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Toward a thermometric method for assessment of fluviokarst properties: application to the Cent-Fonts resurgence (Hérault, France).

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In this work, we test the possibility of using thermometric and piezometric data for the assessment of hydrologic properties of fluviokarsts. The work relies on a classical conceptual model of karsts, whose open conduit system receives diffuse water infiltrations from a surrounding porous-fractured aquifer, direct allogenic stream intrusions from a far swallow zone and from a neighbor stream. Together with the surrounding porous-fractured rocks, this conduit system contributes to water feeding of a neighbor stream through a natural resurgence. However we will focus on the hydrological situation induced by aquifer pumping during low flow recession period. We propose that a thermometric mixing equation links the inflow and outflow discharges with the surface and underground water temperatures inside and outside of the karstic system. The application of the method to particular phases of pumping tests as: 1) pre-pumping period, 2) equilibrium pumping under severe drawdown conditions and, 3) long-duration high rate pumping, allows taking advantage of: 1) undisturbed conditions for baseflow assessment, 2) equilibrium between diffuse infiltration, allogenic intrusions, asymptotic answer of the aquifer to drawdown and pump extraction, and 3) aquifer answer to under increasing drawdown. We propose a first test of the method with thermometric, piezometric and flow discharges data sets recorded during a karstic aquifer pumping test campaign (Cent-Fonts resurgence, Hérault, France, 2005). The results allow finding again the main hydrological behaviors observed on field (spring drying, in-situ speleological observations, geochemical quantification of allogenic intrusions). The results of the paper suggest that this method could bring promising tools assessing baseflow, recession curves, allogenic intrusion discharges, and response of the porous-fractured part of the aquifer to drawdown.