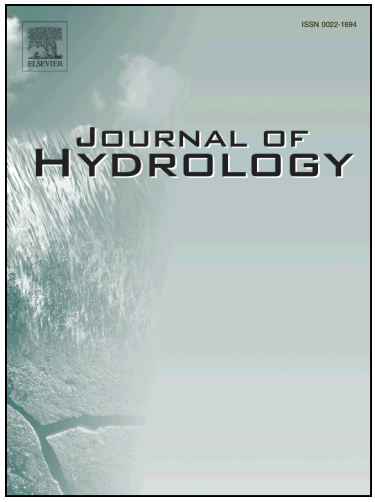

Research papers

Insights on pumping well interpretation from flow dimension analysis: the learnings of a multi-context field database

Anouck Ferroud, Romain Chesnaux, Silvain Rafini

PII: S0022-1694(17)30672-8
DOI: https://doi.org/10.1016/j.jhydrol.2017.10.008
Reference: HYDROL 22288

To appear in: *Journal of Hydrology*

Received Date: 23 December 2016
Revised Date: 26 September 2017
Accepted Date: 4 October 2017

Please cite this article as: Ferroud, A., Chesnaux, R., Rafini, S., Insights on pumping well interpretation from flow dimension analysis: the learnings of a multi-context field database, *Journal of Hydrology* (2017), doi: https://doi.org/10.1016/j.jhydrol.2017.10.008

Reference of the article: HYDROL 22288

Title: Insights on pumping well interpretation from flow dimension analysis: the learnings of a multi-context field database

All authors, their affiliations and complete contact:

First author (corresponding author): Anouck FERROUD ; MSc ; ***1**

Second author: Romain CHESNAUX ; PhD ; ***1**

Third author: Silvain RAFINI ; PhD ; ***1**

***1**: Research Group R2Eau, Centre d'études sur les ressources minérals, Université du Québec à Chicoutimi, 555 boulevard de l'Université, Chicoutimi, Québec, Canada G7H 2B1

Abstract:

The flow dimension parameter *n*, derived from the Generalized Radial Flow model, is a valuable tool to investigate the actual flow regimes that really occur during a pumping test rather than suppose them to be radial, as postulated by the Theis-derived models. A numerical approach has shown that, when the flow dimension is not radial, using the derivative analysis rather than the conventional Theis and Cooper-Jacob methods helps to estimate much more accurately the hydraulic conductivity of the aquifer. Although *n* has been analysed in numerous studies including field-based studies, there is a striking lack of knowledge about its occurrence in nature and how it may be related to the hydrogeological setting. This study provides an overview of the occurrence of *n* in natural aquifers located in various geological contexts including crystalline rock, carbonate rock and granular aquifers. A comprehensive database is compiled from governmental and industrial sources, based on 69 constant-rate pumping tests. By means of a sequential analysis approach, we systematically performed a flow dimension analysis in which straight segments on drawdown-log derivative time series are interpreted as successive, specific and independent flow regimes. To reduce the uncertainties inherent in the identification of *n* sequences, we used the proprietary SIREN code to execute a dual simultaneous fit on both the drawdown and the