

Response to Comments of Anonymous Referee #1

The authors thank the anonymous referee #1 for the valuable and insightful comments. Responses to the issues raised by the Reviewer #1 are provided below in red color:

This manuscript analyzed fractal scaling of groundwater dynamics in confined aquifers and presented important stochastic characteristics of the groundwater. This kind of stochastic analysis is very important to understand the hydrological processes of the groundwater and to improve generalized governing equations of groundwater flow processes. I strongly recommend the manuscript be published in the Journal to share the stochastic properties of the groundwater with the other readers for better understanding of groundwater flow processes in Hydrology. However, minor questions written in below should be considered to revise the manuscript before publication.

The authors thank the positive comments of the Reviewer #1.

1. Well1 and Well2

Why did the authors select these two wells? Please explain how you selected these two wells. Also, please explain the relationship and geophysical and hydrological characteristics of these two wells more clearly. For example, are these two wells located in the same river basin? What is the distance from Well1 to Well2? As such, more detailed explanation should be specified for these two wells. Table 1 presents some information but it is not enough for the readers.

Authors' response:

In this study, the authors tried to find some long-term and complete groundwater level observations from the groundwater datasets that can be accessed through the webpage of Water Data for Texas. The candidate wells are expected to have more than 50 years of continuous daily records with less than 5% of missing data. This is the initial incentive of selecting Well1 and Well2. As the reviewer suggested, further explanation and more details of the two wells will be included in the revised manuscript.

2. The number of wells selected in this study

Why did the authors focus only two wells? I believe there are many wells those provide long period of ground water data. As the authors mentioned, the results presented in the manuscript are site-specific. In that case, it would be much better to explain why only two wells were focused and analyzed in the manuscript.

Authors' response:

The reasons why the authors only focus on the two specific wells are: firstly, the groundwater level monitoring records of these two wells are long (70 and 80 years for Well1 and Well2 respectively). Long-term records can provide adequate data for fitting the probability density function. In addition, a larger sample of data can make the estimated Hurst exponent more stable (Weron, 2002). Secondly, we do agree with the reviewer that other long periods of groundwater datasets exist. For example, a dataset of groundwater monitoring in Texas, which was mentioned in the manuscript, includes more than 250 wells. Other long records can also be found in this dataset. However, comparing to the two wells selected in the study, these long records have large percentage of missing

data, which make them difficult to be analyzed. Thirdly, the authors found these two wells (Well1 and Well2) are very representative, i.e., one of them falls in the Brownian motion domain and the scaling pattern fluctuates in the investigated time intervals, while the other one illustrates the heavy-tailed characteristics and shows persistent scaling pattern. Focusing on the analysis of Well1 and Well2 can provide a more detailed picture of the groundwater level fluctuations. Therefore, Well1 and Well2 are chosen in specific to be analyzed in the manuscript. The manuscript will be revised to add the reasons mentioned above.

Reference

Weron, R.: Estimating long-range dependence: finite sample properties and confidence intervals, *Physica A: Statistical Mechanics and its Applications*, 312, 285-299, 2002.