This manuscript documented a phase lead phenomenon of groundwater level in response to earth tide and try to explain what the phase advance occur.

To be honest, I do not think the phase advance is new and unexplainable, and there are several published papers have dealt the issue (pelease refer to Barbour et al., 2019; Gao et al., 2020; Valois et al. 2023 .Wang et al. 2018 ....). In these papers, they discussed the changes of Taqu, Tcon, Saqu, Scon would have signficant impact on the phase shift. Such findings provide a basic physical mechanism of the phase shift. The discussion of your combination of two signals (x1, x2) only provides an exterior discussion on the changes of tidal wave, and ignored the physical nature of such phase advance phenomenon. Furthermore, your synthetic wave could not fit the theories M2 wave in Fig.7 and Fig.8, which means the fixed phase shift of leaky aquifer or fixed amplitude may not able to explain your observations.

Answer: We would like to thank the anonymous reviewer for their insightful comments. The quality of the manuscript was significantly improved based on these suggestions. Due to some wording and translation errors in the original manuscript, a considerable amount of the information was misunderstood by readers. The revised manuscript has been carefully checked, and a professional English translation company was invited to revise the manuscript. We acknowledge that many people have carried out similar studies on phase advancement. However, this study mainly focused on using actual observation data to demonstrate that the phase change caused by earthquakes is due to new fractures. The effect of new fractures is similar to that of leaky aquifers. This study explores this issue in another direction by combining mathematical methods with actual observation data, and the calculation method can fit the actual observation process. In the original manuscript, to clarify the display, the phase lag of the tidal response of the aquifer was set to -0.1 π, which is larger than the actual observation. After setting the value smaller, we can fully achieve the actual phase leading effect, as shown in the new figures 7 & 8.

Second, the tidal phase shift results showed in this manuscript is opposite with other published studies (Lai et al., 2014; Lai et al., 2016) , the phase shift of Lugu Lake(LGH in their paper) is around -10° before the Wenchuan earthquake, and increased to 10° after the earthquake. And it is unclear how you set the parameters in the tidal analysis, I am also not quite sure about the result from T_tide. The widely used tidal analysis programs are Baytap-08, HALS method etc, I think you should rechecked your setting and the results.

Answer: We have carefully considered this question. Through our comparison of several methods (T_tide, Baytap-08, HALS method, etc.), the results obtained by different calculation methods are almost identical except for minor differences. According to the statement "Fourier analysis provides a robust means of estimating equilibrium conclusion status" (Turnadge et al., 2019), Fourier analysis has been directly used to calculate the tidal response parameters.

Turnadge, C., Crosbie, R. S., Barron, O., and Rau, G. C. (2019). Comparing Methods of Barometric Efficiency Characterization for Specific Storage Estimation, Groundwater, 57, 844–859, https://doi.org/10.1111/gwat.12923.

Minor comments:

1. I cannot understand many terminologies in your manuscript and I think you should pay much more attention about them. i.e. trans-current recharge, transgressive aquifer, semi-[pressurized aquifer and so on.....

   Answer: This is a very good suggestion. First, we standardized these concepts and used professional vocabulary; second, we have provided a unified interpretation of these professional terms in the methodology. Please see the third paragraph of the Introduction.

2. I would strongly ask you to seek help from a native speaker to help you improve the language of this manuscript.

   Answer: Thank you for this advice. We have invited a professional translation company to improve the manuscript's language, and your advice has been conveyed to the relevant staff.

3. A borehole lithology is required to show the aquifer type of this well, where does the semi-confined layer exists? And also the hydrogeological setting of the study area should be presented.

   Answer: Based on the original drilling data and information provided by Lai et al. (2016), we supplemented the borehole lithology and hydrogeological setting data for the study area. Please see Figure 2 and the associated content.

4. Line 43-44, borehole has no unconfined or confined characteristics, here should be confined aquifer, and not unconfined aquifer, and it is very difficult for the unconfined aquifer to record tidal signal.

   Answer: We apologize for any confusion about this issue, which is a language translation error. The original meaning is that the wellhead is unconfined and open. We did not mean to indicate that it is an "unconfined aquifer." We have corrected this error in the revised manuscript.

5. Line 53-54 groundwater level could record the tidal signal, but it also contains many other frequency components of other signals.

   Answer: I strongly agree with this comment. The groundwater level contains many other frequency components of other signals except tidal signals, such as atmospheric pressure disturbance. We have added these descriptions to the revised manuscript.

6. Line 75-76, there are already many studies discussed the phase lead.

   Answer: This is an error in our expression. In the original manuscript, we discussed Chinese and international situations separately. Although many international studies have discussed the phase lead regarding this question, an ideal answer to this question has not been reported in China. In the revised manuscript, we have made modifications to this statement by deleting the research situation in China.

7. Line 80-85, there are papers that modeling the tidal response with real world data. (Zhang et al., 2023; Bastias Espejo et al., 2022)

   Answer: Based on the borehole lithology, the filter tubes of the casing are located at 74.20–200.07 m, with 127 mm inside diameters, where 76–84.5 m, 100–111.3 m, 118–151.25 m, and 181–200.07 m are mostly fragmented and blocky. These fragmented zones imply aquifer properties, while weak weathering and developed fractures in other sections imply semi-confined aquifer properties. The pumping experiment at the borehole completion showed that the permeability coefficient was 0.135 m/d. We consider that the model we have built is very consistent with the actual data. Furthermore, according to the analysis, the findings are also very consistent.

8. Line94, positive fracture?

   Answer: We apologize for this confusion, which was based on a language translation error. We have changed "positive fracture" to "normal fault."

9. Figure 3, I would suggest to use the cpd in X-axis.

   Answer: According to other suggestions, the calculation method has been changed to Fourier analysis. The unit in Figure 3 uses cpd on the X-axis.

10. Line 213, one-dimensional well-aquifer structure, could you provide a figures to show this

structure?

Answer: We have modified Figure 6 by adding a one-dimensional well-aquifer structure.

11. The conclusion section is too long and not clear, please reworded.

    Answer: This is a very good suggestion. We have carefully reviewed the content of the Conclusion section again and realized that a considerable amount of the content should be moved to the Discussion section. In addition, we have reworded the Conclusion section.

12. The innovation of the study should be reworded.

    Answer: We have reworded the innovation of the study; please see the end of the Introduction and Conclusion sections.

References:

Wang, C. Y., & Manga, M. (2023). Changes in Tidal and Barometric Response of Groundwater during Earthquakes—A Review with Recommendations for Better Management of Groundwater Resources. Water, 15(7), 1327.

Bastias Espejo, J. M., Rau, G. C., & Blum, P. (2022). Groundwater responses to Earth tides: Evaluation of analytical solutions using numerical simulation. Journal of Geophysical Research: Solid Earth, 127(10), e2022JB024771.

Valois, R., Rau, G. C., Vouillamoz, J. M., & Derode, B. (2022). Estimating hydraulic properties of the shallow subsurface using the groundwater response to Earth and atmospheric tides: A comparison with pumping tests. Water Resources Research, 58(5), e2021WR031666.

Gao, X., Sato, K., & Horne, R. N. (2020). General solution for tidal behavior in confined and semiconfined aquifers considering skin and wellbore storage effects. Water Resources Research, 56(6), e2020WR027195.

Lai, G., Ge, H., Xue, L., Brodsky, E. E., Huang, F., & Wang, W. (2014). Tidal response variation and recovery following the Wenchuan earthquake from water level data of multiple wells in the nearfield. Tectonophysics, 619, 115-122.

Lai, G., Jiang, C., Han, L., Sheng, S., & Ma, Y. (2016). Co-seismic water level changes in response to multiple large earthquakes at the LGH well in Sichuan, China. Tectonophysics, 679, 211-217.

Zhang, J., Liang, X., & Wang, C. Y. (2023). Capillary Impact on Tidal Response of Groundwater in Unconfined Aquifers With Finite Thickness, Anisotropy and Wellbore Storage—An Analytical Model. Water Resources Research, 59(3), e2022WR033578.

Turnadge, C., Crosbie, R. S., Barron, O., and Rau, G. C. (2019). Comparing Methods of Barometric Efficiency Characterization for Specific Storage Estimation, Groundwater, 57, 844–859, https://doi.org/10.1111/gwat.12923.