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Contribution of piezometric measurement on knowledge and management of low water levels

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This article is based on a BRGM study on piezometric indicators, threshold values of discharges and groundwater levels for the assessment of potentially pumpable volumes of chalky watersheds. A method for estimating low water levels from groundwater levels is presented from three examples of chalk aquifer; the first one is located in Picardy and the two other in the Champagne Ardennes region. Piezometers with “annual” cycles, used in these examples, are supposed to be representative of the aquifer hydrodynamics. The analysis leads to relatively precise and satisfactory relationships between groundwater levels and observed discharges for this chalky context. These relationships may be useful for monitoring, validation, extension or reconstruction of the low water flow. On the one hand, they allow defining the piezometric levels corresponding to the different alert thresholds of river discharges. On the other hand, they clarify the distribution of low water flow from runoff or the draining of the aquifer. Finally, these correlations give an assessment of the minimum flow for the coming weeks using of the rate of draining of the aquifer. Nevertheless the use of these correlations does not allow to optimize the value of pumpable volumes because it seems to be difficult to integrate the amount of the effective rainfall that may occur during the draining period. In addition, these relationships cannot be exploited for multi-annual cycle systems. In these cases, the solution seems to lie on the realization of a rainfall-runoff-piezometric level model. Therefore, two possibilities are possible. The first one is to achieve each year, on a given date, a forecast for the days or months to come with various frequential distributions rainfalls. However, the forecast must be reiterated each year depending on climatic conditions. The principle of the second method is to simulate forecasts for different rainfall intensities and following different initial conditions. The results are presented in chart form. In addition, this last method is currently tested for the problem of floods by groundwater level rise.