Transdisciplinary characterisation of a complex coastal aquifer, for a sustainable exploitation of its groundwater resources in a Mediterranean context. The DEM'EAUX ROUSSILLON project

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More than 80 million m3 per year are pumped into the Roussillon plain coastal aquifer, covering 850 km² and located between the Pyrenean massif to the west and the Mediterranean Sea to the east, south of France. This is a multilayer aquifer of more than 350 m thick, made up of sandy layers embedded in low-permeability clayey material from the Pliocene and topped by alluvial formations from the Quaternary. Its groundwater resource is primarily used for the supply of drinking water, but also contributes to the irrigation of some 13,000 hectares.

For more than 40 years, this aquifer has been undergoing a general decline in its piezometric level due to pumping and water demand is expected to increase (growing irrigation areas and climatic demand). Moreover, given its flat topography, the Roussillon plain is likely to suffer sea water intrusions and marine submersion, due to the sea level rise, which could reach 1 m by 2100.

This context shaped the Dem'Eaux Roussillon project, which brought together nearly ten partners from the Occitanie region (research units, consultancies and local authorities). Its objective was to characterise the behaviour of the groundwater resource in this aquifer, in order to be able to project its future situation, in the context of climate change, rising sea levels (risk of saline intrusion) and changes in water use. A detailed characterisation of the geological reservoir highlighted the need to consider the offshore extension of this coastal aquifer. The analysis of the piezometric evolution at the scale of the Roussillon plain over the last 50 years allowed the spatialized characterization of the hydrodynamic parameters and the understanding of the vertical drainage processes that control the hydraulic equilibrium between the Quaternary and the Pliocene water tables. Two high-resolution hydro-geophysical observatories have been set up to quantify these processes and improve understanding of saline intrusions processes. Finally, a conceptual model presenting the main features of the main processes controlling the groundwater evolution and the sea water intrusion risk was obtained ready to launch a numerical modelling work.