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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Integrated hydrological modeling of the North China Plain and implications for sustainable water management" *by* H. Qin et al.

Anonymous Referee #1

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Qin et al. (2103) introduced a coupled surface water-groundwater model for the North China Plain (NCP, total area: 140000 km2). I found that the paper is interesting and it can be a good contribution to the literature because there are currently still limited studies of coupled surface water-groundwater model in a large scale setting. However, I have to say here that I do not feel to be in position to evaluate their perspectives on sustainable water management.

The paper addresses relevant scientific questions within the scope of HESS. The results are sufficient to support the interpretations and conclusions. Nevertheless, I found that the overall presentation of the paper, especially the explanations of the scientific

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methods and assumptions, should be improved.

I would like to propose that the following comments should be considered. These comments should not be misinterpreted as negative critiques, but as suggestion to further improve the work.

Abstract. Page 3694, lines 11-14. The performance values (RMSE and R) for the simulated groundwater heads should be given.

Page 3694, lines 17-18. "*The water balance results indicate that more than 69% of water leaving the flow system is attributed to the ET component.*" How much fraction of the ET is taken from the (saturated) groundwater part?

Section 2.1. Page 3697, lines 10-14. A map/figure (showing four main hydro-geological zones of the NCP aquifer) will be very useful.

Section 2.3. Page 3698, lines 24-26 and page 3699, lines 1-2. I suggest changing the codes/indexes "10", "20" and "30" to something else.

Section 2.4. Pages 3699-3700. This section needs further explanation and clarification.

Page 3699, lines 22-27. Could the authors illustrate the locations of pumping stations used for irrigation purposes? From which aquifer layers is the irrigation water taken from? Did the authors consider the return flow of the irrigated water?

Page 3700, lines 3-6. The positions of (some) important cities and industrial areas should be indicated in the figure.

Page 3700, lines 6-9. I missed the explanation about the "upper" and "middle" parts of groundwater zone. How much water is extracted from each aquifer zone/layer?

Page 3700, lines 9-23. How was the location of each pumping well verified? I think the explanation and presentation of this method should be improved.

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Section 3.1. Page 3701, lines 25-26. Please rephrase the sentence. I find the statement and reason to inactivate snowmelt not intuitive.

Section 3.2. Page 3702, lines 9-13. So, the models have three unsaturated zone layers and three saturated zone (aquifer) layers? Am I correct? I suggest rephrasing these lines and not using the phrase “computational layers”.

Section 3.4. Page 3703, lines 16-19. I found that the explanation in this important section is unclear. I recommend to extend the explanation, especially about the methodology to calculate the ET in the model.

Section 3.5. Pages 3703-3704. Did the authors define any aquitard layers? I missed their explanation.

Page 3704, lines 4-5. The sentence “*Since the geological units adopted from ...*” does not flow.

Section 3.6. Pages 3706, lines 9-12. This paragraph does not flow.

Section 4.1. Table 6. I missed some useful information about the description of each hydrogeological unit. Could the authors briefly describe the lithological or geological description of each zone?

Section 4.1. Page 3707, lines 14-15. I suggest to also calculating MAE and RMSE after bias correction.

Section 4.1. Page 3707, lines 15-17. I am not sure that there are groundwater level variations of about 60-70 m. These are extremely large.

Section 4.1. Page 3707, lines 19-26 and page 3708, lines 1-5. Did you consider the influence of the spatial support discrepancy between the model resolution (2 km) and measurements (point scale)?

Page 3707, lines 25-29. This reasoning is unclear for me. Please rephrase.

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Section 4.3. Page 3710, lines 8-15. I could not find the location of the discharge points/locations in Figs. 1 and 3.

Section 4.4. Pages 3710-3713. Did the authors compare the water balance analysis to other studies, e.g. Cao et al. (2013)? How much percentage of ET fluxes do come from the saturated groundwater zone? I would recommend that the authors calculate the contribution fractions of unsaturated and saturated zones to ET fluxes.

Page 3711, lines 14-15. Please change the unit in Fig. 11 to m.

Section 4.5. Pages 3710-3713. I suggest moving this part to a separate discussion section.

Section 5. Page 3715, lines 22-26 and page 3716, lines 1-2. I suggest rephrasing this paragraph. I found that this paragraph seems not really supporting or connected to the statements mentioned in the abstract (page 3694, lines 17-18). In the abstract, the authors emphasize the significance of the ET component in the water balance analysis ("*... more than 69% of water leaving the flow is attributed to the ET component*"), while in the conclusion the authors mainly discuss the significance of pumping activities.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 3693, 2013.