

## ***Interactive comment on “The sea level fingerprint of 21st century ice mass fluxes” by J. Bamber and R. Riva***

### **Anonymous Referee #1**

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This study presents predictions of sea-level changes due to mass flux from ice sheets, mountain glaciers and ice caps during the first decade of the 21st century. As made clear by the authors, the results produced only consider one component of the sea level change (e.g. the signal due to dynamic changes, steric changes are not included). However, the results will be of use to the sea-level community, particularly those who interpret ocean altimeter data. The results are based on realistic ice mass changes and so the predicted sea-level patterns are useful targets for this community to resolve in their data. Similar maps for the steric signal have also been produced and so the two can be used together to tackle the attribution problem for this decade. In my mind, this is the main contribution of this work from a sea-level perspective. I suggest that the authors point out this application of their work in the manuscript.

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The results are also of interest to the cryosphere community in that it demonstrates how each ice mass contributes to the global pattern of sea-level change. However, in this respect the advance on previous studies is less clear. As the authors point out, many previous studies assumed simplistic melt scenarios (e.g. uniform thinning). These results are clearly an improvement in this regard. However, the authors do not show the difference between their improved models and the more simple scenarios considered previously. I think this is warranted. Ideally, difference plots should be shown to explicitly demonstrate the errors made when, for example, a uniform ice thinning scenario is adopted. This will also be of interest to the groups that generate these types of predictions.

A few more specific comments: (1) As pointed out by Dr. Oerlemans, the title is misleading. The suggested change is appropriate. (2) Again, as pointed out by Dr. Oerlemans, the spatial signature will not be time invariant as the authors mention (first paragraph of Introduction). This part of the text should be revised accordingly. (3) The non-uniform effect of changes in gravity due to ice melting go back to a study by Woodward (1888) not Clark and Lingle (1977). Clark and Lingle were the first to include gravitational and isostatic processes in this type of study. (4) I think a short conclusions section would be appropriate to bring out the key contributions of this work – as suggested above.

Woodward, R. S. On the form and position of mean sea level. US Geol. Surv. Bull. 48, 87-170 (1888).

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Interactive comment on The Cryosphere Discuss., 4, 1593, 2010.

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