Earth Syst. Sci. Data Discuss., referee comment RC1
https://doi.org/10.5194/essd-2022-261-RC1, 2022

Comment on essd-2022-261

Anny Cazenave (Referee)

Referee comment on "Mass balance of the Greenland and Antarctic ice sheets from 1992 to 2020" by Inès N. Otosaka et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-261-RC1, 2022

This study is an update of the previous IMBIE assessments of the Greenland and Antarctica mass balances based on different space-based estimates provided by several groups worldwide. The new time series of combined ice sheet mass balances are extremely useful for the community, in particular for scientists interested in studying the global mean sea level budget. The paper is clearly written and should be published after accounting for a few minor corrections.

My main comment concerns the systematic differences reported by the authors between the three methods used for estimating the Greenland and Antarctica mass balances (IOM, altimetry and GRACE) as well as on the solutions dispersion within each method. As shown in the present study, satellite altimetry provides more dispersed solutions (lines 240-241) than the other two methods, while the IOM approach leads to systematically lower estimates than altimetry and space gravimetry (Fig.2). The first IMBIE assessment was published 10 years ago and I am sure that the authors have investigated the reasons for such discrepancies. I thus recommend that a discussion be added in the present paper on the potential causes of the reported dispersion of altimetry solutions and of the systematic discrepancies between the 3 methods. A few words on perspectives to reduce them in the future (if possible) would also be welcome. I would also suggest that you show (e.g., in a Supplementary Material section) the different mass balance time series for each method separately (not only annual rates estimates as in Appendix A).

Minor comments:

-In the abstract, ice mass loss values are either positive or negative. Please use the same sign for all

-Lines 89 to 100: for non experts, explain what is the GIA correction and how it affects

each method

Line 93: quote GRACE after 'space gravimetry'

Line 126: clarify the sentence '...orbit crossing' (e.g., difference in ice sheet elevation at a crossover point between ascending and descending satellite passes)

Line 143: Quote land hydrology when refering to leakage of mass trends in the climate system

Lines 145 to 149: it seems that you use the words 'satellite gravimetry when you refer to GRACE and GRACE FO when you refer to GRACE Follow On. Space gravimetry' is the generic term. Indice more clearly is all 'space gravimetry' estimates include GRACE FO

Fig.4: The figure caption is quite brief and not fully clear. Indicate that the starting points of the curves shown in the right hand side panels are the 2030 values of the left hand side panels