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Ocean Science
Discussions

Interactive comment on "Sea level budget over 2005–2013: missing contributions and data errors" *by* H. B. Dieng et al.

H. B. Dieng et al.

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We thank very much Referee 1 for his/her comments, in particular for stressing the limitation of our approach concerning the data uncertainties at interannual time scale. Referee 1's comment is the following : "For example, suppose GMSL and Steric are just junk (and white noise) and Mass was perfect. Then Residual and Mass would be correlated and, by the logic of this paper, the authors would conclude that that was the one in error. So, I can see what they are trying to do, which is worthwhile. But they don't explain themselves as well as they could and they should include reservations about their methods such as my objection above". Our answer is as follows: What we are looking at is 'temporally-correlated" errors between the 3 data sets (GMSL, Steric, Mass). This is why we applied this correlation approach (note that we also

investigate the effect of temporary data gaps, in particular in steric data, that can also lead to uncertainties at interannual time scale). However, we agree with the Reviewer that we need to discuss the limitation of our approach, and for that purpose we did the following simulation: (1) We first compute a 'perfect' mass time series from the difference between (observed) mean GMSL and mean Argo-based steric sea level. (2) Next, we apply random noise to the mean GMSL and mean steric time series. 2 cases are considered: case 1 corresponds to a random error between -2 and +2 mm; case 2 corresponds to a random error between -4 and +4 mm (corresponding to typical data uncertainties at interannal time scale). 100 drawings of lots have been performed for each case. (3) Then, we compute the corresponding residual time series -i.e., noisy GMSL minus noisy steric minus perfect Mass- and correlate these with the 'perfect' mass time series. (4) The attached figure shows a plot of these new correlations for the 2 cases. We can see that most correlations fall below the nominal case (as in the original manuscript). Statistically, for case 1, in 82% of the simulations, the correlation worsen. For case 2, this number increases to 92%. We conclude that if the mass is perfect and the GMSL and steric sea level data are noisy, the residuals appear poorly correlated with the mass time series. Thus, a high correlation very likely reflects errors in the mass.

Responses to other comments: - The present study is dedicated to global mean values. A regional study will be left for a future work. - About the references quoted page 704, we only refer to 3 studies : von schuckmann et al (2014), Llovel et al (2014) and Dieng et al (2015), which is not a lot! Note that these groups are now working togther to better understand this errors issue.

All minor comments have been accounted for.

Figure caption : Correlation coefficient between residuals computed from noisy GMSL, noisy steric sea level and perfect mass for 100 drawings of lots. Blue and red points correspond to cases 1 and 2 respectively. The horizontal black line is the correlation of the nominal case.

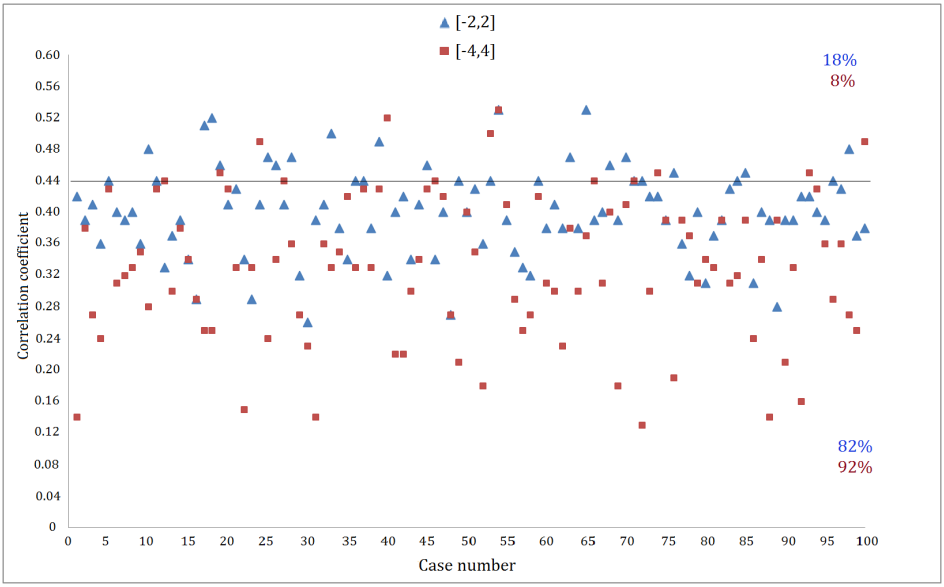
[-2,2]
[-4,4]
18%
8%
82%
92%
Correlation coefficient
Case number
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Fig. 1.