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# Are large-scale aquifers systems in equilibrium with their environmental conditions? A modelling approach on the example of the Paris basin

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A classical assumption in hydrogeological studies of flow and transport in large sedimentary basins is that, prior to their exploitation, these systems were in steady-state, this hypothesis being used to prescribe initial head distribution in the aquifers and aquitards. However the recent evolution of such systems depends upon a wide range of natural processes, primarily driven by climate change and geodynamic processes. We show, on the example of the Paris basin, that in the past many changes occurred in the recharge due to climate oscillations, and in boundary conditions because of sea-level variations, general uplift, river incision, etc. We tried to determine if the system could keep the memory of these past changes and to estimate how far back we should take them into account. To this end, we have developed a three-dimensional transient modelling of the Paris basin groundwater system. Changes in the forcings of the model with time have been reconstructed over the last million years. By trying to quantify their effects at the basin scale, we show that, for the aquitards and deeper aquifers, the present situation is far from a steady-state. Sensitivity analysis shows the important causes of the persistence of transient effects.