

## ***Interactive comment on “Climate-groundwater dynamics inferred from GRACE and the role of hydraulic memory” by Simon Opie et al.***

**Anonymous Referee #1**

Received and published: 18 February 2020

This is an interesting study that I suspect will be of wide interest to ESD readers. The premise for the research is straightforward and clearly articulated, with a generally well-reasoned account of methods and presentation of findings. I have some relatively minor points to consider for a redrafted version of this manuscript, as follows:

1. There are quite a large number of acronyms used in the manuscript. Not all of these seem essential, and in places they detract from the overall readability. Some are rarely used (e.g. COV, PCC), others are arguably not really necessary (PCP for precipitation). I recommend the authors rethink and reduce the number of acronyms accordingly.

2. Inconsistent capitalisation of nouns. Some terms that are converted to acronyms are not capitalised (e.g. global hydrological models, GHMs – p2, line 52), whereas others are (Groundwater Storage,  $\Delta$ GWS).

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3. P2, line 61-62. Presumably this increase of 15%/decade is a global average?

4. P7, lines 168 and 189. It is potentially somewhat misleading to provide coefficient of variation statistics for sample sizes of 3 and 4. The mean, standard deviation (and thus the coefficient of variation too) are not particularly informative descriptors of central tendency or distribution of samples that are this small.

5. P7, line 192. Improper use of the term “significant” when discussing the magnitude of statistical terms. From my reading of this sentence, “substantial” would be a more appropriate descriptor.

6. Figure 3. The different y-axis scales, and scaling of the data are noted in the caption, but this twin approach to scaling, plus the relatively small size of the panes and faint axis labels makes it somewhat difficult to compare scales of variability between the different aquifers.

7. P16, line 400. The reference for this statement is slightly misleading. It could be read that Zwiers and Von Storch (1995) found robust statistical significance, but actually I think the authors mean that robust statistical significance was found using the methods described by Zwiers and Von Storch.

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Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2019-83>, 2020.

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