Author Response to the Public Discussion of "*Technical Note: Disentangling the groundwater response to Earth and atmospheric tides to improve subsurface characterisation*" by Gabriel C. Rau *et al.*

Referee Comments 2 (Anonymous Referee):

This manuscript is an interesting one and I think it provide a more general method in calculating the barometric efficient (BE) in comparing with the provide Acworth's method. However, when reading this manuscript, I feel that there are several places that need to be made more clearly.

We thank the anonymous referee for the valuable time and constructive feedback.

In Equation (7) and Equation (10), the expression of Ac is different, it is very confused. Please explain why you use different expression for Ac. What's the difference between them.

We apologise for the confusion and will correct these definitions.

Line 187 please explain how you calculate the areial strain sensitivity.

We calculated this using PyGTide software (Rau, 2018) which is based on ETERNA 3.4 by Wenzel (1996). We will add this information to the manuscript.

References:

Wenzel, H.-G. (1996). The nanogal software: Earth tide data processing package ETERNA 3.30. Bulletin d'Informations Mareés Terrestres, 124, 9425–9439.

Please provide a table to list all the parameters used in the example, and list all the result that obtained from your new method.

We will add such a table to the revised manuscript.

Line 207 about the negative phase shift, the phase shift is very close to 0 (-1.1)° what about the error in the phase estimation? And there are always some inconsist between theoretical calculated and measured earth tide, how can you make sure that the -1.1° phase shift is real, not caused by the different in theoretical and measured one. Also, there are several recently publications that deal with the negative phase shift, which showed that the vertical flow across the aqutiard may also cause negative phases shift, and the effect of wellbore storage or skin effect can also cause negative or positive phase shift. I suggest you provide some discussion about it. Which you may also want to make some clarlity when discuss the indication of confinment during Line 216-226.

We will calculate the phase error and add additional discussion including appropriate references of the implications to the manuscript. This may have implications for the permeability and specific storage derived from Earth tides. However, it will not significantly affect the new BE estimation technique which is the focus of the manuscript.

Table 1 The unit of amplitude of ET is "m", thus many tidal components had amplitude more than 1 meter, are you sure?

These values are stated in Agnew (2010) and depict the amplitudes that are used to calculate Earth tide potentials. They do not represent a groundwater head response but serve to illustrate the relative magnitudes that can be expected for each frequency component. We will clarify this in our revised manuscript.

Author Response to the Public Discussion of "*Technical Note: Disentangling the groundwater response to Earth and atmospheric tides to improve subsurface characterisation*" by Gabriel C. Rau *et al.*

Line 116-117 the authors argued that they assumed an aquitard with K=5.10-5 m/s, it is a rather permeabe, I think the aquitard should have a hydraulic conductivity with much small value.

We deliberately chose this value as a representative "worst case" for an aquitard. This discussion is meant to illustrate that fully confined conditions induce a tidal damping that is worse than under semi-confined conditions, i.e. a leaky aquitard. We will clarify this in our revisions.

Line 120 Figure ?? which Figure do you mean.....

Apologies for the broken reference. This refers to Figure 1 and will be fixed.

Line 126 Equation 4.7 should be Equation 7

We will make this correction.

Line 134 Hsieh et al., 1988 should be Hsieh et al., 1987, and other places in the manuscript. "Hsieh, P. A., J. D. Bredehoeft, and J. M. Farr (1987), Determination of aquifer transmissivity from earth tide analysis, Water. Resour. Res., 23, 1824-1832."

Correct, we will carefully check and correct these references.

Code and data availability, I encourage the authors to share the code and data once the manuscript has been fully accepted.

We will make our dataset and code available if/when the manuscript is accepted.