Reviewer 1#

1. Authors have analyzed water level, flow rate, and water temperature data from an artesian well in southwestern China before and after multiple earthquakes. Water level and temperature showed co-seismic step-like increases following earthquakes. Tidal analysis revealed changes in aquifer and aquitard permeability following earthquakes. Authors coupled the flow rate and temperature data to model the mixing processes that occurred following each earthquake. Results indicate that co-seismic temperature changes are the result of the mixing of different volumes of water from shallow and deep aquifers, with the mixing ratio varying according to each earthquake. I think the manuscript is interesting and suitable for HESS. Resent manuscript should be soon published.

Authors thought useful not to consider atmospheric pressure since not monitored at the monitoring site, anyway barometric fields are characterized by large extensions. Authors may decide to ask data to Simao Airport or no, just to evidence relevant eventual variations. In any case present tractation may be considered suitable and convincing.

Response: We collect the monitoring data of barometric pressure in Simao City. In order to identify the effect of barometric pressure on the variation of water level in Dazhai well, the wavelet coherence analysis is employed to explore the correlation between water level and barometric pressure, and then the tidal components of water level in Dazhai well which extracted from the water level signal is compared under and without the influence of barometric pressure. Taking EQ1 as an example to analyze. The hourly monitoring data of water level and barometric pressure from Sep, 1 2004 to May, 30 2005 are chosen for the wavelet coherence analysis and extracting the tidal components.

The wavelet coherence is used to explore the relationship between water level response to barometric pressure, which is a powerful tool to analyzing nonstationary signals. We convert the time series of water level and barometric pressure into time-frequency space based on the wavelet coherence. In Figure R1, the water level and barometric pressure are highly correlated at a 95% pointwise confidence level with coherence coefficients > 0.9 within band between 0.5 and 1 day. The semidiurnal period is evident throughout the entire data set. Periods of approximately 1 day are slightly unstable. The result of wavelet analysis indicates that the variation of water level is affected by barometric pressure.

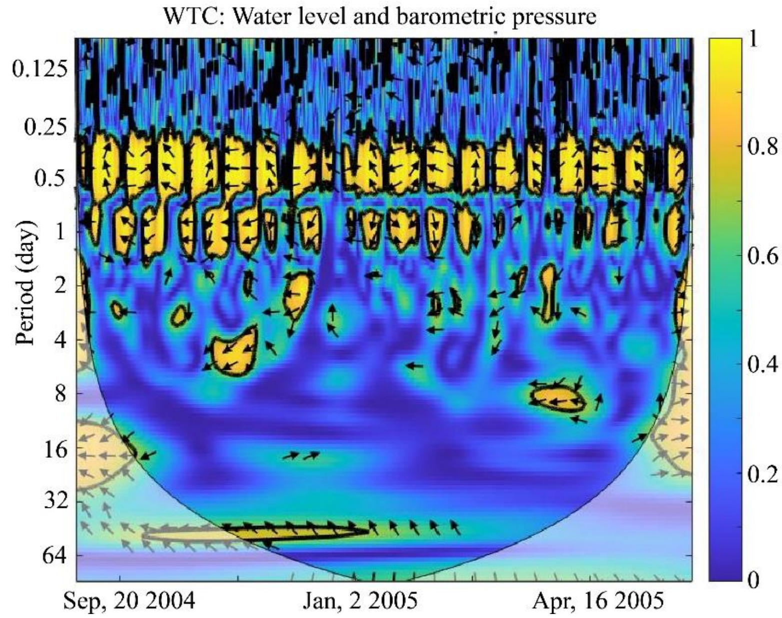

Figure R1. Wavelet coherence between water level and barometric pressure. The thick black contour specifies the 95% confidence level. The arrow directions indicate the relative phase relationship: in-phase pointing right, antiphase pointing left, and phase-leading by 90° pointing straight down.

We compare the tidal components extracted from the water level time series under and without the influence of barometric pressure. Baytap-G program is used to remove the interference caused by barometric pressure in the time series of water level (Tamura et al., 1991). The time series can be divided into several items, as follow:

$$y_i = \sum_{m=1}^{M}\left(\alpha_m C_{mi} + \beta_m S_{mi}\right) + \sum_{k=0}^{K} b_k x_{i-k} + d_i + e_i \qquad \text{(R1)}$$

Where the first term and second term on the right-hand side represent the tidal components and barometric pressure components, respectively; d_i is the long-time drift; and e_i is the random noise. By using Baytap-G program, the tidal components are extracted from the water level time series with the elimination of barometric pressure (Figure R2). Compared the tidal components extracted from the water level time series under and without the influence of barometric pressure (Figure R2 and R3), the results are similar and it is indicated the effect of barometric pressure on the variation of water level has little effect on the extraction of tidal components from the water level time series.

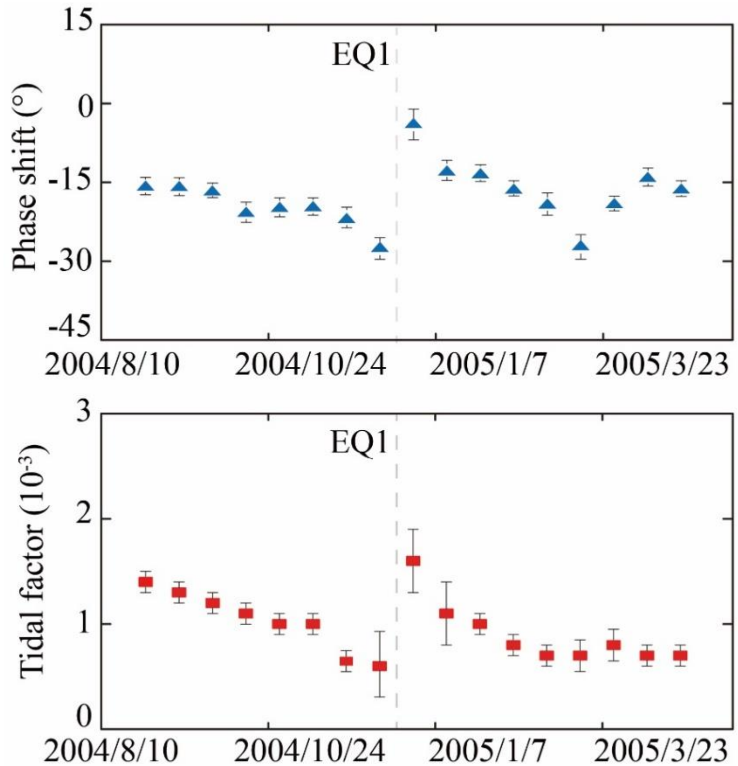

Figure R2. Tidal analysis after removing barometric pressure by Baytap-G (a) Amplitude ratio and (b) Phase shift. The gray dash line indicates the time the earthquake occurred.

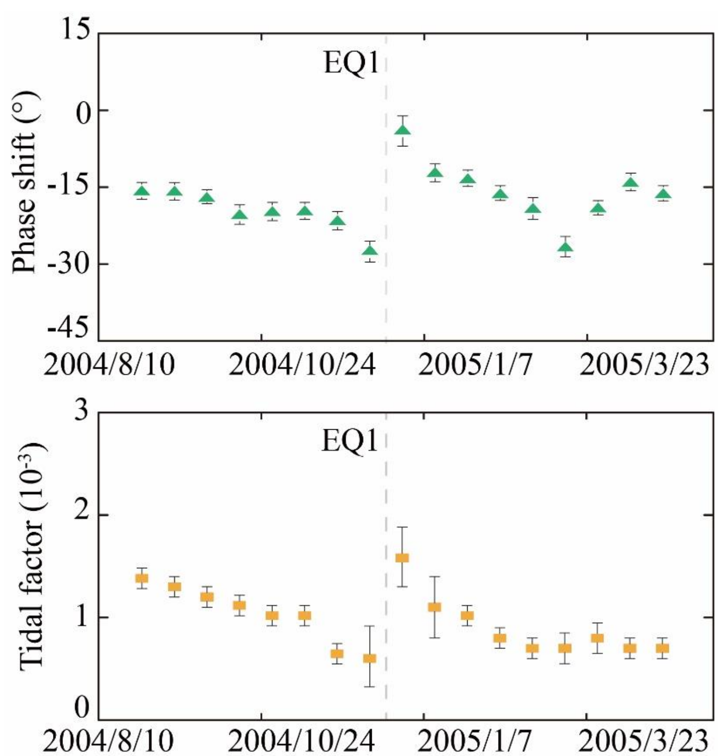

Figure R3. Tidal analysis after removing barometric pressure by Baytap-G (a) Amplitude ratio and (b) Phase shift. The gray dash line indicates the time the earthquake occurred.

References:

Tamura, Y., Sato, T., Ooe, M., Ishiguro, M., 1991. A procedure for tidal analysis with a Bayesian information criterion. Geophysical Journal International, 104(3): 507-516.