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The Cryosphere Discussions

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

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Response to referee 1.

This referee makes two key points: 1) the use of our RSL patterns as targets for the sea level community combined with steric estimates 2) What the difference is between a uniform mass distribution (e.g. (Mitrovica et al., 2001)) and our observed mass distribution (Fig 1).

1) We will deal with this main points first and then discuss the minor points raised. We agree with 1) and have added text to emphasise this point. We note, however, that ocean dynamic effects can be large as are, to a lesser extent, the uncertainties in estimates of the steric contribution (Yin et al., 2009;Willis et al., 2008). As a consequence,



the signal to noise ratio is poor and it will, likely, require more than a decade of current rates of ice sheet mass loss to identify the signatures in the open ocean. The prospects for observing the fingerprint in tide gauge data may be better but these are afflicted by coastal currents and localised loading effects that also present challenges.

2) This is a good point and a key improvement over earlier analyses. We have added a set of additional figures to the main text to illustrate the difference between a uniform and localised mass distribution over the ice sheets (Fig 3).

Minor comments. Others have commented about the title and we agree that it needs to be changed. We also agree that the claim that the spatial pattern is time invariant is overstated and have reworded this section. We have added the reference to Woodward, as suggested.

Mitrovica, J. X., Tamisiea, M. E., Davis, J. L., and Milne, G. A.: Recent mass balance of polar ice sheets inferred from patterns of global sea-level change, Nature, 409, 1026-1029, 2001. Willis, J. K., Chambers, D. P., and Nerem, R. S.: Assessing the globally averaged sea level budget on seasonal to interannual timescales, J. Geophys. Res.-Oceans, 113, C06015 10.1029/2007jc004517, 2008. Yin, J. J., Schlesinger, M. E., and Stouffer, R. J.: Model projections of rapid sea-level rise on the northeast coast of the United States, Nature Geoscience, 2, 262-266, 10.1038/ngeo462, 2009.

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