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Interactive comment on "Century-scale simulations of the response of the West Antarctic Ice Sheet to a warming climate" *by* S. L. Cornford et al.

Anonymous Referee #2

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This paper studies the evolution of the West Antarctic Ice Sheet (WAIS) using the ice sheet model, BISICLES, which is driven by atmospheric and ocean model predictions. It is well known that numerical simulation of the grounding line migration needs a high level of horizontal resolution. The authors in this paper applied a high resolution regional ice sheet model to each sector of the WAIS and evaluated detailed grounding line migration processes and sea level equivalent ice volume changes in the region. Furthermore, the topic is within the scope of this journal. The result of prognostic runs and estimated sea level changes are also carefully written. Therefore, I recommend this paper for publication provided certain corrections and minor revisions are applied.

Though quantification of ice volume sensitivities on mesh resolution is certainly an

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important result of this study, its presence in the body of the paper detracts from the main thrust. The estimation of sea level values in the coming centuries using the WAIS atmospheric and ocean models is paramount here. With this in mind, I recommend that the section on ice volume sensitivities on mesh resolution be included into the appendix or supplementary information.

I offered these comments based on the current structure of the manuscript. However. I also welcome it to be modified the structure based on the suggestion of another reviewer. If there is no significant change in scientific results, there would be no trouble for publication.

<SPECIFIC COMMENTS>

P1899. L9 - 17. Because ice velocity has a certain range, it is better to report the percentage of the mismatch, not only the magnitude of difference.

P1901. L14 - P1902. L8. Change of stiffening factor also modifies ice velocity, which is adjusted by the inverse method described in 2.4.1. It would thus be possible to move this part into or after that subsection. The rest of this subsection (1902. L9-25) concerns adjustment of surface mass balance. It would be more appropriate to title this subsection as such.

P1903. L23. The authors describe numerical simulation settings carefully in the Method section, however, there is no description on some basic settings, such as the time step of the prognostic simulations, and the vertical coordinate resolutions used to calculate vertical shear stresses. Because the inclusion of the effect of vertical shear is an advantage of this model (Cornford et al., (2013); Fravier et al., (2014)), it is recommended that the authors add this information in an annex.

P1909. L13 - 16. Several different topography datasets are used in this adaptive mesh model. Although Sun et al. (2014) shows that a lower frequency scale topography is more important than a high frequency scale topography, does the result partly depend

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on topography dataset resolution? ALBMAP (5 km resolution) is used in RISFRIS and MBL experiments. The other custom topography map based on Bedmap2 (1 km resolution) is used in ASE experiments. The latter can be more sensitive than the former. For example, one kilometer is one fifth of ALBMAP and just the same size of Bedmap2.

<Figures>

Most figures are clear and possible to understand.

Figure 3. Although it is clear, it is preferable to write what Figure (a) or (b) represent. Figures 15 and 16. It is difficult to distinguish each line even in the on-line document, particularly in the region of the first one hundred years. If possible, use a non-linear scale, a log-scale, or split up the figures.

Interactive comment on The Cryosphere Discuss., 9, 1887, 2015.