Untangling past and present water and salinity flows in coastal wetlands (Marquenterre area, Northern France)

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The coastal plain of the Marquenterre is located between the Somme bay and the Authie River in Picardie (North of France). The entire coastline and its wetlands are designated as Wetland of International Importance in the international Ramsar Convention on the conservation of wetlands and their resources. The principal aquifer system bordering the English Channel is the Chalk which was uncovered over a wide area of the English Channel region during the Late Pleistocene. The flat landscapes have allowed a record of the marine transgression with marine sedimentation (Ters et al., 1980). The recent industrialization of agriculture threatens the wetlands and their associated flora and fauna by increasing water demand and the induced inflow of saline water. To trace groundwater recharge, the origin of salinisation and interactions between wetlands and groundwaters, a multi-isotope approach ($^{87}Sr/^{86}Sr$, $\delta^{11}B$, $\delta^{18}O$, $\delta^{2}H$) was used, completed with datation (CFC-SF6 and ^{14}C). It was combined to a hydrogeological approach to better evaluate the hydrodynamics of the aquifers system. No present-day seawater intrusion has been detected and the chalk groundwater presents an old component indicating that salinisation is inherited from the period of high sea levels post 14 ky BP. By introducing large amounts of sulphates, the marine infiltration in groundwaters has also deeply modified the past redox equilibria in the fresh Chalk aquifer. The geological structure and climate change dynamics constrain the present-day water chemistry. Apprehending the whole system by taking into account dynamics at multiple scales (space and time) is the key to a better understanding of the critical zone in complex coastal environments.