Dear editor,

We thank the editor for the careful review of our paper, and the suggestions. Our detailed responses to the comments are shown in blue, and the resulting changes to the manuscript are shown in green.

On behalf of all co-authors,

Jinhwa Shin

Comments to the author:

Thank you for your comments on the reviews and for your revisions to the manuscript. Although I share the feeling of the reviewers that you are overstating the robustness of the millennial variations you discuss, i think there are now enough caveats that the data can safely be published and readers can draw their own conclusions. There are two issues where further edits are needed. I refer to line numbers in the clean, final pdf:

1. Line 256-7. "However it is the case that large variations of solar forcing at ~11.1, 10.1 and 8.3 ka. The 14C production rate and 10Be flux are correlated with CO2 at ~9.1 ka on submillennial time scales." This doesn't make sense - the first sentence doesn't finish and the second sentence refers to a correlation at a single time point. Please check and edit this paragraph.

The paragraph is revised to: In this study, we observed that atmospheric CO_2 is highly anti-correlated with the ^{14}C production rate and ^{10}Be flux on millennial time scales with CO_2 time lag during the early Holocene (Figure 3). The local minima of atmospheric CO_2 highly match with the local maxima of the ^{14}C production rate and ^{10}Be flux (minima in solar activity) at ~11.1, 10.1 and 8.3 ka. The phenomena might be related to large variations in solar activity. However, the relationship between solar forcing and atmospheric CO_2 is different at ~9.1 ka. The ^{14}C production rate and ^{10}Be flux are positively correlated with CO_2 at ~9.1 ka on sub-millennial time scales, indicating that atmospheric CO_2 was in a local minimum at ~9.1 ka when solar forcing was relatively high.

2. I understand that you restricted correlations between CO2 and other climate records to 11.45-7.45 ka. Did you also do this for the correlations (lines 115 and 128) between ice core records? In any case, what is relevant for assessing whether the millennial variations you see are robust or not is the correlation of the filtered/detrended records (as shown in Fig 2B). I would be very surprised if these are as high as you cite. Please cite the correlation coefficients of the filtered records. Please also reconsider the phrase (line 126) "We observe that CO2 data sets from Siple Dome and Dome C share similar trends in CO2 variations despite the CO2 offset in longer term means of 3–8 ppm". To me the blue line (SD) and the red line (EDC) do not share the same millennial peaks, rather they are offset, and you should acknowledge that.

Yes, I calculated correlations between Siple Dome and other CO_2 records from WAIS Divide and Dome C with their 250-running means. As you suggested I also calculated the correlations with the filtered CO_2 records.

Line 116 is revised to: The correlation coefficient between Siple Dome CO_2 and WAIS divide CO_2 during 11.45–9.02 ka is 0.02 ($p = 0.28$)

Line 126 is revised to: The CO_2 record from the Siple Dome is roughly correlated with the CO_2 record from Dome C during 11.45–7.45 ka ($r = 0.42$, $p < 0.001$). We observe the CO_2 offset of 3-8 ppm in the 250-yr running means.

Please address these two points and I should be able to accept the paper.