Response to the comments of Dr. Fuyuki SAITO.

This paper describes the structure and performance of LOVECLIM 1.2, which is an earth system model of intermediate complexity. The model includes Atmosphere, Ocean, Carbon cycles, Vegetation and Ice-sheet components, and the main characteristics of the components as well as coupling design among them are clearly described.

We would like first to thank the Dr. Fuyuki SAITO for his very positive evaluation and for his comments that will help us to improve the manuscript.

There are a few minor suggestions to be included in the revision, mainly relating to ice-sheet modeling.

There are some experiments using 'uncoupled mode' of ice sheet component. I think you need to explain how ice-sheet (or other component) is managed in the uncoupled mode. I assumed that the uncoupled ice sheet means constant ice-sheet topography and variable water flux from ice sheet depending on the snowfall (to keep the balance of ice sheet mass), but there are several possibilities.

'uncoupled' mode means that the ice sheets are not forced by LOVECLIM output nor are ECBilt and CLIO receiving input from AGISM. In the experiments described in this manuscript, this terminology is used to describe the spin-up procedure of AGISM during the last glacial-interglacial cycle forced by temperature/ precipitation anomalies derived from ice cores.

Similarly, you explain the iceberg model, which is not activated in the present paper. I wonder how calving is treated in the ice sheet model when not activated.

Iceberg calving in the ice sheet model is calculated as the amount of ice that is transported across a prescribed outer boundary and is incorporated in CLIO as fresh water and latent heat fluxes at the ocean surface. When the iceberg model is not activated, the transport of the icebergs is not taken into account so that the latent/freshwater flux release takes place at the oceanic grid point where the icebergs leave the ice sheet. This will be clarified in the revised version of the manuscript.

I agree your description in P341, as 'Land cover changes over Antarctica are not expected for most periods' being studied. However, I wonder how you manage changes in the bed topography of the ocean when an ice shelf grounded or ice sheet floated during your simulation.

The ice sheet/ice shelf mask is updated in AGISM every time step by applying a floatation criterion. The bed topography over all of Antarctica (including ocean/ ice shelf/ ice sheet cover) is calculated from total loading changes (ice+water) from eqs. 18 and 19.

Very minor points.

Table 5. Some units are represented by 'year'. What is the definition of the 'year'? Usually an ice sheet model use 31556926 seconds as 1 year, but using this value may cause inconsistency with other model components. I do not think the difference in the definition of 'year' is significant (as long as you use the perturbation method to couple with the ice-sheet), but I think it good to mention.

Time keeping between all model components is consistently taken care of.

Fig 7. Greenland figure. Lengths of distance in the X and Y direction are different. They should be identical.

The figure got squeezed in the submitted manuscript, the original has the correct proportions. We will checked the final version to be sure that proportions are kept.

Fig 7. surface elevation at the present?

Yes, for illustrative purposes, we display observed ice sheet geometries for the present day. This will be specified in the revised version of the manuscript.

Fig 7. What is the definition of ice-free area? The white regions seem to be ice-covered area.

Ice-free areas are grid boxes where there is no observed ice cover, and these are represented by green-to-brown-to-white colours. In the inset the difference between high elevation ice-free grid boxes (white) and ice cover (grey) is quite clear on the original figure. We will check in the proof of the revised version that this is the case on the published version also.

References P361L26 Sato F is Saito F (forgive me for very minor point, but this is myself so I cannot skip it).

Sorry, this will be corrected in the revised version.