Review of EGUsphere-2025-3690

The observed evolution of Arctic amplification over the past 45 years

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Overview: This study provides an update on the evolution of seasonal Arctic amplification (AA) during 1980 to 2024 using output mainly from ERA5. AA is calculated as differences between monthly mean Arctic two-meter air temperature anomalies (both pan-Arctic or individual Arctic gridpoints) and global-average two-meter air temperature anomalies. It should be noted this metric differs from that used in some other studies based on ratios of Arctic-to-global pace of temperature changes. While this manuscript provides no new revelations about Arctic amplification, it is a worthwhile addition as an update through 2024, especially the local amplification anomaly (LLA) metric that helps elucidate "hot spot" regions of AA in connection with sea-ice variability and horizontal advection. I don't have any major concerns or suggestions, and after addressing numerous minor suggestions/corrections/comments listed below, I recommend the manuscript be published.

Specific comments and suggestions

1. In many instances while reading the text, if found the tense confusing or awkward. Past events and conclusions from past papers were often described with the present tense when it seemed past tense was more appropriate. I request the authors reread the manuscript and decide which tense is indicated and be consistent throughout.
2. Add units to color bars in all plots. Labels on color bars are too small.
3. Line 59: Misplaced parenthesis
4. Figures 1, 2, 3, 4, 8, 9: I suggest removing some longitude labels (maybe every 10 or 20 degrees instead of 5?) to look less cluttered, and please add labels on some latitude lines.
5. Fig. 2: The plot for Sept is duplicated.
6. 110: "limiting" seems like an odd word to use here. Fluxes are always limited – maybe "reducing" is better?
7. 113: Please add a reference for thinning ice cover.
8. 116: Replace "of much of" to "over much of"
9. 137: Are the units of global anomalies in degrees per decade or per year? Please specify units in Table 1.

10. 139 and 141: Is Arctic defined as poleward of 50 or 60N?
11. Table 1, row 3: should be 2000-2009? Row 4 should be 2010-2019. Please specify units in table title.
12. 145: It would be valuable IMO to point out that AA can also enhance cooling, as presented in Table 1. Usually AA is understood as amplification of warming, but it can go both ways and has in the past.
13. 146: To increase clarity, I suggest beginning this sentence with: “During the decade at the middle of the baseline period…”
14. 157: “now” is confusing and extraneous here.
15. 165: It seems the comma after “values” should be a hyphen?
16. 187: “Regressed” has a specific statistical meaning, so I suggest replacing it with “decreased” for added clarity.
17. 193: Add “period” after 2010-2019
18. 193-194: “grow” appears twice in grown and growing
19. 197: I suggest adding “pan-Arctic” before “AA is somewhat smaller” if that is what is meant.
20. 204: Two “promotings” in this line
21. 227-228: Three “used” in this sentence
22. 233: I believe this should say “latitudes” 75-80N. Why is this latitude range so narrow? The zonal pattern of AA in SON and DJF is substantially wider.
23. 240: Although December anomalies are less vertically extensive, it may be worth noting they are likely to have a bigger impact on fluxes because of larger difference in temperature between the surface and air above.
24. 252: Perhaps note here that summer inversions are elevated? It seems contradictory to say summer inversions are shallower but accompanied by a deep mixed layer.
25. 256: I’m not sure this will be obvious to readers. Please explain how this plot illustrates variations in stability with latitude. Even better would be a plot of the vertical gradient in theta versus latitude.
26. 260: The decrease in cloud cover and moisture content from autumn into winter also tends to increase radiative cooling to space.

27. 263: Table 1 illustrates that AA can be negative, so perhaps “progresses” is not appropriate word here. Amplified warming might be clearer.
28. Figs. 7, 8, and 9 captions: add units.
29. Figs. 8 and 9: I suggest changing color scales to be just negative for left plots and just positive for right plots to more clearly display spatial variations.
30. 273 and 306: Units are unclear. “Over 1000-850” not clear – I believe it should be K/hPa. K/hPa is not a trend – what is unit of time? There’s a typo at ends of these lines: “numbers in for the…”
31. 282: The word “trend” appears often in these lines – how about changing “downward trends” to “declines”?
32. 284: Remove one “October”
33. 285: Are these fluxes turbulent or just sensible? Do you mean upward fluxes have increased?
34. 290: Ditto.
35. 296-302: This information is pretty old (2012 paper). Maybe MERRA-2 is better? Please add more up-to-date information if it’s available.
36. 315: I think “they” should be “it” to agree with “any process”