

## ***Interactive comment on “Monitoring Groundwater Storage Depletion Using Gravity Recovery and Climate Experiment (GRACE) Data in the Semi-Arid Catchments” by Nizar Abou Zaki et al.***

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Received and published: 7 February 2019

The aim of this study is to assess the efficiency of the (GRACE) derived data in catchments smaller than the recommended limitation of 200,000 squared kilometers suggested by (Longuevergne et al., 2010). This approach was stated clearly in the abstract (Page 1: Line 16-17), and discussed later in the discussion section (Page 17: Line 7-18). When approached on smaller scale, GRACE data tend to show more uncertainty. For a better understanding, Bekhtegan catchment is chosen as a study site, as detailed data is available from 448 groundwater observation wells, and 22 climatic monitoring station. The water mass balance of the catchment is calculated from this collected

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data, which includes the daily precipitation, evapotranspiration and soil moisture. This water mass is compared with GRACE derived data (Figure 4B and 4C). Also the two constants (KA) and (KB) (Page 7: equations 6 and 7) (Figure 5D) show the uncertainty when comparing the (GRACE) data with both the water mass and the groundwater volume variation. The study also suggests that the uncertainty can also be related to the catchment's aquifers type, as the aquifers in the study area are considered to be shallow (Page 14: Line 5-10) and (Page 14 Line 20-25).

We agree with the referee statement that a lot of studies have been done to estimate groundwater fluctuation using (GRACE) data. Most studies are older than the studies suggested by the reviewer: {Various studies e.g., Forootan et al 2014 and 2017 provide a complete analysis of water storage and water fluxes in the area}. Voss et al. (2013), Tourian et al. (2015) as Middle East cases, and other studies from different study regions mentioned in (Page 16 Line 22 till Page 17 Line 6). In the introduction (Page 2 Line 11-19) also mentions, as much as the introduction section will allow, the (GRACE) data usage and previous studies. But what all these previous studies have in common, is the large scale study area. In our study, smaller scale helps noticing the direct effects of local hydrologic phenomena like droughts (Page 8: line 6-24) on the groundwater level and its occurrence in (GRACE) derived data. The study discusses the efficiency of (GRACE) data as a tool that can be used for water management on local level (Page 17 Line 19 till Page 18 Line 2). From what mentioned, we believe this study gives innovation against already published studies.

We agree on the (major comment) of the referee regarding the title, even that the approach can be used in any semi-arid catchment. If accepted by the editor for the next level of revision, we will change the title to agree with the reviewer comment.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-471>, 2018.

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