Impact of groundwater extraction on the subsurface thermal regime

Maria Klepikova*[1], Victor Bense , Olivier Bour , Nicolas Guiheneuf , and Tanguy Le Borgne

[1]Univ Rennes, CNRS, Géosciences Rennes – CNRS : UMR6118 – France

Résumé

Being the world's largest freshwater resource, groundwater is under simultaneous threat from increasing human water consumption. Beside substantial drops in groundwater levels that modify the recharge/discharge relationships between large-scale hydrogeological units, this hydraulic forcing is also responsible for changes in thermal regimes within the critical zone. While the impact of global groundwater pumping on the hydrogeological cycle has long been demonstrated, we still have insufficient knowledge on the influence of human activities on groundwater temperatures and, as a consequence, on stream thermal regimes. In this contribution we discuss temperature anomalies that develop in the shallow subsurface as a result of localized groundwater extraction. We study different hydrogeological settings, i.e., porous and fractured aquifers, that we explore via numerical modelling and comparison with field observations. In the field, we use repeated temperature-depth borehole profiles separated by decades, the advantage of which is that differencing the temperature logs for individual boreholes yields real temperature change and eliminates steady-state sources of curvature. Thus, it enables us to detect changes in subsurface thermal regimes, resulting from transient conditions, i.e., climate change and changes in groundwater hydrodynamics.

Mots-Clés: groundwatr temperature, groundwater abstraction

*Intervenant