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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Impacts of the emergency operation of the South-to-North Water Diversion Project's eastern route on flooding and drainage in the water-receiving area: An empirical case from China" *by* Kun Wang et al.

Kun Wang et al.

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Responses to Referee' comments Referee #1: This is a very interesting paper. The effect of interbasin water diversion and flood management in a large lake basin is very important and hot topic. In this study, authors constructed a flood and waterlogging simulation model for assessing the effect of the South-to-North Water Diversion Project's eastern route on flooding and drainage Nansi Lake, a water-receiving area of the water diversion project in China. The model and the problem discussed in this paper were very useful and meaningful. I would like to recommend its publication. The

following issues need to be solved well before its publication. 1. Please kindly polish the language. For example, "Therefore, simulations of the flood and waterlogging process in the lakeside areas under the condition of emergency water diversion by the SNWDP and analyses of the impacts of emergency water diversions on flood and waterlogging drainage characteristics and the scheduling of flood control and drainage projects must be performed to strengthen the scientific scheduling of water diversion projects and flood control projects in water-receiving regions. "There are grammatically mistakes in this sentence. I would like to recommend that authors used short sentences to replace too long sentence like this one. Answer: The language in this paper has been improved. Thanks a lot. 2. The abstract can be more informative by highlighting the significance and novel contribution of this research. Moreover, key findings of this paper must be included in the abstract. The abstract is revised as follow: "The water levels of lakes along the eastern route of the South-to-North Water Diversion Project (ER-SNWDP) are expected to rise significantly and subsequently affect the process of flood control and drainage in those lake basins. However, few studies have focused on the impacts of the interbasin water diversion on the flood control and drainage of water-receiving areas at a lake basin scale. Using MIKE software, this paper builds a coupled hydrodynamic model to address the existing literature gap on the impacts of the interbasin water diversion on the process of flood control and drainage in a water-receiving lake basin, and it considers many types of hydraulic structures in the model. First, a flood and waterlogging simulation model was constructed to simulate the complex movement of the transferred water, waterlogging water in the lakeside area surrounding Nansi Lake (NL), and water in NL and its tributaries. The ER-SNWDP was also considered in the model. Second, the model was calibrated and verified with measured data, and the results showed that the model is efficient and presents a Nash-Sutcliffe efficiency coefficient (NSE) between 0.65 and 0.99. Third, the process of flood and drainage in the lakeside area of NL was simulated under different water diversion and precipitation values. Finally, the impacts of emergency operations of the ER-SNWDP on flood control and waterlogging

drainage in the lakeside area of NL were analyzed based on the results from the proposed model, and some implications are presented for the integrated management of the interbasin water diversion and the affected lakes." 3. Please check the reference style according to journal requirements. In addition, please avoid multiple references. It is not recommended to cite over three references in one sentence. Answer: We checked carefully and deleted some unimportant references in the manuscript. Thanks a lot. 4. The figures 3 and 5 are very beautiful. But it is a little confusing. Authors need to introduce the directions more clearly. Answer: We added a detailed description for all figures in the revised manuscript. Thanks a lot. 5. In the introduction, authors need to make the innovations (i.e., the research gap this paper fills) more clear. Answer: The introduction has been rewritten as recommended by the two experts, to the innovations more clear. 6. In the lines 20-25, authors demonstrate three key issues they aim to solve. Authors need to give answers to these questions in the conclusions. Answer: We answered the proposed issues in the conclusions one by one as: (1) In order to clarify the impacts that interbasin water transfer on the water-receiving area, this study using MIKE model to simulate the flood and waterlogging in NLB. One- and two-dimensional coupled floods and a waterlogging simulation model of the NLB were established to simulate the water diversion of the ER-SNWDP. The MIKE 11 model was applied to simulate the flow movement of the water in the water diversion channel and the tributaries of NL. The MIKE 21 model was applied to simulate the waterlogging in the lakeside area and the water flow in NL. The verification results show that the presented method can effectively simulate the flood and waterlogging process in NLB under the effect of the ER-SNWDP. (2) The ER-SNWDP emergency water transfer to NL increases the risk of waterlogging damage in the lakeside area if it occurs simultaneously with DFAA. The increased water level caused by water diversion decreases the efficiency of waterlogging drainage. As a result, the waterlogged area with an inundated water depth above 0.1 m increased by 0.99% and an inundated water depth above 0.5 m increased by 13.32%. The flood-discharge time of the Erji dam increased by 4 days and the total discharge volume increased by 249 million m3

during the simulation. (3) The ER-SNWDP emergency water transfer to Shandong Peninsula raised the water level of NL which acted as a regulation and storage lake. Compared with the no water transfer situation, the waterlogging areas in the lakeside area increased when NL encountered a storm with 5-year, 10-year and 20-year return periods under water diversion. The calculation results show that water diversion has a more obvious effect on the waterlogging area with an inundated water depth above 0.5 m. The total volume of flood discharged by the Erji dam also increased. 7. Line 41: Wrong format of the citation to Bisht et al. 2016. Answer: The citation is revised accordingly, thanks a lot. 8. Line 24-25, page 10 "Considering emergency water diversion occurs during the flood season is scenario 2", while the ER-SNWDP doesn't work during the simulation in scenario 2 according to the table 2? Please modify table 2. Answer: We carefully checked this part of content and revised the mistake as follow: "Considering the flood control safety of NLB, we assume that the emergency water transfer stopped at the beginning of rain, on August 22, 2003." Thanks a lot. 9. Line 25, page 11 the eastern portion of NL is mountainous? Answer: We revised the sentence as follow: "Comparing with the eastern part of NLB, the terrain of the western NLB is lower and flat, and the western NLB has a greater impediment to drainage water into NL when the water level of NL is high." Tanks a lot. 10. Line 6-7, page 13. Text descriptions of both figure a and figure b are reversed. Please correction. Answer: We corrected the mistakes in the manuscript. Thanks a lot. 11. Line 25, page13. Should it be figure 8(c) instead of figure 8(b)? Answer: We revised it in manuscript. Thanks a lot.

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-216/nhess-2018-216-AC1-supplement.pdf

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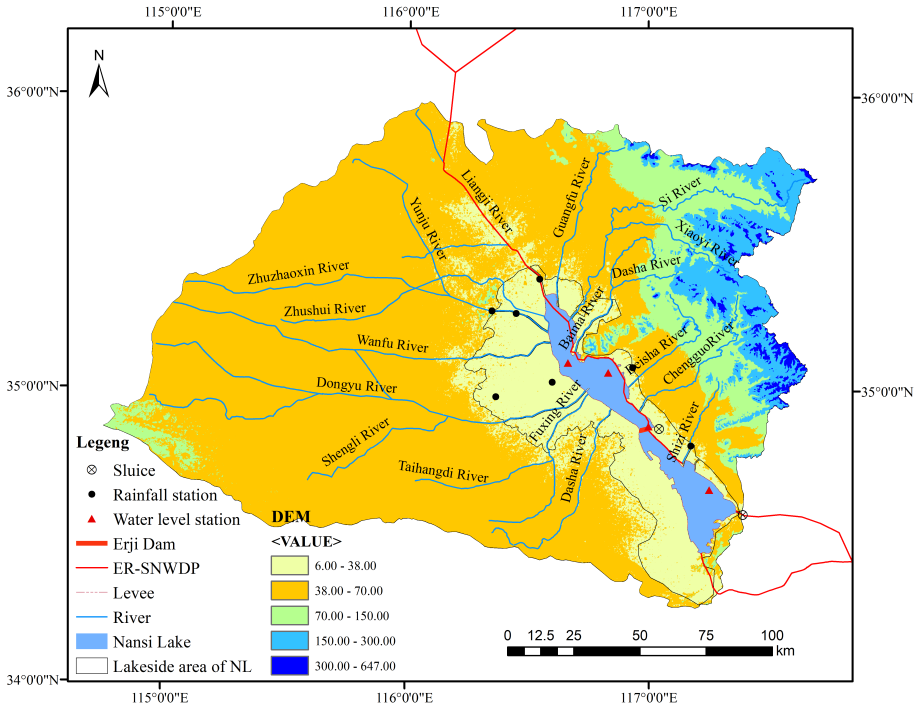
115°0'0"E
116°0'0"E
117°0'0"E
36°0'0"N
35°0'0"N
34°0'0"N
N
Liangji River
Yunlu River
Guangfu River
Si River
Xiaoyi River
Dasha River
Zhuzhaoxin River
Zhushui River
Wanfu River
Dongyu River
Shengli River
Taihangdi River
Baisha River
Huixing River
Dasha River
Baisha River
ChengguoRiver
Shizi River
Legeng
Sluice
Rainfall station
Water level station
Erji Dam
ER-SNWDP
Levee
River
Nansi Lake
Lakeside area of NL
DEM
<VALUE>
6.00 - 38.00
38.00 - 70.00
70.00 - 150.00
150.00 - 300.00
300.00 - 647.00
0 12.5 25 50 75 100
km

Fig. 1.

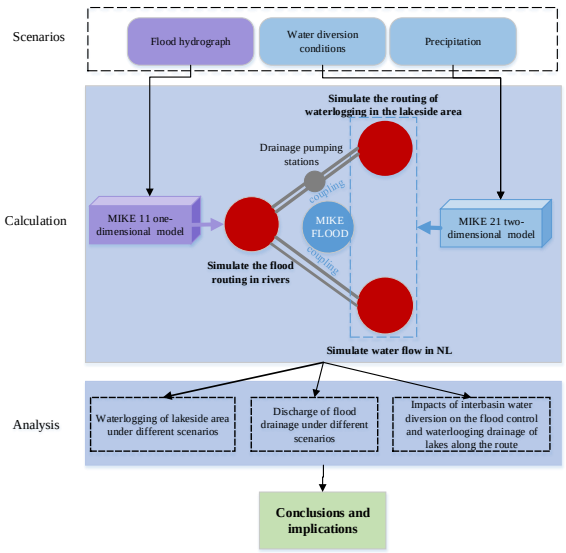
Scenarios
Flood hydrograph
Water diversion conditions
Precipitation
Calculation
Simulate the routing of waterlogging in the lakeside area
Drainage pumping stations
coupling
MIKE 11 one-dimensional model
MIKE FLOOD
MIKE 21 two-dimensional model
Simulate the flood routing in rivers
coupling
Simulate water flow in NL
Analysis
Waterlogging of lakeside area under different scenarios
Discharge of flood drainage under different scenarios
Impacts of interbasin water diversion on the flood control and waterlooging drainage of lakes along the route
Conclusions and implications

Fig. 2.

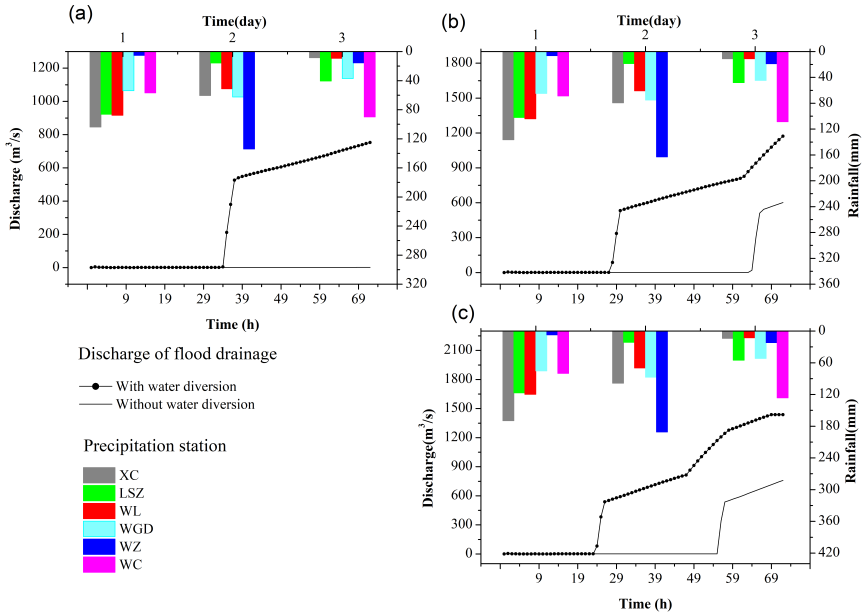
(a)
Time(day)
1
2
3
Discharge (m³/s)
Time (h)
Discharge of flood drainage
With water diversion
Without water diversion
Precipitation station
XC
LSZ
WL
WGD
WZ
WC
(b)
Time(day)
Rainfall(mm)
(c)
Discharge(m³/s)
Rainfall(mm)
Time (h)

Fig. 3.