QUANTIFICATION OF CLIMATIC AND MORPHOLOGICAL IMPACTS ON THE HYDROGEOLOGICAL PROCESSES IN THE PARIS BASIN DURING THE LAST FIVE MILLIONS YEARS.

A. Jost (1), S. Violette (1), J. Gonçalvès (1), E. Ledoux (2), M. Kageyama (3), G. Ramstein (3), S. Fauquette (4), J.-P. Suc (5), Y. Guyomard (6) and F. Guillocheau (6)

(1) UMR CNRS 7619 Sisyphe, Université Pierre et Marie Curie (Anne.Jost@ccr.jussieu.fr), (2) UMR CNRS 7619 Sisyphe, CIG, ENSMP, (3) LSCE, UMR CEA-CNRS 1572, (4) Institut des Sciences de l'Evolution, UMR CNRS 5554, Université de Montpellier 2, (5) Laboratoire PaléoEnvironnements et PaléobioSphère, UMR CNRS 5125, Université Claude Bernard Lyon 1, (6) Géosciences Rennes, UMR CNRS 6118, Université de Rennes 1

In the framework of safe underground storage of radioactive waste in low permeability layers, it is essential to evaluate the mobility of deep groundwaters over timescales of several million years. Given this timeframe, climatic and geomorphological changes are considered to be among the primary drivers of environmental evolution. Indeed natural geochemical tracers archived in the Paris basin groundwater system suggest that these changes may have played a predominant role in the recent evolution of this complex multi-layered aquifer system. The cyclic alternation of glacial and interglacial intervals characteristic of the Plio-Pleistocene climate, combined to geomorphological processes, has altered recharge rates and outlet conditions, and hence, groundwater dynamics.

It is therefore relevant to determine the implications for climate changes together with geodynamic processes on groundwater systems. Here we investigate the response of the Paris basin aquifer system to variations in hydrodynamic boundary conditions during the last five million years, trying to determine how long the transient system could keep the memory of these past changes.

For this purpose, a 3D modelling of the Paris basin groundwater system has been developed using the code NEWSAM (ENSMP). Geomorphological evolution is deduced from digital elevation model analysis, which allows to reconstruct the palaeotopography and measure river-valley incision. Climate forcing results from a suite of interpolated palaeoclimate modelling experiments using the LMDz atmospheric general circulation model (IPSL) with a refined spatial resolution centered on Paris, for the present, the Last Glacial Maximum (21 kyr BP) and the Middle Pliocene (3 Ma). We present the simulated evolution of the transfers in the aquifer system in response to the altered boundary conditions induced by atmospheric and geomorphological forcing.