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► **To cite this version:**

Bruno Mougin, Jean-Michel Baltassat, Raymonde Blanchin, Francis Mathieu, Eric Putot, et al.. Calculation of groundwater response times in eleven Brittany catchments. G-DAT 2012 - Groundwater dating meeting - Rennes - France 15-19 October 2012, Oct 2012, Rennes, France. hal-01180216

HAL Id: hal-01180216

<https://brgm.hal.science/hal-01180216>

Submitted on 24 Jul 2015

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Calculation of groundwater response times in eleven Brittany catchments.

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Abstract

« SILURES Bretagne » is a scientific program (Information system for the Localization and the Use of groundwater resources), which aims to realize decision-making tools for a policy of management of the water (better consideration of groundwater, definition of priorities in the actions of restoration quality of Breton superficial waters). One of the stages of this project consisted in modelling the hydrograms of rivers to know the contribution that groundwater makes to the flows of Breton rivers and estimate the slowness of groundwater physical environment. By basing on the conceptual diagram of hard-rocks aquifer platforms (R. Wyns and al. 2004, B. Dewandel and al. 2006), 70 global modellings rains/river flow were realized in the step of daily time with the software BRGM Gardenia[®].

On 11 of 70 catchments studied (Elorn, Aulne, Yar, Horn, Coët-Dan, Dourduff, Maudouve, Noë sèche, Oust, Yvel and Nançon), the volumes of groundwater in the first 50 metres of basement were calculated. By modelling the thickness of the aquifer layers (regolith and fissured horizon) in the rocks that form the bed of a catchment, and the content of free water in rocks measure with Protonic Magnetic Resonance system, the volume of groundwater present in the zone can be estimated (R. Wyns and al. 2004).

Knowing the amount of groundwater flow exiting a river catchment, as well as the average speed a water droplet takes to reach the water table from the ground, (according to the bibliography, this speed varies between 1.75 and 2.5 m/yr.), response times of groundwater can be estimated (the time taken for a drop of water to seep from the ground to the water table and then from the water table to the river). These times are very varied (between 2 and 8 years), depends very much on the geology of the catchment and also on the amount of rainfall they have each experienced.

These times do not correspond to the amount of time taken for water quality to be recovered. This is for a mixture of reasons based around the ground, the water table, the regolith and the fissured horizon. However, these are minimum times and it is imperative to obtain tangible results on the quality of the water tables and consequently the water system, which can then be followed by action on the surface.

References

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