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ABSTRACT

I have built this dissertation around questions about the interactions between groundwater and its environment, which have guided my research to date and which I intend to pursue in greater depth in the coming years. I first discuss the reactivity of aquifer systems in response to the stimuli they receive, focusing on the key concept of their characteristic timescale, and then consider the challenges of estimating it from local to global scales. To accurately describe the behaviour of aquifer systems in an ever-changing environment, a thorough understanding of the processes by which they interact with other compartments of the water cycle is also required. In a second step, I examine the studies that I have conducted and supervised from this perspective: whether it is to understand recharge mechanisms in semi-arid areas, the connection/disconnection between aquifer and river, especially in the presence of permafrost, or the relationships between the various entities that make up wetlands in environments where the water table is close to the surface. Finally, I illustrate these representations with characteristic case studies on which I have worked, using original approaches combining modelling and in situ measurements. These case studies illustrate the diversity expressed both in the research I have undertaken and in the responses of aquifer systems to anthropogenic pressures and climate variability. The work perspectives presented here are set in the same context of future global change.