

Responses to reviewer comments

We thank the reviewer for their time and thoughtful comments on the manuscript. Responses are below.

Reviewer #1

Thank you to the authors for their thoughtful responses to all the reviewer comments. The clarifications and discussion added has improved the manuscript. I believe the paper is very close to being ready for publication, and my only remaining concern requiring some additional clarification is outlined below:

General comment:

The definition of complete data coverage (i.e., “where all twelve months have at least one hour with precipitation type codes of any phase reported”) is still a slightly unclear. This definition given suggests that as long as one hour of precipitation is present, then the month is included as complete, regardless of if all other data for the month is unavailable. If this is correct, then this is a very low threshold to use for defining complete data coverage. For example, WMO standards suggest requiring no more than 11 days of missing data and no periods of 5 consecutive days of missing data for a month to be complete (Section 4.4 of <https://library.wmo.int/records/item/55797-wmo-guidelines-on-the-calculation-of-climate-normals>). Would the results found here be different if more stringent data completeness requirements were applied?

We agree this is unclear and does not describe our screening process fully. The text has been updated to say the following:

“A difficulty with using the ASOS record is that stations only report precipitation type if there is a precipitation event. We use 2 m air temperature to screen for months with less than 90% of days reporting to identify when stations are off-line. Months that do not meet this criteria are set to missing. We then count the number of precipitation events of all precipitation types in each month that pass the screening. A year is considered to have a complete record if there is at least one hour in each of the twelve months. The reason for this low threshold is that it is not unreasonable that a month can have just one day with precipitation, where the rain event lasts only one hour.”

Technical comments:

Line 297-298: The definition of “complete year” appears to be incorrect – should it be a year in which every month has at least one hour of precipitation of any phase (currently doesn’t say month in this sentence)

The sentence has been clarified as such:

“A complete year is defined as a year in which at least one hour per month has precipitation of any phase.”

Line 618: suggest including “For example,” before “on February 2, 2025” for a smoother transition

Done.

Figures 7/8: Is it possible to include some form of units for each panel (i.e., % of month for the top left panel, % of total precipitation for the other three panels), either within the figure or caption. This might help ease interpretation of these figures.

The figure captions have been clarified and units added.

Line 895-897: This sentence is slightly unclear – is the 4-5% increase annual or over the entire period? For example: “Analysis of the full-length ERA5 record shows a statistically significant linear increase in the ratio between convective and total precipitation of 4-5% since 1950 in this area.” or something similar

The increase is over the entire period. This has been clarified in the text.

Reviewer #2

We thank the reviewer for their time and thoughtful comments on the manuscript. Responses are below.

The authors have addressed the reviewer comments to my satisfaction. I appreciate the expanded discussion and additional clarifications in the text, and the figure captions are much improved. I think the article reads well, and as such, would be suitable for publication. I just have some very minor line-by-line comments below (minor phrasing suggestions, etc.), but nothing that I think requires further review.

Line by line comments:

L32: “and how precipitation totals and its phase are changing” reads a bit awkwardly to me since “precipitation totals” is plural, consider omitting ‘its’ (“how precipitation totals and phase are changing”) or otherwise rephrasing.

'Its' was omitted from the sentence.

L109-110: I suggest rephrasing to "Impacts can be immediate (such as on travel), evolving, or cumulative."

Rephrased as suggested.

L451: I suggest adding a comma after "Station" and removing the comma after "sheet"

Done.

L955: "especially autumn" -> "especially in autumn"

Fixed.

L1050: 80°N -> 82°N

Fixed. Thank you for catching that.

L1067-1068: "snowfall fractions based ICOADS records" -> "snowfall fractions based on ICOADS records"

Fixed.