

# ***Interactive comment on “Link between the Surface Mass Balance of the Greenland Ice Sheet and the North Atlantic Oscillation under preindustrial and last interglacial climates: a study with a Coupled Global Circulation Model” by Silvana Ramos Buarque and David Salas y Melia***

## **Anonymous Referee #1**

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This paper shows that the link between NAO and SMB over Greenland has been changed through the centuries by using the CNRM-CM5.2 global model. The paper is interesting to read and deserves to be published in CP. However, some (major) improvements are still needed before publication.

Major:

1. In Fettweis (2007), seasonal 2D correlations with NAO was shown (see Fig 15 and

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Fig16). Such similar figures should be shown with the MAR data used here and the CNRM based present climate reconstruction to check if CNRM is able to simulate the current pattern of NAO impacts on SMB. The validation by using the R value (correlation) shown in Fig 5 and Fig 6 is not enough for me. A 2D validation is needed here as the paper discusses 2D changes in the correlation with NAO.

2. The ERA forced 1979-2012 period is used here as validation for pre-industrial climate but since the end of the 1990's, we have observed a switch of NAO toward negative value in summer as remembered in this manuscript. This issue should be discussed or the period 1980-1999 should be used as validation. This reference period 1980-1999 was selected in Fettweis et al (2013b) for this reason because surface melt GrIS records were observed over the 2007-2012 period (included in the reference period used here) which is not representative of the present or pre-industrial climate.

Minor:

1. Fig1: What is the interest of showing the whole globe while only the North Atlantic area is discussed here ? A zoom over the area of interest will be more useful.
2. Fig2: as only positive values are shown, the legend could be adapted.
3. As said earlier, what is the interest of showing Fig 5, fig 6 and Fig 11. Only the statistics listed here are useful for me and can be put in a table. Are there any trends in the CNRM based time series? Over 1979-2012, the MAR based SMB should significantly decrease as well as the JJA NAO index.
4. Why Fig 12 and Fig 13 are black and white and not in colour? Why only the correlation with accumulation is show over summer in Fig 12? Over these figures, it is difficult to distinguish which is significant or not.
5. Section 4.3 : Fig 11 and Fig 12 are referenced in the text instead of Fig 12 and Fig 13 (ex: line 284).

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