

Anonymous Referee #1

I have reviewed this paper once before, and the authors have satisfactorily responded to and addressed the issues I mentioned, and I think the current version of the manuscript is greatly improved and worthy of publication in this journal. Compared with the current commonly used karst groundwater models, this QMG model has the advantage of relatively simple double-layer structures and parameters, making it possible to model with a smaller data requirement in karst areas. For instance, the MODFLOW-CFP needs more distribution data of the karst underground conduit system. This QMG model can be extended to more karst areas to verify its general applicability in karst flood simulation and prediction. The innovation of this paper is clear, i.e., it proposes a hydrological model- QMG model-V1.0 applicable to karst areas, and the optimization method of model parameters-the improved particle swarm algorithm (IPSO) offered a better flood simulation effects than those with the initial model parameters, indicating the applicability of this IPSO method. In addition, the theory research on hydrological model also applies to the scope of the GMD journal. All in all, I think this paper is suitable for publication in this journal, but some minor errors need to be fixed beforehand.

#### Response

We thank you for reviewing this paper again and for your recognition of the progress of the paper and suggestions for publication. In addition, your affirmation of the innovation of this research deeply appreciated. Below are our point-by-point responses to specific comments.

##### Specific comments

###### 1. Technical term

Some terminologies in the text may be inappropriate or non-standard that need to be corrected. For example, the flood ‘forecasting’ had better be replaced by ‘prediction’; “Excess water overflows” should be “excess infiltration runoff”; and “during floods” should be “during flooding”, etc.

#### Response

The terminology in the manuscript has been effectively modified. For instance, ‘forecasting’ has been replaced by ‘prediction’ (Lines 36, etc.); “excess water overflows” has been replaced

by “excess infiltration runoff” (Line 49); and “during floods” has been replaced by “during flooding” (Lines 50).

2. The specific location of the study area in China should be indicated in Figure 1, and more information on karst distribution and development should be added to the study area and data.

#### Response

The specific location of the study area in Chongqing, China, has been added to Fig. 1.

Some information on karst distribution and development has been added to the study area and data (Lines 147-159).

3. Methodology: “3.1 Hydrological model framework and algorithms” has better be replaced by “3.1 Hydrological model”; “4.1 Parameter Sensitivity Results” should be “4.1 Parameter sensitivity results”; “4.2 Parametric Optimization” should be “4.2 Parametric optimization”; and “4.3 Model Validation in Flood Simulations” should be “4.3 Model validation”.

#### Response

These headings have been modified accordingly (Lines 234, 542, 575, and 633).

4. Results and discussion should be written separately.

#### Response

Separate Results and Discussion sections have been written (Lines 541 and 662).

5. Conclusions: it is suggested to list the specific conclusions of this study one by one, so that readers can intuitively discover the main conclusions of this paper.

#### Response

The specific conclusions of this study have been listed (Lines 766, 775, and 782).

## Anonymous Referee #2

### (1) Language errors

Some English language errors, such as the wrong words and grammar in the text, making it a bit difficult to read and understand. It is suggested that the authors correct the language and writing problems carefully.

#### Response

The English language errors, including incorrect words and grammar, in the paper have been corrected, and a professional editing service (American Journal Experts) has addressed the language issues in the text.

### (2) Study area and data

“2.3 data” should be replaced by “Modeling Data”

#### Response

“2.3 data” has been replaced by “Modelling data” (Line 192).

(3) Lines 448: The sentence “The parametric prior distribution is calculated as” misses punctuation, should be “The parametric prior distribution is calculated as:”

#### Response

This punctuation has been modified in the revised version (Line 514).

(4) Lines 475: Usually the results and discussion of scientific papers are written separately, it is recommended that this manuscript is also separated.

#### Response

Separate Results and Discussion sections have been written (Lines 541 and 662).

Anonymous Referee #3

#### General comments

Review for -“A physically-based distributed karst hydrological model (QMG model-V1.0) for flood simulations” by Ji Li et.

It is well known that numerical simulation of karst groundwater is very difficult. Because of the complex karst basin subsurface conditions and spatially anisotropic karst water-bearing medias, it is a great challenge to quantitatively describe the transport and transformation patterns of karst groundwater. This study proposed a distributed hydrological model- QMG model for flood simulation and prediction in karst regions. This QMG model is a karst groundwater numerical model with potential application value, and the reasonable flood simulation results proved the accuracy and applicability of the model. The main innovation of this study is that a new karst model (QMG model-V1.0) is proposed and good flood simulation results are obtained. In addition, I am interested in the fact that the code of this model is very simple and easy to operate. Through my own modeling test, I used the modeling data in the case provided by the author to complete the construction and trial operation of the QMG model, and obtained satisfactory flood simulation results, which proved the effectiveness of the model. However, there are some language and writing problems that hinder readability and fluency of this paper, and I think the current version needs some minor revisions before it can be published in the GMD journal.

#### Response

Thank you for your praise regarding the potential application of the QMG model presented in this study. The point-by-point responses to your comments are as follows.

#### Specific comments

##### 1) Language and writing problems

There are some English language problems in the current manuscript, including wrong words, grammar and inappropriate technical terms. For instance, “forecasting” is used many times in the paper, and I think the potential use of this new QMG model is better written as a “prediction”

based on the simulation results of this study. It is suggested that the authors find a hydrologist who is a native English speaker to help revise the language and writing problems of the whole paper.

#### Response

We have carefully revised the language issues throughout the text and enlisted the help of a professional editing service (American Journal Experts). Some technical terms such as “forecasting” have been replaced by “prediction”.

#### 2) Abstract

It is suggested to add some technical indexes to evaluate the performance of the new model in the abstract, so as to better reflect the effect of the QMG model in karst flood simulations.

#### Response

Some technical indices have been added to the abstract to evaluate the model performance (Lines 31).

#### 3) Keywords

“Simulation and forecasting of karst floods” should be replaced by “Simulation and prediction of karst floods”.

#### Response

This phrase has been modified accordingly (Line 36).

#### 4) Introduction

I read through the whole text and found that the latest literature cited by the authors is only from 2021. In the last two years 2020-2022 many hydrologists have also published some important literature on theoretical development and application of hydrological models in karst areas, and I suggest the authors to add several representative ones to the Introduction and the References lists. For instance,

Masciopinto, C., Passarella, G., Caputo, M. C., Masciale, R, & Carlo, L. D.. (2021). Hydrogeological models of water flow and pollutant transport in karstic and fractured reservoirs. Water Resources Research, 57.

Zhang, H.. (2021). Characterization of a multi-layer karst aquifer through analysis of tidal fluctuation. *Journal of Hydrology*, 601, 126677.

Gautama, R.S., Notosiswoyo, S., Zen, M. T., & Kusumayudha, S. B.. (2021). Mathematical model of fractal conduits flow mechanics in the gunungsewu karst area, yogyakarta special region, indonesia. *International Journal of Hydrology Science and Technology*, 1(1), 1.

Y Chang, Hartmann, A., Liu, L., Jiang, G., & Wu, J.. (2021). Identifying more realistic model structures by electrical conductivity observations of the karst spring. *Water Resources Research*.

#### Response

Some relevant and important new literature has been added to the revised paper, for instance, Gautama et. (2021) in Line 43; Masciopinto et. (2021) in Line 104; Chang et. (2021) in Line 75; Zhang (2021) in Line 62; Jamal and Awotunde (2022) in Line 65; and Guila et. (2022) in Line 75. These studies have been added to the References list.

#### 5) Study area and data

“2.3 data” should be replaced by “2.3 Modeling Data”. Considering that the audience of the article may not be hydrology professionals, it is recommended that the author try to put himself in the position of a lay reader when writing, so as to ensure that the written paper can be easily read and understood.

#### Response

“2.3 data” has been replaced by “2.3 Modelling Data” in Line 192.

#### 6) Methodology

The parentheses in formula 1 are not formatted properly and need to be rewritten.

“3.1.2 Runoff generation” should be replaced by “3.1.2 Runoff generation algorithms”.

“3.1.3 Channel routing and confluence” should be replaced by “3.1.3 Confluence algorithms”.

#### Response

“3.1.2 Runoff generation” has been replaced by “3.1.2 Runoff generation algorithms” (Line 290).

“3.1.3 Channel routing and confluence” has been replaced by “3.1.3 Confluence algorithms”  
(Line 330).

7) Results and discussion

It is recommended to write these two parts separately, means 4 Results and 5 Discussion.

Response

Separate Results and Discussion sections have been written.