We thank again the reviewer for the thorough review and detailed comments.

To Anonymous Referee #1

General comments 1: *"The section numbers seem to be off. (i.e. 1 Introduction, 1 IOM method, 2.1 SMB and D)".*

Response: the typo probable results from the mis-match of the editing software format settings. But we have corrected the section numbers.

General comments 2: *"Some of the annotations can be improved or replaced in the case of prior version remnants. The annotations adds complexity to reading the manuscript.".*

Response: we have update the annotations according to your comments, see the response to line-by-line comments 3 and 5

General comments 3: *"My main concern is still related to the application of the correction factors. As opposed to the GRACE level-3 product (Landerer and Swenson, 2012) and the JPL GRACE mascon product (Watkins et al., 2015), the solutions here are both scaled and offset. If you reverse the scaling factors and the offsets for the coastal regions, the resultant losses are different than the corrected versions by a degree larger than the uncertainty for the interior. Since the least squares mascon technique accounts for the attenuation of the GRACE signal from spherical harmonic truncation and the additional post-processing, the major uncertainty remaining is the leakage component. At least from what I can ascertain from the manuscript, I am not sure why there is this difference. This could be explained in the paper. This could also be tested following Tiwari et al. (2009) by recalculating the results using the GRACE residuals (GRACE-your results). This would help determine the uniqueness from the approximation corrections.*

Response: To better explain this, considering the following example:

Assuming the true mass balance on DS1 is $\mathbf{X}$, and in GRACE it is $\mathbf{X}'$, since it is mixed with all sorts of errors that you mentioned. The residual is $\varepsilon_1 = \mathbf{x} - \mathbf{x}'$. Then we approximate $\mathbf{X}'$ using the least squares, it yields the approximation $\widehat{\mathbf{X}}$. The residual is $\varepsilon_2 = \mathbf{X}' - \widehat{\mathbf{X}}$, ε_2 is the approximation error as we referred in the text.

So the overall error in the least squares solution should be $\varepsilon_1 + \varepsilon_2$. However, without external information (such as a simulation) of $\mathbf{X}$, we can only estimate ε_1. The error ε_2 was estimated in Bonin and Chambers (2014) and Xu et al. (2015). And in this study, we remove the estimates of ε_2 from the least squares solution. So ε_2 is not considering as the error source, then the errorbar for the approximation before correction in fact only relates to ε_1. But to clarify this confusion, we updated the content as following:

One may notice that the corrected GRACE mass loss rates exceed the uncertainty range of the mass loss rates before correction e.g. in DS1a and DS3a, it is because the uncertainty before our correction is estimated without considering the approximation error. (P20, L5-L7)

Also we think the uniqueness of the correction is supported by 1000 times Monte-Carlo.

Line-by-line comments:

Comment 1: "*Page 2, Lines 4-6: no mention of the dynamic component of the mass balance*"

Response: we introduce the details of the dynamic components of the mass balance in Sect 2.1.

Comment 2: "*Page 5, Line 14: no comma needed after "here"*"

Response: comma is added. (See P5 L13)

Comment 3: "*Page 16, Lines 4-7: this is mentioned as cumulative discharge anomaly, but refers to (I believe) the anomaly in discharge fluxes (δD). Perhaps also use the δD annotation for DD-08 and DD-14 (δD-08 and δD-14 respectively)*"

Response: we have replaced the $D^{D\text{-}08}$, $D^{D\text{-}14}$ and D^{R} with $\delta D^{D\text{-}08}$, $\delta D^{D\text{-}14}$ and δD^{R} respectively. Those are in Page 16 and in Fig 3.

Comment 4: "*Page 34, Figure 5: while the estimates before the correction are shown in the figure, the exact numbers should be listed for comparison."*

Response: We choose to mention only the value of the improved solutions in the figure. But we also discuss the changes regarding the correction in the text (in Sect. 4.3). On the other hand, we show the parameters of the correction in Table A1, so the readers can calculate the mass loss rates before the correction.

Comment 5: "*Page 37, Table A1: Using k0 and k1 in the caption versus* α_0 *and* α_1 *in the table. Should the units of k0 be Gt/yr? Are you scaling the acceleration estimates differently than the trends?"*

Response: We change k0 and k1 to α_0 and α_1 and update the unit accordingly. The acceleration is not considered during the correction. Since the acceleration can always be reflected by the linear trends at different time period, e.g. before and after the year of 2005. So our method also can be applied to the acceleration in this way.