

Interactive comment on “An abrupt slowdown of Atlantic Meridional Overturning Circulation during 1915–1935 induced by solar forcing in a coupled GCM” by P. Lin et al.

Anonymous Referee #2

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Review on the manuscript "An abrupt slowdown of Atlantic Meridional Overturning Circulation during 1915-1935 induced by solar forcing in a coupled GCM", by P. Lin, Y. Song, Y. Yu and H. Liu.

General comments In the study is described and abrupt slowdown of the Atlantic Meridional Overturning Circulation (AMOC) identified in a numerical simulation with a Global Ocean-Atmosphere-Land System model. It is argued that the AMOC weakening is induced by the solar forcing. A significant rapid change in TSI after 1910 is not clear and the proposed links between the changes in the solar forcing and the AMOC weakening are not convincing (please see below). The text needs significant improvement. Therefore I can not recommend publication of the manuscript in its present form.

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Specific comments In Fig. 2a the differences in sea ice concentration are close to zero in the Labrador Sea. Then what is the significance of this composite map? In Fig. 2 are shown differences between 1920-1930 and 1910-1920, whereas in Fig. 4 the differences are between 1913-1917 and 1900-1912 averages. Why are used different periods to calculate the composite maps in Figs. 2 and 4? The TSI changes around 1900 do not indicate an abrupt behavior. For example, the TSI increases after 1954 and after 1975 have much larger amplitude than that after 1914. Why there are no AMOC abrupt weakenings after 1954 and 1975? An increase in TSI could initially warm the SST in the tropics, but this would be then attenuated by the associated clouds induced by increased convection (as a negative feedback). The increase of the NAO index around 1915 is associated with increased westerlies over the Labrador sea. This should decrease the SST and result in increased density (through a thermal effect) and convection, and consequently in an AMOC increase, but not a weakening as is shown in Fig. 1. The discussion and conclusions should be separated and clearer.

Technical corrections Abstract "The weakened AMOC can be explained in the following" - needs reformulation. Introduction, para 1 "The Atlantic meridional overturning circulation (AMOC) is a major thermohaline circulation characterized by ..." - needs reformulation. Introduction, para 2 "The abrupt slowdown of AMOC had been found in the paleoclimate proxy records ..." - need reformulation. A wealth of abrupt climate changes were identified in paleoarchives. Introduction, para 2 The questions formulated at the end of the paragraph are not clear. - they need reformulation. Section "Reasons for abrupt slowdown", para 3, last sentence: "reductive DC" - needs reformulation.

Interactive comment on Clim. Past Discuss., 10, 2519, 2014.

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