

Interactive comment on “How does sea ice influence $\delta^{18}\text{O}$ of Arctic precipitation?” by A.-K. Faber et al.

Anonymous Referee #2

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In this manuscript, the authors investigated the impact of sea ice and SST distributions in an isotope-incorporated general circulation model (IsoCAM3). The results indicated that less sea ice leads more enriched $\delta^{18}\text{O}$ in precipitation, but mostly over the areas where sea ice changed. Inland areas, such as central part of Greenland, there was almost no change in $\delta^{18}\text{O}$ in P. That was a unique finding of them because previous studies showed that at central Greenland $\delta^{18}\text{O}$ changed by surface temperature.

However, in my opinion, it was premature to conclude there was almost local impact only on $\delta^{18}\text{O}$ in Greenland. The experiments they conducted were using the same SST and sea ice distribution over non-Arctic regions. The atmospheric fields of four experiments could be essentially very similar each other over not only non-Arctic but also Arctic. If so, the impact of sea ice could be only local because the general circulation was constrained. In other words, sea ice had little impact to the large scale moisture

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transport.

Therefore, this reviewer would like to request the authors to conduct additional experiments using globally different SST and sea ice distribution in addition to the current experiments. By doing so, it can be concluded that whether $\delta^{18}\text{O}$ over Greenland cannot be influenced by SST and sea ice over the region. I believe that this is a main reason of the difference from previous studies (i.e., $\delta^{18}\text{O}$ change over Greenland was insignificantly related with sea ice change). That is my major request.

There are relatively smaller requests, too.

1. L67: What is third-generation isotope scheme?

2. L82: How did the initial condition prepared?

3. L90: As written above, Arctic oceanic surface boundary conditions may not so significantly influence the general circulation. Please check.

4. L115: I could not understand, “this would also smooth out naturally occurring SST gradients”.

5. L127: In addition to Figure 3, please show anomalies of precipitation.

6. L201: It is hard to see the anomalies in wind speed from Figure 7.

7. L255: From the experiment, there was no impact in $\delta^{18}\text{O}$ over central Greenland. However how about the real situations? There is no temperature change, too? Please check.

8. L314: How about temporal tendency in Delta- $\delta^{18}\text{O}$ and DeltT? How about in reality? Please check.

9. L319: What's the major difference in this model compared to Sime et al. (2013)?