Response to comments of Anonymous Referee #1

We would like to thank the referee for the thoughtful comments and suggestions. The follows are our response in regard to the comments and suggestions.

Comments to the Authors:

1. This sentence is clear for all experts in the field, "Upon evaluating the closed-form expressions, it is found that the variability in stream flow discharge increases with distance from the upstream boundary of the channel and time as well.". Instead, the authors should focus on the new results of the investigation.

Reply

As suggested, the main findings of the investigation have been included in the abstract as

"The treatment of the discharge variance (square root of the variance) gives us a quantitative estimate of uncertainty in predictions from the deterministic model. It is found that the stream flow discharge variance is very large in the downstream reach, indicating large uncertainty anticipated from the use of the deterministic model. A larger temporal correlation scale of inflow rate fluctuations, representing more temporal consistency of fluctuations in inflow rate around the mean, introduces a higher variability in stream flow discharge."

2. Add some of the most important quantitative results to the Abstract.

Reply

Please refer to **Reply #1**.

3. Add a more new (2015) reference (in below) for the first sentence of the Introduction:

- Long-term runoff study using SARIMA and ARIMA models in the United States.

Reply

The following references have been added to the first sentence of the Introduction:

"… of the surface (e.g., Duan et al., 1992; Sivakumar et al., 2000; Ruiz-Villanueva et al., 2012; Valipour, 2015)."

Duan, Q., Sorooshian, S., and Gupta, V.: Effective and efficient global optimization for conceptual rainfall-runoff models, Water Resour. Res., 28(4), 1015-1031, 1992.

Sivakumar, B., Berndtsson, R., Olsson, J., Jinno, K., and Kawamura, A.: Dynamics of monthly rainfall-runoff process at the Gota basin: A search for chaos, Hydrol. Earth Syst. Sci., 4(3), 407-417, 2000.

Ruiz-Villanueva, V., Borga, M., Zoccatelli, D., Marchi, L., Gaume, E., and Ehret, U.: Extreme flood response to short-duration convective rainfall in South-West Germany, Hydrol. Earth Syst. Sci., 16(5), 1543-1559, 2012.

Valipour, M.: Long-term runoff study using SARIMA and ARIMA models in the United States, Meteorol. Appl., doi: 10.1002/met.1491, early view, 2015.

4. Add two more new (2012, 2014 & 2015) references (in below) to this sentence "Natural variability, such as significant variability of rainfall events on both temporal and spatial scales":
   - Critical Areas of Iran for Agriculture Water Management According to the Annual Rainfall.
   - Future of agricultural water management in Africa.
   - A comprehensive study on irrigation management in Asia and Oceania.

Reply

New related references are now cited in that sentence:

"… and spatial scales (e.g.,…, Haberlandt et al., 2008; Valipour, 2012; Bewket and Lal, 2014)."

Haberlandt, U., Ebner von Eschenbach, A.-D., and Buchwald, I.: A space-time hybrid hourly rainfall model for derived flood frequency analysis, Hydrol. Earth Syst. Sci., 12(6), 1353-1367, 2008.

Valipour, M.: Critical areas of Iran for agriculture water management according to the annual rainfall, Eur. J. Sci. Res., 84(4), 600-608, 2012.

Bewket, W., and Lal, R.: Recent spatiotemporal temperature and rainfall variability and trends over the Upper Blue Nile River Basin, Ethiopia, Int. J. Climatol., 34(7), 2278-2292, 2014.

5. In the last paragraph of the Introduction, the authors should mention the weaknesses point of the previous works (gaps identification) and novelty of current investigation to justify us this paper deserves to be published in HESS.

Reply

Following statements are added in the last paragraph of the Introduction:

"To the best of our knowledge, the issue on quantifying the effect of temporal

variation of lateral inflow on the stream flow variability using non-stationary spectral techniques so far has not been addressed. It is hoped that the proposed approach and our findings obtained in this study are useful for further research in this area."

6. Simplification of Saint-Venant equations leads to increase of uncertainty. In this case, it is necessary to cite some of the successful applications of this method to underline that the results are reliable. For this purpose, add the below papers:
   - Simulation of open- and closed-end border irrigation systems using SIRMOD
   - Optimize of all effective infiltration parameters in furrow irrigation using visual basic and genetic algorithm programming
   - Sensitive analysis of optimized infiltration parameters in SWDC model.

Reply

As suggested, we have added following sentence and mentioned related articles shown below:

"Some of the successful applications of the simplified channel flow models to flood routing are available in the literature (e.g., Ponce et al., 1978; Singh and Aravamuthan, 1995; Moramarco and Singh, 2002; Khasraghi et al., 2015)"

Ponce, V. M., Li, R. M., and Simons, D. B.: Applicability of kinematic and diffusion models, Journal of the Hydraulics Division, ASCE, 104(HY3), 353-360, 1978.

Singh, V. P., and Aravamuthan V.: Accuracy of kinematic wave and diffusion wave approximations for time-independent flows, Hydrol. Process., 9(7), 755-782, 1995.

Moramarco, T., and Singh, V. P.: Accuracy of kinematic wave and diffusion wave for spatial-varying rainfall excess over a plane, Hydrol. Process., 16(17), 3419-3435, 2002.

Khasraghi, M. M., Sefidkouhi M. A. G., and Valipour M.: Simulation of open- and closed-end border irrigation systems using SIRMOD, Arch. Agron. Soil Sci., 61(7), 929-941, 2015.

7. In the Conclusions, the authors should mention the sources of error in this study to consider them in next investigations.

Reply

We have mentioned the limitation of this study in the Conclusions as

"This work represents an initial step in stochastic study of the effect of temporal variation of lateral inflow on the stream flow discharge variability. To take the advantage of a closed-form solution, the linearized diffusion wave equation (2) is

therefore used as the starting point for this research. It is important to recognize that the results developed in this work are valid only for the case of small variations in flow discharge around an initially uniform flow regime."

8. What is the reason of different distance between ξ = 0.35 & ξ = 0.5 vs. ξ = 0.5 & ξ = 0.65 (Figure 1)?

Reply

Figure 1 is plotted on the basis of Eq. (19). The evolutionary power spectral density S_{QQ} is proportional to $\exp(\upsilon\xi)\sin^2(\pi\xi/2)$ as indicated in Eq. (19). Obviously, S_{QQ} is not linearly related to ξ. The difference in S_{QQ} for ξ = 0.35 and ξ = 0.5 and that for ξ = 0.5 and ξ = 0.65 is therefore not the same.

9. There is no (a) & (b) in Figure 1!

Reply

Thanks, we have placed "a)" and "b)" in Figure1.

10. Quality of the language needs to improve. A native English speaker should check whole of the manuscript for grammatically errors.

Reply

The last version of this manuscript will be edited by a professional editor to improve the English usage.