**Hydrology and
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Discussions

Interactive comment on "Regional GRACE-based estimates of water mass variations over Australia: validation and interpretation" *by* L. Seoane et al.

Anonymous Referee #1

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The paper by Seoane et al. 2013 applies a regional gravity recovery approach to compute 10-daily gravity products over Australia. I found the idea of the paper relevant to the aims and scope of HESSD. However, I recognize so many technical issues that are not well addressed in the manuscript. Due to the reasons below, I would suggest a major revision of the paper.

Major remarks

1. The different GRACE products of the study are validated by rainfall observations. Rainfall is however only one of the input parameters of total water storage changes that are modeled by GRACE products. I would suggest redoing the validation with comparing the GRACE products with terrestrial water storage out-

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puts of AWRA.(e.g., that of van Dijk et al. 2011). Their study clearly shows that AWRA-TWS agrees very well with GRACE and in-situ observations. The resolution of the AWRA model is either 0.25 or 0.5, which is also much better than the computed GRACE solutions.

van Dijk, A. I. J. M., Renzullo, L. J., Rodell, M. (2011). Use of gravity recovery and climate experiment terrestrial water storage retrievals to evaluate model estimates by the Australian water resources assessment system. Water Resources Research,47, W11524. http://dx.doi.org/10.1029/2011WR010714.

1. There are some technical issues in the computation that are not well addressed, e.g.,

   (a) Solutions are filtered using a combination of ICA and 400km Gaussian filters. Why has 400 km been selected while the new GRACE-level-2 products contain less errors and a filter of 250-300 km might be enough for the Australian case.

   (b) For performing a fair comparison between different data sets, all available data should be filtered using a same filter. How have the authors handled this issue?

   (c) Some results are derived and left un-interpreted, e.g., page 13, lines 25:28, the authors derive a lag of 4 months and 5 months between GRACE and groundwater observations. Why are the computed lags different? Some previous studies also find a lag of 3 months!

2. In the entire paper, the authors improperly use some statistical terms. For instance, Abstract Line 17: "ICA solution" is not a valid term. This has been repeated in the entire paper. In page 13, Line 7, even the solutions are called "ICA". I suggest to be more careful on the use of the statistical terms. One can

consistently call the products "ICA-filtered solutions". Please also consider the comments on the pdf version of the paper.

3. Some statements that refer to the previous works are not correct. For instance, page 4, lines 14:16 the authors claim that Garcia Garcia et al. 2010 and Forootan and Kusche 2012 propose the using of PCA which is not true. Garcia Garcia et al. 2010 suggest the use of complex PCA instead of PCA to catch the annual component in one mode. Forootan and Kusche compare PCA with VARIMAX and ICA for a global case and prefer ICA to decompose TWS maps. On the other hand, Forootan et al. 2012 propose the use of ICA to reduce the leakage problem. Please revise the manuscript accordingly.

Forootan, E., Awange, J., Kusche, J., Heck, B., Eicker, A. (2012). Independent patterns of water mass anomalies over Australia from satellite data and models. Journal of Remote Sensing of Environment, Vol.124, Page 427-443,dx.doi.org/10.1016/j.rse.2012.05.023

1. In page 4, Lines 7 to 9, the authors claim that they select Australia since the signal and noise are close. I am not sure if it is true! I agree that the signal over the region is weak, but at the same time atmospheric de-aliasing noise is also weaker over Australia (see e.g. Duan et al. 2012). Wouldn't it be better to test the method over, for instance, middle Asia whose signal is strong and de-aliasing error is also strong?

Duan, J., Shum, C.K., Guo, J., Huang, Z. (2012). Uncovered spurious jumps in the GRACE atmospheric de-aliasing data: potential contamination of GRACE observed mass change. Geophys. J. Int., 191, 83-87. doi: 10.1111/j.1365-246X.2012.05640.x.

1. The manuscript should be rewritten and thoroughly proof read. Some abbreviations are introduced for the first time, e.g. EHW but not written in full.

Minor remarks

Minor remarks are stated in the pdf version of the manuscript, as comments.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/10/C2737/2013/hessd-10-C2737-2013-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 5355, 2013.