneous permeability) compared to alluvial systems

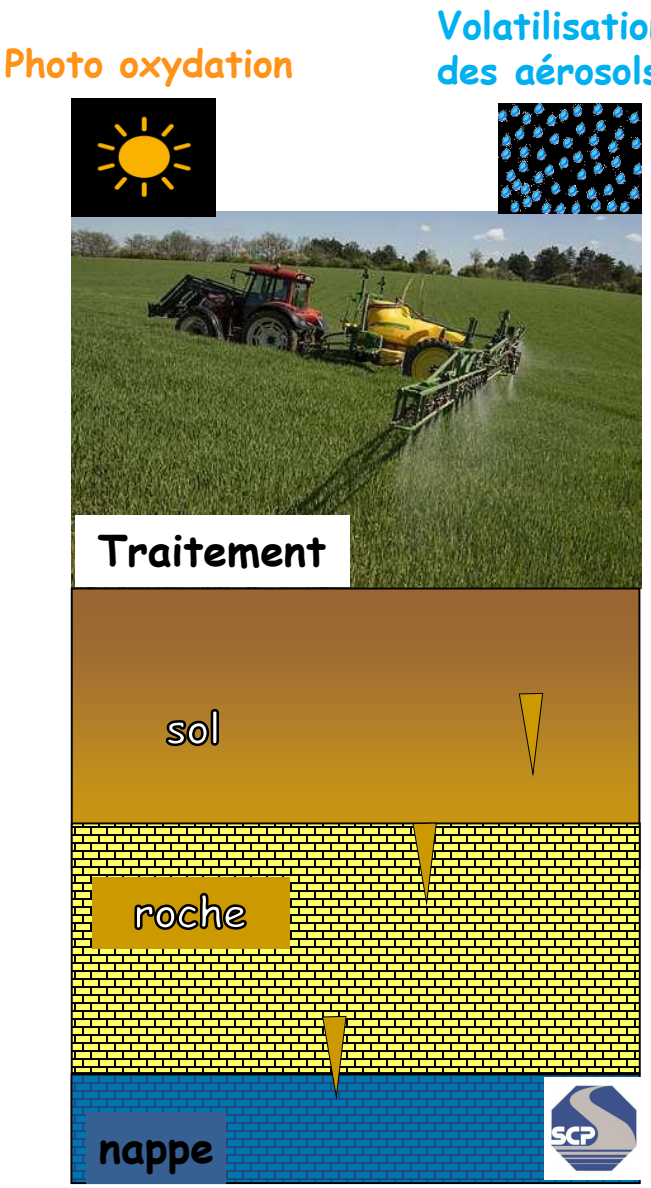
Knowledge of the water resource – monitoring



- Continuous hydrodynamic and physicochemical monitoring network for 9 priority wells and springs
- Groundwater dating campaigns using CFC/SF6 on 10 selected points
- Spatial analysis of groundwater chemistry, pesticides and some metabolites content on 70 wells and springs in June 2014



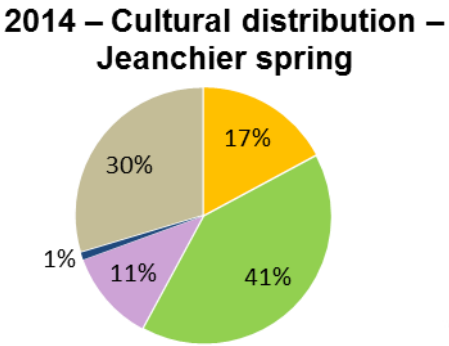
Knowledge of the pollution pressure – method



- Investigations conducted with farmers/agricultural cooperative/Chambre of Agriculture to trace history of agricultural practices
- GIS analysis and aerial photographs

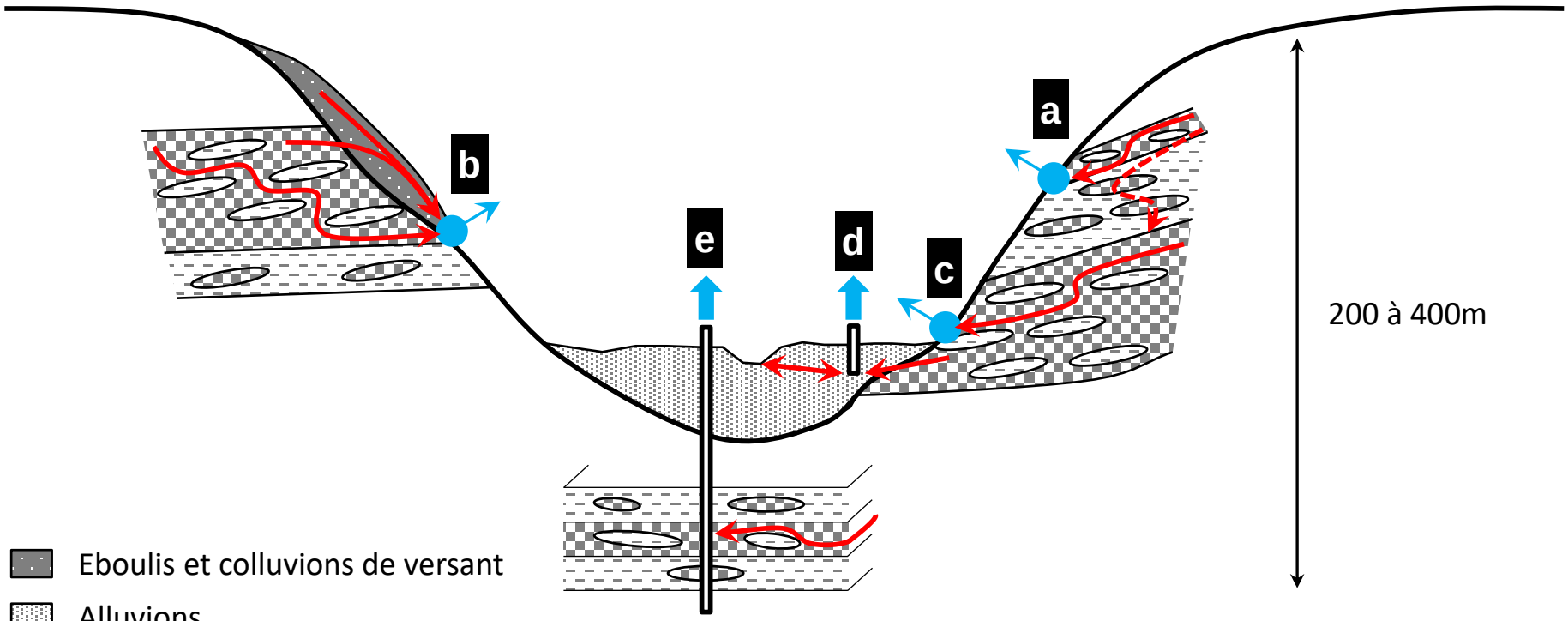
=> complicated to trace history

- Identification of products and molecules in use on the plateau



Knowledge of the water resource – results

Hydrogeological conceptual model of the aquifer

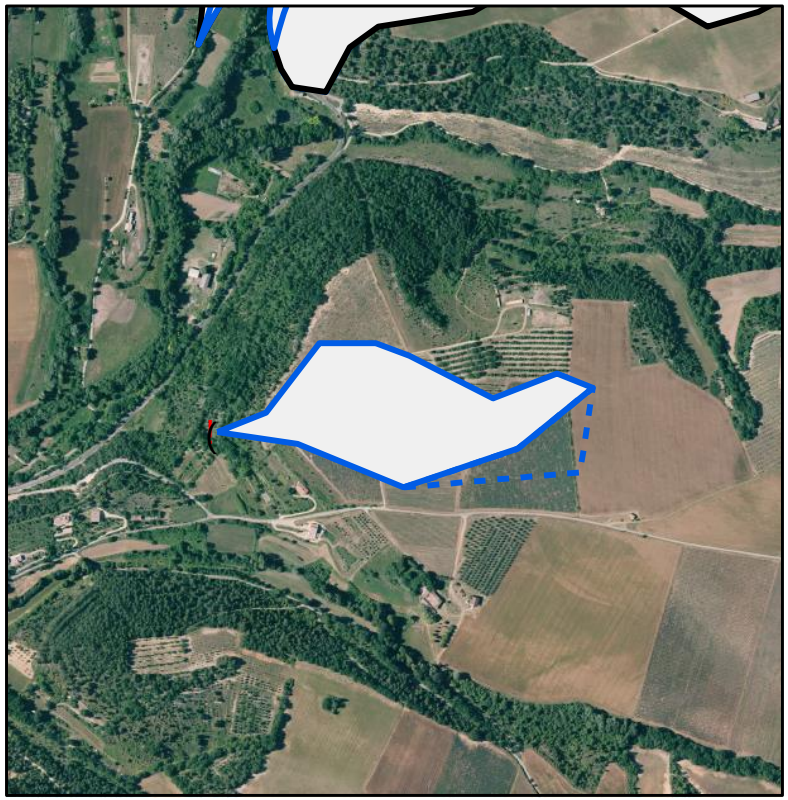


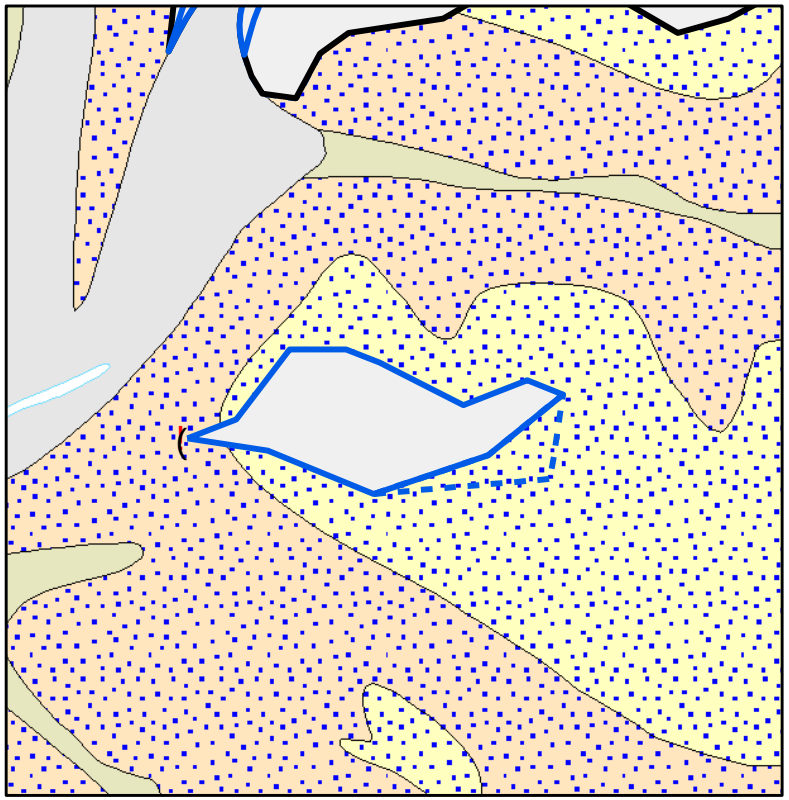
- Eboulis et colluvions de versant
- Alluvions
- Séquence perméable de conglomérats avec lentilles argilo-gréseuse moins perméables
- Séquence peu perméable avec lentilles localement plus graveleuses
- Exemple de chemin emprunté par l'eau
- Source
- Forage

Knowledge of the water resource – results

Impluvium of the priority drinking groundwater well delineated

Vulnerability map established based on infiltration hazard (pedology parameters)





Légende

Impluvium / transfert par infiltration / tracé fiable

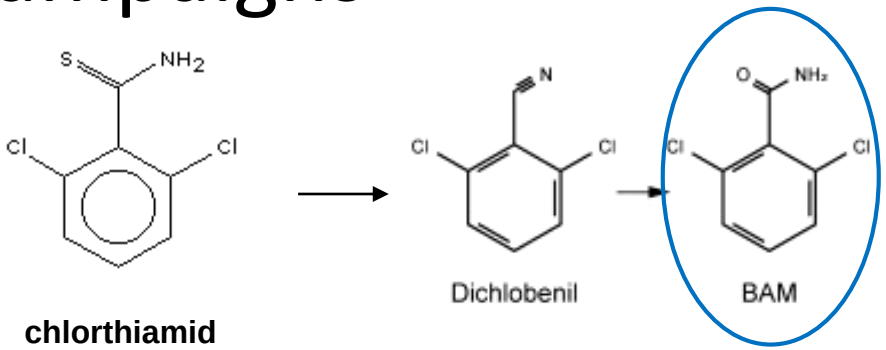
Impluvium / transfert par infiltration / tracé incertain

Impluvium / transfert par ruissellement

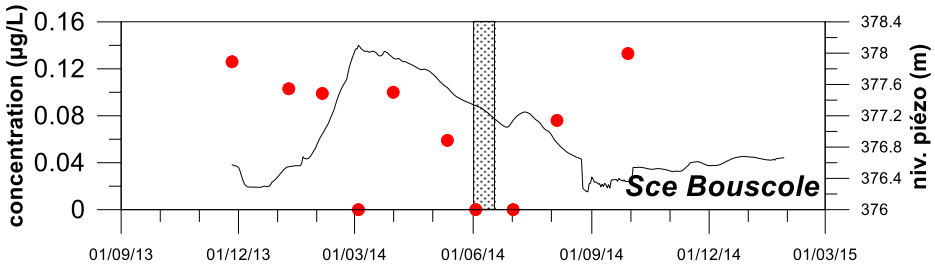
0 0.25 0.5 1 Kilomètres

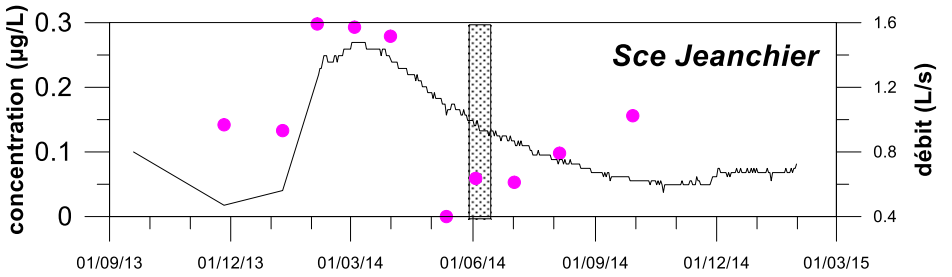
Knowledge of the water resource – results of analysis campaigns

- Same molecules found through spatial observation and quarterly/monthly campaigns and other still authorized (less than 10 molecules among 50 molecules searched)



- Active substances and metabolites have been found. Some of them related to products that are now prohibited from sale (Bromacil, deethylatrazine, BAM) an others still authorized (Isoproturon, Fluzifop-p-butil = molecule which are not monitored by sanitary network)





- There is still a large groundwater contamination by BAM but concentration are lower than 1µg/L

Conclusion : many pending questions about the behavior of pesticides ...

Contamination linked to the history, is it possible to assess the time at which BAM contamination will be over?

=> Time evolution of concentration closely related to recharge events
=> What is the stock of parent molecule in the soil?
=> How is this stock re-mobilized?

Other molecules to monitor

=> Which monitoring strategy? (frequency, hydrological conditions, etc)
=> analytical threshold is exceeded : exceptional or recurrent situation?

Conclusion : example of actions at the catchment scale

Decrease the use of insecticides

Technological innovations

Control spreading

Property master