Comment 1) In the manuscript, an analytical solution is proposed to analyze steady state non-isothermal well flow in a slanted aquifer. The analytical solution is then applied to a case study to explain some data. The topic is interesting and is appropriate for possible publication to HESS. However, due to several weaknesses about the organization of the manuscript, its writing, the English language or about the mathematical developments or the application to the case study, I do not recommend to accept the manuscript. It needs to be reorganized and rewritten to clarify different points before a possible publication could be considered. Details of my reviews are given below. Response We did a reorganization and a thorough editing for the manuscript. Specifically, we added assumptions for the equations. We clarified the procedures for obtaining the permeability data for the deep fault. We also addressed the possibility of natural convection of geothermal water in the field site of deep fall.

In summary, we made the following changes. 1. we have re-organized the text in putting the site description to a new section Case Study. 2. We added a cross section of the field site as in Figure 5b. 3. We have modified Table 1 (density and viscosity data) to make it stand out for our novel formula of viscosity at the very start of the note. 4. We added a discussion section for the effect and implication from borehole drilling fluid. The text is from the previous site description section.5. We addressed the concern that natural free convection in a geothermal field of a deep fault. And 6. We added assumptions to the analytical solutions.

We believe we have fully addressed the review comments. The paper is sound in terms of science and writing.
site than a clear and comprehensive understanding of a scientific question. An introduction clearly written should clearly state the context of the work, the scientific questions addressed and the method proposed to solve them. This is an example from the introduction, but the other parts of the manuscript requires also to be re-organized and clarified (see below). Response ii) Thanks for your time for the comments. but the word messy is overly harsh. We have partially re-organized the text. The introduction has been re-organized and the site description has been moved to the case study to improve the structure of the paper. We revised to improve the context. We reworked the scientific problem as: “Field studies have shown that a geothermal field is active in geothermal water outflow with a central area of high temperature and a periphery of dramatically lowered down water temperatures. We want to find out how the temperature effect plays out in the dynamic geothermal water flow to wells in the deep fault geothermal field, and what method can be used to characterize the geothermal flow in the fault zone to improve understanding of the deep fault.”

Comment ii) Furthermore, the English language needs to be thoroughly proof-read and re-written. I recommend finding a native English speaker to assist with this component. Response ii) We have edited the text thoroughly to improve the flow of English. We believe the revised manuscript is sound. Thanks.

Comment iii) Some references are missing, especially in the field of geothermal flow associated to fault zones. Some very general references about geothermal applications are given in the manuscript, but, for instance, the following references could be more appropriately cited: Malkovsky, V. I., and F. Magri (2016), Thermal convection of temperature-dependent viscous fluids within three-dimensional faulted geothermal systems: Estimation from linear and numerical analyses, Water Resour. Res., 52, 2855–2867, doi:10.1002/2015WR018001. Zhao, C., B. E. Hobbs, A. Ord, S. Peng, H. B. MC, L. Liu (2004), Theoretical investigation of convective instability in inclined and fluid-saturated three-dimensional fault zones, Tectonophysics, 387(1–4), 47–64, doi:10.1016/j.tecto.2004.06.007 These are only examples. About flow in slanted aquifer, some other references could be also of interest. Response iii) We added these papers (Malkovsky and Magri, 2016; Zhao et al., 2004), to go with the ones we already have had for fault-zone flow characterizations. Relevant discussion is made. Thanks!

Comment iv) The calculations in section 4 and 5 are simple, but the boundaries conditions used should be clarified. The aim of the manuscript is to propose a coupling between head and temperature variations, but it is not clear how varies temperature in figure 4 and 5. Line 262, it is assumed that the temperature is linearly varying along the flow direction. But why this is necessary, how this is justified? It should be clarified and explained. Some equations should be checked, in particular equation 1b which is incorrect in this form. Response iv) The assumptions for the linear and radial flows are: In a horizontal or an inclined aquifer, radial thermal flow also has several assumptions for its features. The aquifer is continually distributed with a uniform thickness. The permeability of the aquifer is uniform, leading to inference of an uniform thermal property. The aquifer is assumed to have a single source, leading to the fact that the temperature field with smooth temperature variations.

In Figures 4 and 5 the temperature changes are smooth and gradual, with the aquifer is assumed to have only one heat source. Therefore, the assumption for temperature is not necessary to be linear.

We have checked the formulations in all the equations. We have removed the equation (1b). Equation (1b) was not used actually used any way; it is there for completeness of the flow of none steady state.

Comment v) It is difficult to understand from section 6 and figure 5 how analytical results from section 5 are applied to the field case. This should be clarified as well as the geometry of the aquifer and the assumptions used for the calculations. Response v) We added text to clarify the utility of analytical solution to the field site. We added a cross section of the field site to enhance understanding the of fault zone (Fig.6 in
revised version). The fault plane for the deep fault is assumed to have a flat surface, slightly curved to the south at the western end, based on borehole data in the field site. Assumptions are made for applications of analytical solutions (Eqs. 11,12) to the Xinzhou geothermal field. The fault is approximated to have uniform properties such as thickness, permeability. The temperature distribution between boreholes is resulted from a single heat source so that the temperature changes are smooth and the trend is known. In this case study we used the linear interpolation to approximate the actual inter-borehole temperature. The linear approximation for temperature is expected to have negligible error, because of the steady state nature of the flow field condition. A more rigorous approximation could have obtained a better fit for temperature, for example, a second-order of polynomial function. But it is hard to find the data for the fit of the curve.

We added the above text in the revision to the analytical sections (Section 4.1; 4.2, revised version)

Comment 6) How is calculated the fault permeability? Permeability values are given (line 392) and largely discussed (section 7.2). It appears as a major result (line 45-46 in the abstract and 475-477 in the conclusion), but it should be explained how permeability is calculated. Response The fault permeability calculation is discussed in details (Section 5.3, revised version). The assumptions are also provided.

Comment 7) Moreover, in such permeable fault zone, with such temperature gradients, one may expect natural freeconvection to occur. This should be discussed since conditions for flow and pressuredistribution in the fault zone (slanted aquifer) should control the response observed in the deep borehole. Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2018-624, 2019 Response In light of the flow field with the permeable fault, one would think whether the temperature and pressure condition could lead natural free convection to occur. The flow condition in the top part of the deep fault system is predominantly upward. There is no field evidence that natural convection occurs in this field site at the scale of this size (C5 scale of about 800 m across). A simulation in regional scale of the deep fault reaching 7 km deep, the flow field shows that the upper part is dominantly up-swelling flow while, the down-drawing flow occurs near the bottom part of the deep fault. More detailed investigation is referred to Lu et al. (2017). We added the above text in the revision to the end of permeability calculation section (Section 6.3 in the revised version).
