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Impact of sinkholes management on the turbidity of drinking water

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Karst hydrosystems are well known for their vulnerability to contamination due to their complex and unique characteristics which make them very different from other aquifers: high heterogeneity created and structured by groundwater flow i.e. large voids, high flow velocities, high flow rate springs and most of all, a strong connection with surface watersheds. Karst systems can be affected by either rapid, delayed or slow infiltration processes through surficial formations, swallow holes or epikarst, and on the other hand by rapid horizontal flows. So, karst spring water represents variable mixtures of groundwater and surface water, which define notably turbidity. Turbidity can come from direct transfer, resuspension of intrakarstic sediments or deposition of suspended matter.

To protect drinking water resources, sinkholes management, like storage basin, filter tank, scraping and sizing of sinkholes, have been developed to reduce turbidity at karstic outputs. They require many karst investigations and environmental studies. Many watershed plannings are realized to reduce turbidity of surface water introduced to karst system. But, have they a really impact on turbidity at the karst springs and wells who supply inhabitants on drinking water ? If yes, can you evaluate and quantify this impact ?

In this paper, time series analyses (spectral and wavelet analyses) were used to pluviometry and turbidity datasets of a karst well located near the city of Rouen in the western part of Paris Basin (France). These analyses were performed to two periods,

the first before sinkholes management then the second after these, in order to evaluate their impact on the turbidity of drinking water. Results present many differences between these two periods. But, they can result from the rainfall intensity variations and/or the sinkholes management. To remove the impact of rainfall intensity variations and only study the impact of sinkholes management, the signals of turbidity/rainfall intensity were analysed at the two periods. Results show that certain amplitudes of high frequencies were reduced in the second period due to the sinkholes management. But, some high frequencies are always present at the two periods. By comparison to the results of artificial tracer tests and the time transfer of these high frequencies, we can identify that they correspond to the sinkholes who have not been managed.