



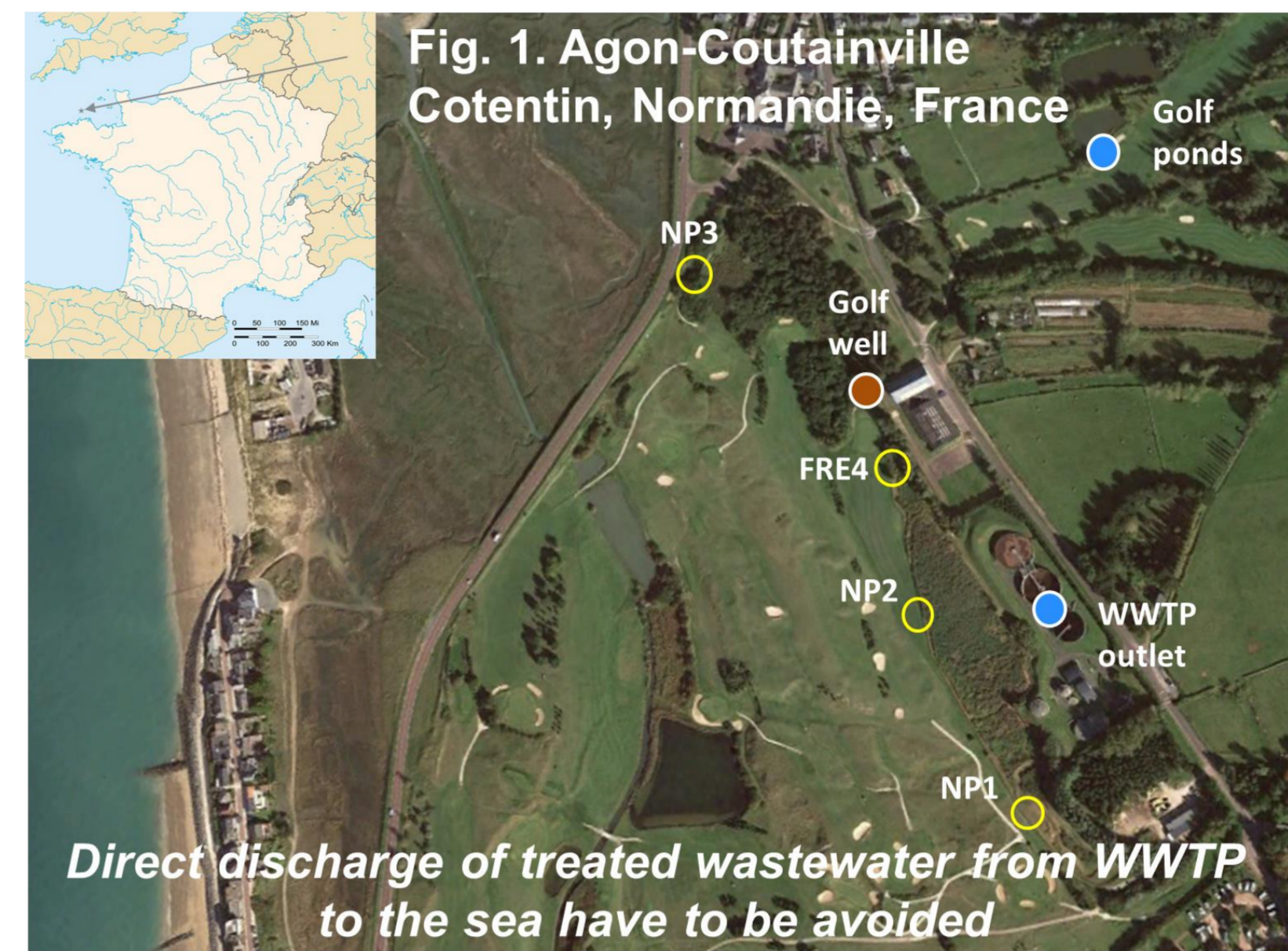
# Advanced monitoring for optimised MAR/SAT system design & operation, Agon-Coutainville site

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Challenge: health safety issues in coastal area

Scope of the AquaNES actions on Agon:

- Most important area of shellfish farming in France (21% of french production)
- Agon-Coutainville is one of the older seaside resort of the Manche department
- Strengthen context:
  - Important seasonal variation of population
  - Financial and environmental regulations constraints (french Coastal acts) to take into account
  - Ambitious water quality targets in a superficial hydraulic area with low capacity for water supply



- Complete monitoring for a better understanding of the SAT efficiency
- Consider the natural environment in cNES efficiency (time and space)
- Enhance for Golf irrigation the quantity of freshwater and its quality

## Demonstrate innovative monitoring to foster full scale implementation and operation of cNES

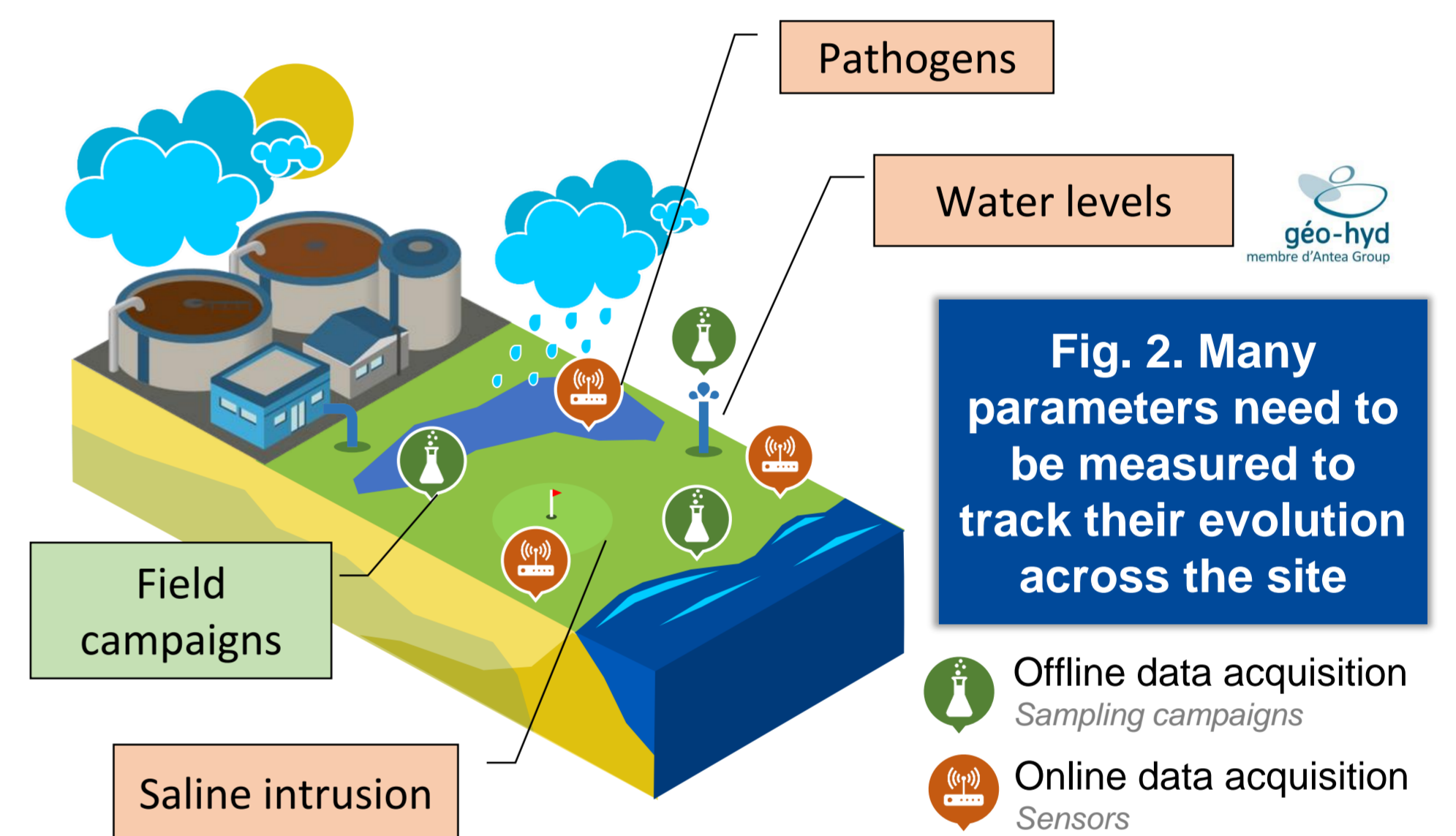
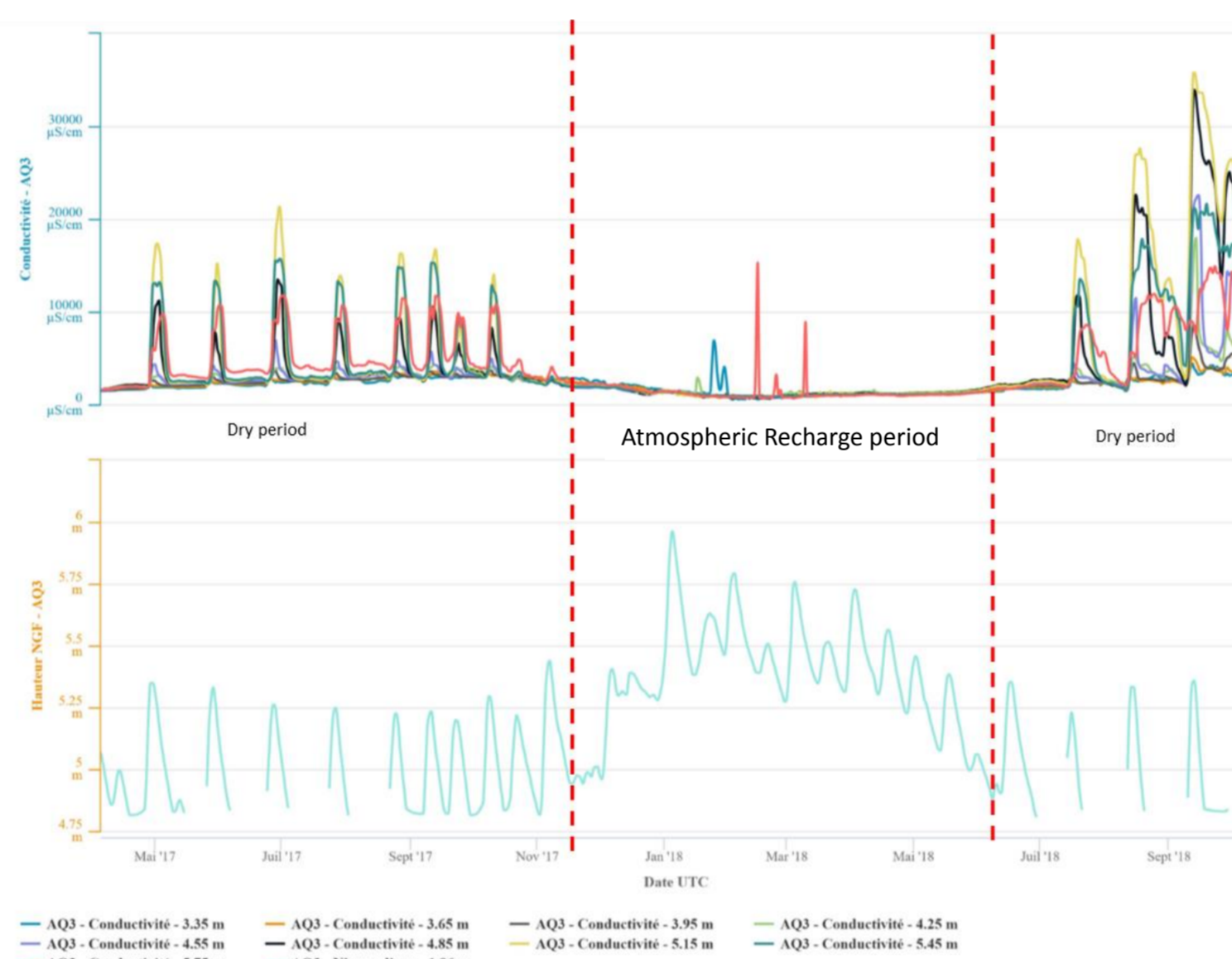
The Site 8 of Agon-Countainville (Fig. 1) uses secondary effluent after reed bed and sand dune filtration for golf course irrigation in a coastal area. The underlying aquifer is prone to salinization. The study of Agon-Coutainville site will demonstrate how innovative water quality monitoring and modelling linked to data management and communication, facilitates an optimised management of cNES sites and their future implementation (Fig. 2).

### Real time monitoring

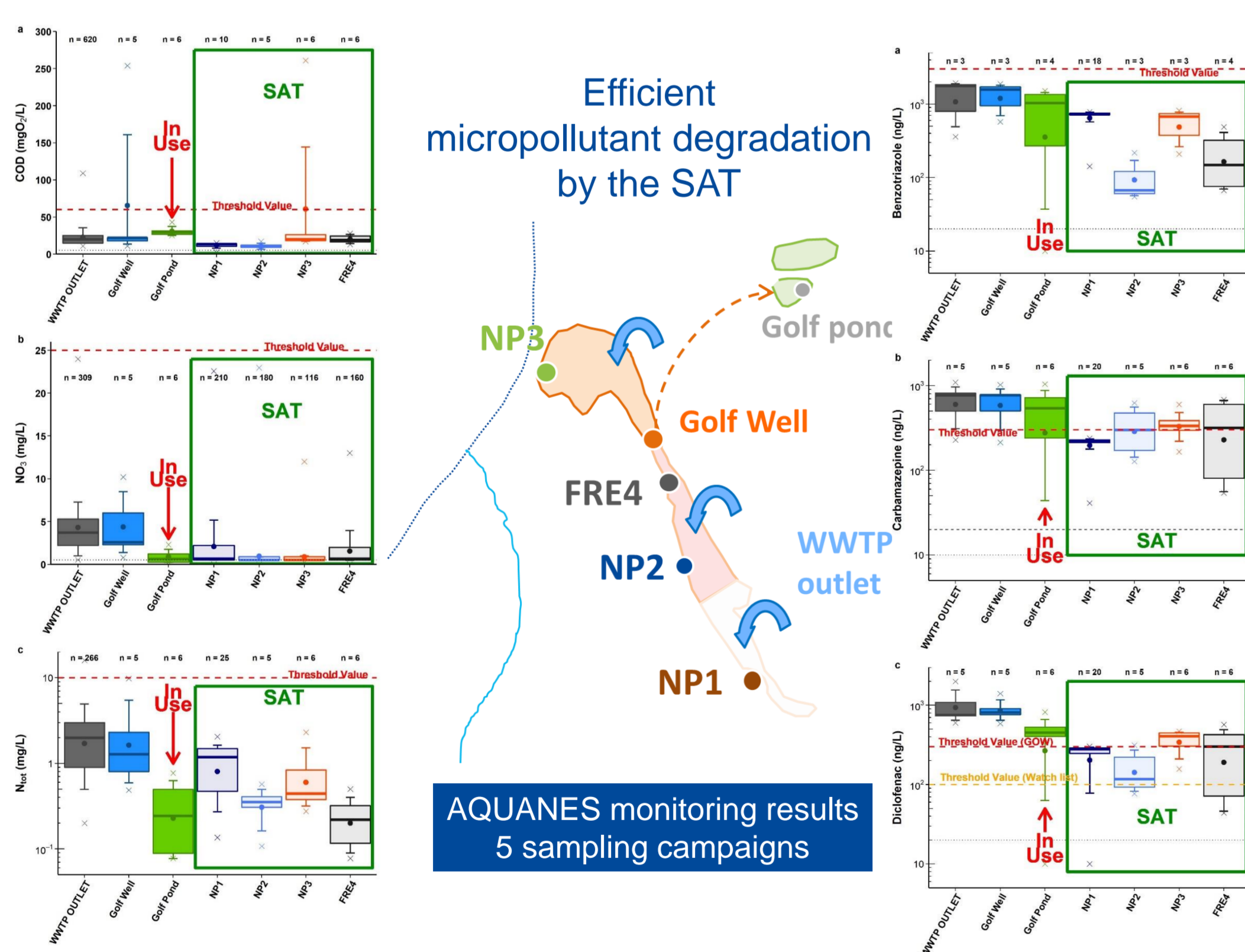
#### Monitoring Saline Intrusion



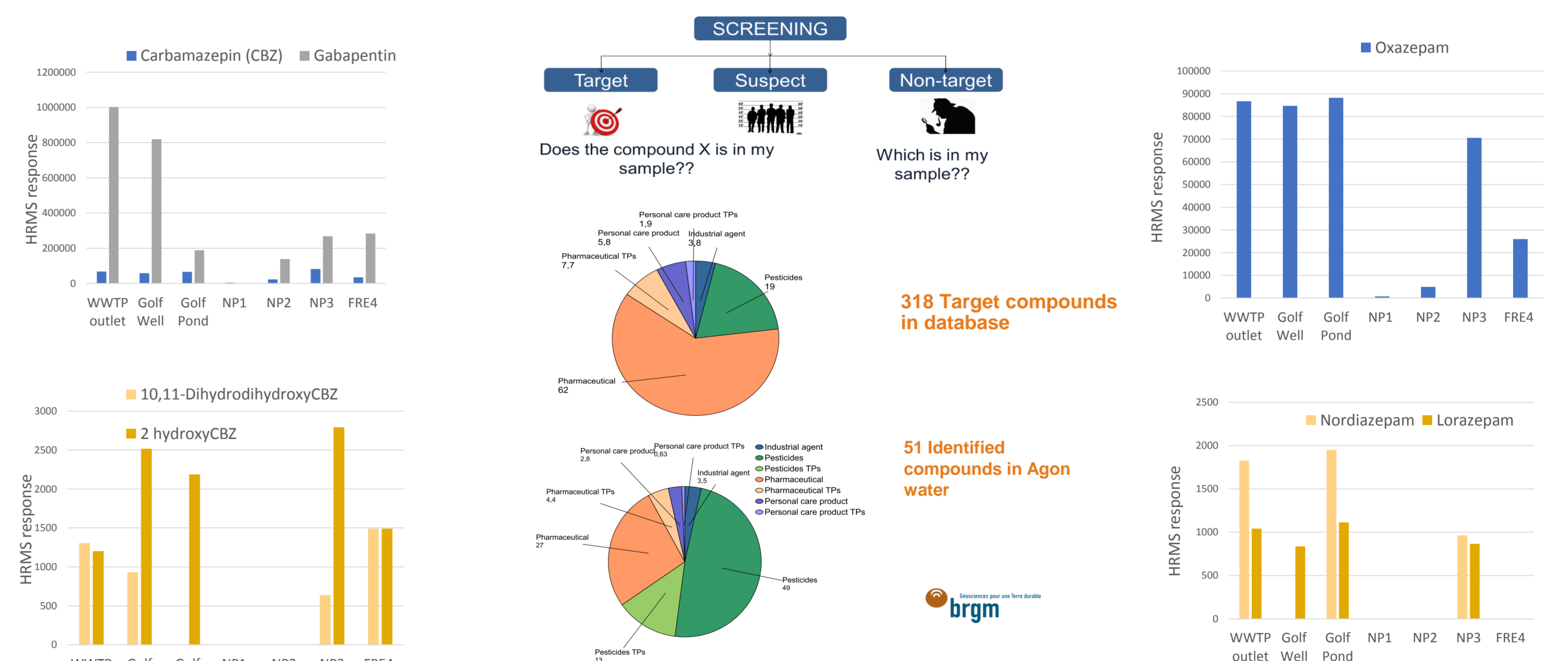
- SMD remote controlled**
- Change data acquisition frequency
  - Modify acquisition pattern (wenner, dipole/dipole...)
  - Remote diagnostic (including and other sensors, batteries charge ...)
- Desktop interface**
- Online access to all data
  - Graphic interface
  - Download data in all type of format
  - Set alert thresholds



### Monitoring Micropollutants



#### Analysis results of the 3rd campaign (September 2017), High Resolution Mass Spectrometry (HRMS) analysis

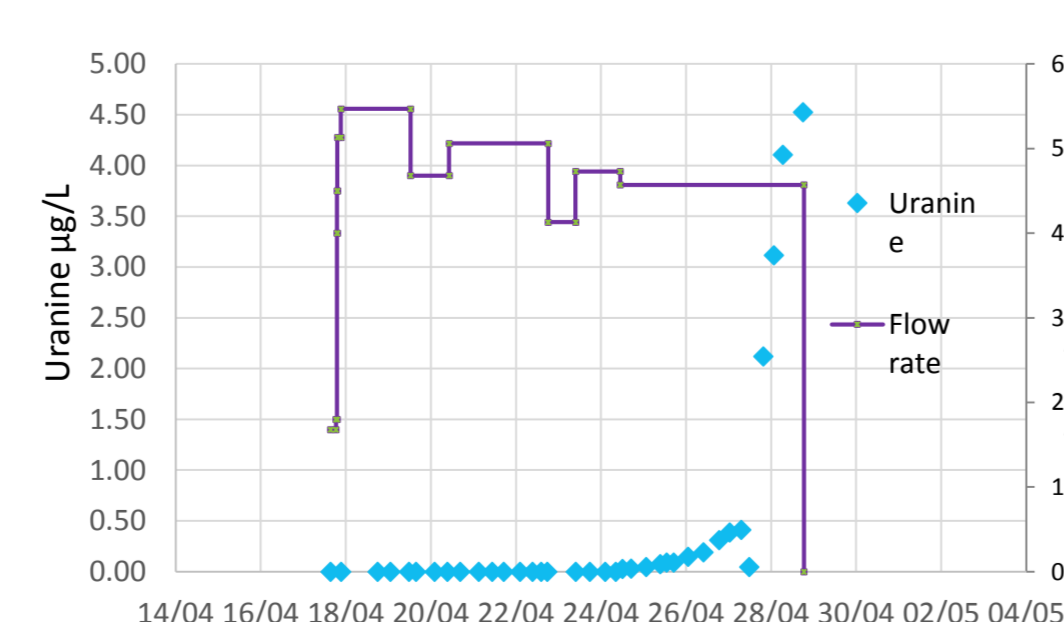


Bi-annual sampling campaigns, performed at the MAR site scale between fall 2016 and fall 2018, support the efficiency of the WWTP with respect to the regulated concentrations of key chemical parameters by the French water reuse standards (e.g. C.O.D., NO<sub>3</sub>, Ntot). The quantitative monitoring of micropollutants, mostly discharged from the WWTP, generally display higher (median) concentrations in the groundwater currently used for the irrigational needs of the Golf course, exceeding the recommended environmental quality standards (EQS: GOW, Watch list) for carbamazepine and diclofenac. The SAT, combined to the natural recharge, significantly reduce the micropollutant concentrations, which overall reach the recommended threshold values defined by the EQS.

### Hydraulic tracer Test



SAT mean residence time is around two weeks that allows SAT reactivity and thus increases quality of the pumped groundwater.



### Conclusion

Results show that the MAR system provides a freshwater barrier in the aquifer which is seasonally affected by saline intrusion. A part of the aquifer is assessed for freshwater potential production, regardless of the natural and anthropogenic recharge, which also provides key information with respect to the evolution of the groundwater quality. This novel subsurface monitoring provides a better understanding of the SAT capacity to enhance the quantity of freshwater and improve its quality.

