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Discussions
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Interactive comment on "Technical Note: Disentangling the groundwater response to Earth and atmospheric tides to improve subsurface characterisation" *by* Gabriel C. Rau et al.

Anonymous Referee #3

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The paper by Gabriel C. Rau et al. with title: "Technical Note: Disentangling the groundwater response to Earth and atmospheric tides to improve subsurface characterization" presents an interesting study regarding the method to deal with the groundwater response to Earth and atmospheric tides. It seems to me that the approach for estimating barometric efficiency (BE) proposed in the manuscript is of particularly novelty. The study is well done and publication is recommended after the following concerns are addressed (moderate revision).

Major comments:

1. Page 4. Paragraph 4: Equation about the complex response to atmospheric tides

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alone shows some difference with that of Acworth et al., 2016. Phase shift between the Earth tide and barometric pressure was considered in Acworth et al., 2016. Why authors simplified this term? Please say something about this.

2. Page 7. Paragraph 1: “In such cases, the concept of BE is no longer valid.” The initial concept proposed by Jacob (1940) was that a change in groundwater head measured in a piezometer was directly proportional to the change in barometric pressure. BE value ranges from 0 to 1. BE=0 for an unconfined aquifer and BE=1 for an extreme ideal confined aquifer. Semi-confined conditions maybe belong to between such two extreme situations (e.g., a confined aquifer with a weakly permeable upper confining bed overlain by an unconfined aquifer). Why did authors consider it should be no longer valid in semi-confined conditions? Authors may wish to put some constraints or limitations.

3. Figure 3b and Figure 4: These two figures show some similarities. You may consider merging Figure 3b into Figure 4 and show more components in Figure 4.

Minor comments:

1. Page 4. Paragraph 3: “The groundwater response to Earth tides only, for example at frequency M2, is assumed to be the same because the frequency is very close.” Did you mean that M2 is assumed to be the same with S2? Please make it clearly.

2. Page 5 around Paragraph 2: “K=5*10-5 m/s” K should be changed as K’.

3. Page 5 Figure 1 highlights: “Figure ??” should be changed as Figure 1.

4. Equation (7) and Equation (10): Ac indicates the amplitude of pressure relationship between subsurface and well water level in Equation (7), however, in Equation (10) Ac indicates the amplitude of the well water level to an ET component. So, they are different in the physical aspect. It is easy to cause confusion if using the same symbol. Please replace one of them.

5. Page 7. last paragraph: Please add the value of the sampling frequency in this

paragraph.

6. Page 8. last sentence in the last paragraph: Where is the Earth tide component M1? Please check it.

7. Figure 3: Please make the label clearly in your Figure and avoid overlap of the label.

8. Figure 3: The abbreviation of APES should be explained in the text or in the caption of the figure.

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