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## **Assessing the safe yield of a karst aquifer by rainfall-discharge modelling.**

Groundwater flows and storage in karst aquifer are heterogeneous, deeply impacted by karst conduit network. Two main structures are usually used to describe flows: matrix and conduits. This conceptual view of the aquifer is useful to reduce the karst hydrodynamic functioning to few parameters that can be modelled. Another main property of karst is the drainage of the aquifer by springs, connected to the karst network. Groundwater outflow can then be described by two components: baseflow and quickflow. Quickflow is mainly occurring during floods. Baseflow is the sustainable flow, varying between seasonal low and high flow, and during floods. Quickflow discharging at springs during flood is a part of the water budget that is not stored in the aquifer and is then not available for water supply.

It results that groundwater availability at a spring, i.e. at the outlet of the aquifer, can be assessed by separating the quick and base flows. Studying a spring over years or decades gives insight the mean annual baseflow. We propose to define the safe yield that can be withdrawn from a karst aquifer close to the outlet as the mean inter-annual baseflow. For this purpose, lumped rainfall-discharge models are efficient tools to easily separate flow components from spring data.

The modular karst modelling tool *KarstMod* is used in this study. This is a free open tool, made by the French National Karst Observatory Service. We focus on the Dardennes springs case study (South-East France). This aquifer is already used for water supply; twenty years of data are available. This is a typical karst aquifer, with huge flash flood up to 30 m<sup>3</sup>/s in few hours, and a mean total discharge close to 0.7 m<sup>3</sup>/s. We show that the mean annual baseflow is quite constant over the years while the rainfall is highly variable.

Keywords : sustainable water budget, groundwater management, model, SNO Karst, hydrograph separation

KarstMod software : <https://hal.archives-ouvertes.fr/hal-02071006v1>