Groundwater-surface water interaction and related groundwater dependant ecosystems : case study of the Natura 2000 wetlands of the Crau plain (SE France)

Abstract n° 1977

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Introduction

The **European Water Framework** (2000/60/EC) aims for groundwater good status and their dependant ecosystems. The present study shows several equipment to set up into **Natura 2000 wetlands** in order to define ecosystems dependence (quantitative and qualitative) to groundwater and surface water. It is, specifically, the **first diagnosis about groundwater resurgences of the Crau aquifer named "lauron"**.

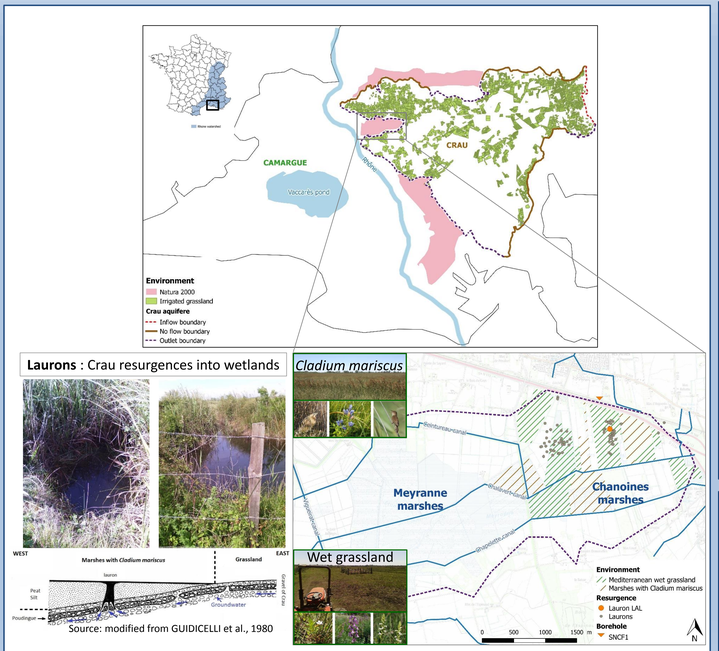

Figure 1: Site map, Crau resurgences localisation and cross-section

Marshes with ***Cladium mariscus*** and **wet grassland** belong to Natura 2000. They shelter rare and protected species and represent habitats for several birds. It maintains biodiversity into wetlands.

Hydrodynamic feature

Water levels (piezometers and laurons) and canal flow rates were monitored from March to July 2016.

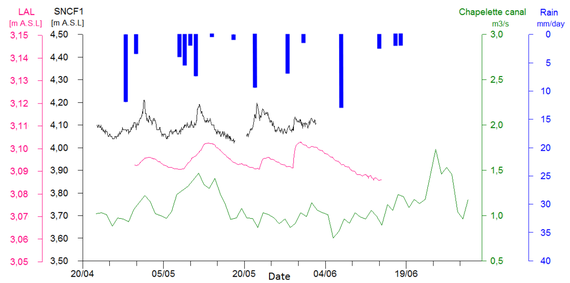

Figure 2: Water level variation into lauron (LAL), piezometer (SNCF1) and flow variation into canal (Chapelette canal)

Piezometric map of groundwater into marshes shows a global direction flow: East to West.
The **water level is between 15 and 70 cm** below soil surface = favourable for protected ecosystems.

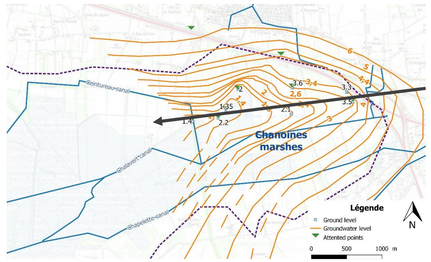

Figure 3: Piezometric map into Chanoines marshes

Hydro and geochemical survey

Hydrodrochemistry shows that:
-Groundwater and surface water are **Ca-HCO_3**.
-**H_4SiO_4** could be defined as a natural tracer of groundwater.
-Whereas **K+** is the natural tracer of surface water.

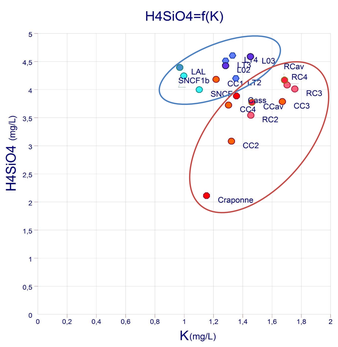

Figure 4: H_4SiO_4 vs K^+

Geochemical tracer:
Radon (^{222}Rn) has been used to determine groundwater discharge and to evaluate water balance into wetlands. Results show a groundwater discharge into Chalavert canal about **0,06 to 0,13** m^3/s (if we consider a constant flux of ^{222}Rn into the canal).

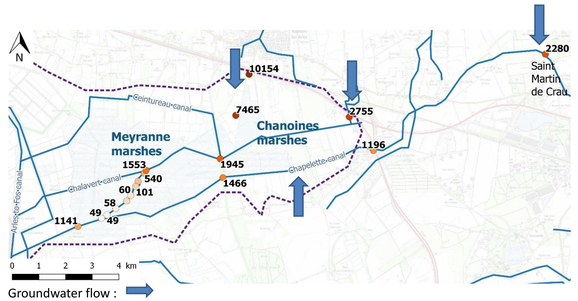

Figure 5: Map results of ^{222}Rn (Bq/m^3)

Outputs

Wetlands are supplied by two connected aquifers:
- **Permeable aquifer**: Pleistocene gravel of Crau
- **Semi-permeable aquifer**: Holocene peat

Connection between groundwater and ecosystems:
- **Canal** which is going into marshes is **partly filled by groundwater**
- Hydrology of **laurons presents a steady state** during summer thanks to hydrogeological conditions
- Low **water table depth allows the conservation** of Natura 2000 species

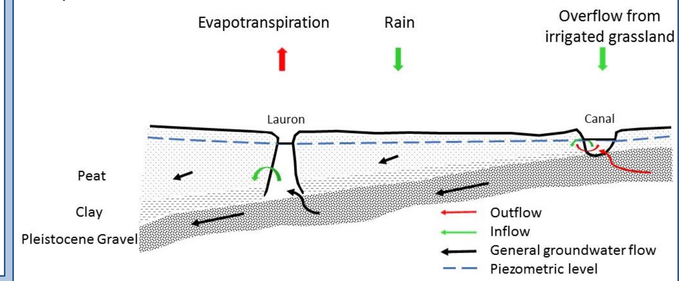

Figure 6: Conceptual scheme showing the functioning of laurons

Conclusions and prospects

Wetlands maintenance is complex to grasp because of many interaction between groundwater and surface water. This 5 months study showed a steady state of water level during summer into marshes. Geochemical tracer highlighted the interaction between surface water and groundwater.
Monitoring should continue on 1 hydrologic complete year. This could help to define water level (min/max) favourable and unfavourable to maintain wetlands along the Crau territory.

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References:
GUIDICELLI et al, 1980, *Un biotope hydrobiologique remarquable : les laurons de la Crau (Bouches-du-Rhône, France). La communauté animale et ses relations avec le peuplement des biotopes aquatiques voisins*, 27p

Additional details are available in **Ros L**, 2016, *Interactions eaux souterraines - eaux de surfaces des milieux humides naturels : Etude des résurgences de la nappe de la Crau sur le site Natura 2000 des «trois marais»*, Mémoire de Master 1, 51p