Review Hoffman et al. 2023

Hoffman et al. present GNSS records from the Thwaites Glacier region. They highlight the benefits of this equipment over AWS. They make composites of reanalysis parameters at the time and before extreme accumulation events. They show that blocking events with distant origins is important in blocking the westerly flow and channeling humid air masses into WA.

I suggest that the manuscript get accepted with minor revisions.

- L 196. Are these seasonal differences significant? The authors write in the response that they are significant, but it is not enough to just state that they are significant. Please, provide a p-value and which test has been used. That is, specify at what level it is significant to the main text of the article (not suppl. m.) (e.g. $p<0.05$). If it is not significant, just say that the relationship is weak, because the time series is short, and this is a bit speculative. Provide the r and p-values in the main text.

- Gaps in record. 2941 days is 8 years, and 3282 days is 9 years. Provide the length as years too, that way it is easier to see how long they are. It is a great record, but it is wrong to describe it as over 10 years of continuous data. What are the gaps caused by storms?

- ERA5 anomalies. "Anomalies were calculated by subtracting the historical seasonal means for the observational period (2009–2022)". The whole period of reliable data 1979-2022 should be used when you calculate the anomalies, not just 2009-2002.

l. 13. …Rosby wave train…

l. 26. e.g. not i.e.

l. 44. Interannual blocking variability has been linked to marine air intrusion and accumulation variability recorded in the Roosevelt Island Ice Core, West Antarctica ~~using automated weather stations.~~ AWSs were indeed used in this study but it doesn't fit here at the end of this sentence.

l. 82. Figures

l. 90. Insert a major header for the method section first "2. Methods".

l. 92 The stations' names have already been defined. No need to do it again here. Or at line 199.

l. 125 I would suggest that you don't refer to the figures here. It's enough to say something about the type of result that will come but don't go into too much detail. It is better to wait to refer to the figures in the results.

Figure 2d, is the black line in the time series from a running mean? Is it possible to make the time series less blurry? Capitalize the stations' abbreviations in the legend.

Are the supplementary figures and tables listed in the order of appearance?

Figure 3 caption. R_h not RH?

l. 164 The B term could be explained earlier, eq. 6?

l. 155 Could the Metropolis-Hastings algorithm be described as machine learning? I'm not an expert in regards to the GNSS method, but your description sounds like self-learning and I see the cost function in Figure 3. If it is ML maybe write so to boost the search hits for the article.

l. 176. "Kohler Glacier site is included"

l 192. Check the header structure. The results section should have a new major header (3 Results) and not continue with 2.3.1.

l. 199. "and minimum in November…"

l. 208. Use "meters above sea level (m.a.s.l.)".

Figure 4. The figures don't appear in the order that they are presented in the text. Perhaps it would be easier if you mainly wait to introduce the figures until the results.

Figure 4. … height (grey contours)...

Fig. 4. …(cyan-green contour) with the guiding 500 hPa geopotential height (grey contours)...

Figure 4. Explain the graph to the right. Shows cumulative accumulation and the vertical dashed line indicates the timing of the atmospheric river event.

Figure 5. capitalize the letters in the station abbreviations.

Figure 6. Delete the first part here. ~~Interannual accumulation and t~~ The seasonal accumulation cycle…

Figure 7 caption. …500-hPa geopotential height (grey contours)…atmospheric river event (cyan-green contour)

Figure 7 (D, E). Is there any significance to the fitted linear regression lines? I'm not questioning the relationship but it might not be significant for these measurements where there is a fair amount of spread in the data.

Figure 8 (A, D). Why isn't there any stippling for the blocking frequency? Make the significant test here too.

l. 231., l. 233., l.293. Remove "spring" since it is not a season that is presented results for.

l. 259. "500-hPa pressure level composites were analyzed across the Southern Hemisphere to for the significance of tropical teleconnection"?

Figure 11. "the numbering of the days indicates the days before the extreme precipitation events"

Figure 11. How come there is stippling where the anomaly is close to zero? Perhaps something spurious with the SST anomalies in the sea ice zone near Antarctica. Filter out outliers?

l. 319. Suggested change "Significant sea surface temperature composite anomalies observed in the Atlantic and western Indian Ocean preceding extreme precipitation using the GNSS-IR record are consistent with the propagation paths of eastward propagating Rossby waves modeled in the Southern Ocean by Li et al., (2015)."

P. 18-19 Disucsion about Rossby wave trains. Check if this part can be written more clearly. Split up long sentences. Can you add some explaining arrows to the plots perhaps to show the direction of the propagation?

l. 330. This is a too-sweeping general statement. Perhaps correct for the Thwaites region, the area of investigation here, but not for all Antarctica ice cores. A standard check before (or at least afterward) an ice core site is proposed would be to check for seasonal bias.

l. 335. “aquifer”?

l. 362. Delete “interrogate”, “investigate” sounds better.

l. 363. “…that precedes the GNSS extreme…”

l. 372. “events”?

Supplementary material

Table 1. Column 4 name: “days (for which accumulation can be extracted and averaged)”.

ERA5 anomalies. “Anomalies were calculated by subtracting the historical seasonal means for the observational period (2009–2022)”. Please use the whole period of reliable data 1979-2022 when you calculate the anomalies.

Move section 3.2. Significance testing into the method section of the main text. Does the test consider autocorrelation? You give a reference for spatial autocorrelation but is regular autocorrelation in time considered?

Comments on the author's response

- Emanuelsson et al. first established the relationship between high-pressure anticyclones and accumulation with the RICE ice core records. Then they checked the details of the mechanism using the AWS records and ERA-interim reanalysis composites, e.g. using Z500. Then the spatial validity of the relationship was checked by checking the relationship for several West Antarctica sites: WDC, ITASE 2000- 5, and ITASE 2001-5.