Comments to "Decomposition technique for contributions to groundwater heads from inside and outside of an arbitrary boundary: Application to Guantao County, North China Plain" submitted to HESS.

General comments:

This paper presents a decomposition technique to describe the contributions to groundwater heads from inside and outside drivers. This technique could provide useful information for groundwater management of an administrative unit. Guantao County of Hebei Province, China, serves as an example to demonstrate the decomposition technique, and this technique is implemented by building three groundwater models. This manuscript is well organized and easy to read.

Building reliable groundwater models is crucial to this technique, and the results depends on accurate groundwater models. I have some questions on these groundwater models (e.g., calibration, model parameters) and the results of this paper, please see the specific comments below. Therefore, these questions should be clarified before publication, and a moderate revision is recommended to this paper.

Specific comments:

1. As for the unsaturated zone of study area with a thickness of 20m, although there is no phreatic evaporation from the aquifer, the evapotranspiration process of recharge to groundwater (e.g., precipitation or irrigation) is not neglectable, because some precipitation can't contribute to effective groundwater recharge due to this thick unsaturated zone. As stated at line 23-24 of page 9, "The water input for the groundwater surface equals precipitation plus irrigation minus evaporation and evapotranspiration," and how to evaluate this process.

2. The amount of groundwater pumping Q is an important input for groundwater model, especially when the observed water head of the pumping well is used for model

calibration. Is this parameter Q calibrated by using PEST? It would be nice to give a summarized information about the calibrated model parameters and their prescribed ranges.

3. According to the line 30-32 of page 9, the PEST is used to calibrated the parameters of steady state model, and then these parameters are used for the transient model, and the parameter specific yield is adjusted manually. I think the calibrated parameters from steady state model used for transient model may be problematic, because the two models have different input-output relationship. Why not calibrate the transient model by PEST?

4. Line 17 of page 12. The transient model has four specific yield variables, are these variables have fixed proportional relationship? otherwise, it is difficult to adjust these variables manually.

5. Line 23-27 of page 12, and the first half of page 13, the fitting results are used to represent the performance of model calibration. However, I think the data could be divided into two parts, one for model calibration, and the other for model validation.

6. What's the definition of the "sensitivity" in Table 1, or how to calculate it in this paper?

7. It would be nice to quantify the contributions of inside and outside drivers to the overall groundwater flow field of Guantao county, such as the **% average variation of Guantao's groundwater flow field is contributed by the inside drives, …, because this information is of interest to the manager of local water resources administration.