

Response to Editor's Comments

We appreciate editor's comprehensive review and helpful suggestions for improving this manuscript. The response to editor's comments is below.

General.

** For clarity, I suggest to use "sea ice" instead of "ice" in every relevant mention... as recently many confusions between "sea ice", "ice sheet" and similar occurred... especially by non-experts. (Optional)*

Done

** Provide area (in km²) for each of the "black boxes", at first mention.*

~100000 km²

** Pls be consistent in the use of "i.e.," and "e.g.," noting fullstops and commas.*

Done

** Apply consistent hyphenation, i.e., my preference is, for example, "sea-ice motion". -> Be consistent throughout the manuscript.*

Done

** Suggest to add an "Acknowledgement" section for data or information used. Suggest to also acknowledge contributions of (three reviewers).*

Done

** Note: References not checked.*

** Note: Figure captions not checked.*

** Note: Some labels/titles of figures are too small to read.*

47: Suggest to remove ", which is a primary goal of this paper". Done

53: Replace "deserves more studies." with "requires further investigation." Done

60: Replace "when ARs happen in the Arctic" with "associated with Arctic ARs". Done

60: I understand why you replace "Novel aspects" with "Originality" but recommend to revert to the earlier wording via "A novel aspect". Done

61: And replace "includes revealing" with "reveals". Done

61: Add "the" to read "and the AR's wind effect". Done

61: Remove "change". Done

61/62: Replace "on weather timescales" with "at synoptic timescale". Timescale is weather, and spatial scale is synoptic.

66: Replace "applications to" with "implication on". Done

68: Suggest to replace "influence" to "contribute to". Done

69: Replace "and dynamic winds" with "as well as dynamic winds". Done

123: Replace "lowest ever observed since satellite observations started in 1979" with "lowest in the satellite record". Done

124: Replace "Before that, an Arctic cyclone ... (Simmonds and Rudeva, 2012)." with "This was preceded between August 5 - 12, 2012 by a severe Arctic cyclone, one with deepest central pressure (966 hPa) since August 1979 (Simmonds and Rudeva, 2012)." Done

126: Replace "AR entered" to "AR arrived in". Done

128: Correct "decreases" with "decreased". 129: Correct "enters" with "entered", "reaches" with "reached". Done

131: Correct "is" with "was". Done

132: Add information on how you inferred the NE surface winds. I.e., "(inferred from sea level pressure from the geostrophic balance)". Done

132: Correct "push" with "pushed". Done

134: Change "Coincident with ... (Figure 1cd)." with "This coincided with strong downward sensible and latent heat fluxes near the sea ice edge, driven by warm and moist air and high wind speed at low levels within the AR (Figure 1cd)". Done

136: Add and correct "near the ice edge is also" to "near the sea ice edge was also". Done

138: Remove "cover" to read "over sea ice". Done

139: Correct "are" to "were". Done

140: Replace "gives" with "provides". Done

140: Suggest to replace "can be the" with "may be the". Done

141: Change "ARs." to "an AR." Done

141: Change "In contrast, most former... and clouds" to read "This is in contrast to prior studies, which identified dominance of downwelling longwave radiation in relation to water vapor and clouds". Done

Figure 1a: The black box is VERY small... need to enhance it... ie with an arrow pointing towards it? -- Also bad to have the "black box" and the "black 15% SIC contour". The figure will be modified once software can be accessed.

149: Add note in caption (Fig. 1) about the black box in 1a. Done

154: Is this needed? Here in the caption? If not, I suggest to remove "Time is in UTC." Done

165ff: Replace "Figure 2... shortwave component." with "In the Chukchi Sea anomalies of the turbulent heat flux during the event collocated with IVT anomalous (Figure 2), whereas significant radiative anomalies occurred throughout the domain especially for the shortwave component." Done

175: Shorten by removing "In order", and "also". Done

177: Remove "cover" from "sea ice cover" to read "sea ice". Done

180ff: Change "The effect ... by winds." to read "In the Western Arctic Ocean, the cyclone extensively reduces the sea ice over its life cycle, corresponding to strong IVT, atmospheric warming (enhanced sensible/latent heat fluxes and longwave radiation) as well as by sea ice advection driven by winds." Done

185 - 190: This addition seems to contradict itself. Pls streamline and ensure to deliver a clear argument.

For example, change to: "While our study focusses on ARs and their effect on Arctic sea ice, the roles of cyclones/anticyclones in sea ice changes is complex and varies between seasons and regions. For example, Wernli and Papritz (2018) showed that enhanced sea ice melt during Arctic summer is related to polar anticyclones as well as extratropical cyclones, however, overall

cyclones seem to have less effect on sea ice than long wavelenngth atmospheric waves (Hofsteenge et al., 2022), i.e., those associated with ARs." Done

196: Correct "is chosen" to "was chosen". Done

197: Correct to read "before the arrival of the cyclone". Done

199: Remove "The time series shows that" to read "The sea ice concentration...". Done

201: Correct "occurs" to "occurred". Done

202: Correct "are related" to "were related". Done

203: Correct "enhances" to "enhanced". Done

204: Correct "This AR event on Aug 5, 2012 over the black box" to "Over the black box the Aug 5, 2012 AR event". Done

206: Correct "separate thermodynamics and dynamics of ARs" to "separate into thermodynamic and dynamic of AR components". Done

207: Change "shows a prominent peak" to "peaks prominently". Done

211: Clarify by changing "peaks" to "maxima". Done

212: Change "when the AR arrives on Aug 5, 2012." to "as the AR arrived on Aug 5, 2012." Done

217: Clarify by changing "averaged over" to "area averaged over". Done

220: Clarify by changing "averaged over" to "area averaged over". Done

221: Not sure if the following information is really needed: "Time is in UTC, and dates marked on time axis represent 00:00 UTC." Deleted.

223: Correct "decreases" to "decreased". Done

233: Change "We study... (Fetterer et al., 2017)." to "The second lowest sea ice extent minimum (recorded in 2020, based on the NSIDC sea ice index (Fetterer et al., 2017)) is also investigated for its relation to AR forcing." Done

237: For consistency change "Jan" to "January". Done

268: Pls check contradicting wording "decreases GRADUALLY" when contrasting to Aug 2012. I think that is the case.

267: Remove "first" from "the first case". Done

289-291: Avoid single sentence paragraph. Consider merging with next paragraph or later discussion. Merged with next paragraph.

287-289: "Our future work will examine the relative contribution of water vapor/heat transport and local warming/moistening in sea ice decline in the Arctic." -> Consider moving to the final section (outlook) of this manuscript. Moved to discussion.

293: Remove "While". Done

294: Change "here we extend" to "which we extend here". Done

294: Remove "more" from "more general". Done

294: Replace "for 40 years" with "spanning four decades". Done

328: Replace "40 years" with "four decades". Done

329: Add "the" to read "from the daily time series". Done

331: Change "15% and 85%" to "15 and 85%". I think 15% is more accurate.

332: Change "15% and 80%" to "15 and 80%". I think 15% is more accurate.

332: Add reference for "definition of marginal ice zone". Done

339: Provide reference and/or stats method for "all with p-values <0.01". Done

340-41: Change "The big red ... 1981-2020." to "The AR event from Aug 5, 2012 (big red dot in Figure 8a) stands out as an extreme event during 1981-2020." Done

365 and prev lines: Change "indicates" to a much stronger term, similar replace "good agreement" with "the congruent argument" or some strong term... and make the lines much stronger. Done

387: Change "to each grid box" to "to all grid boxes". Done

396: Change "15% and 85%" to "15 and 85%". I think 15% is more accurate.

426: Typically one would first have the "discussion" followed by the "conclusion. Change to "Discussion and Conclusion". Done

432: Change "formed by" to "associated with". Done

434: Remove "dynamic" from "dynamic sea-ice motion". Done

435: Change "ice margins" to read "the sea-ice margins". Done

436: Add "here" to "(not shown)" to read "(not shown here)". Done

439: Correct "across seasons as well." to "year-round." Done