

2nd reply for egusphere-2025-1724

Case study of a long-lived Siberian summer cyclone that evolved from a heat low into an Arctic cyclone

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22 September 2025

We are grateful to the reviewers for their additional constructive comments and are glad that our initial revisions have satisfied most of their main concerns. Based on the reviewer's comment, we improved the justification of the chosen threshold of 75% for the selection of our Siberian summer cyclones.

This document presents the reviewers' comments in blue and our responses in black.

Reviewer 1

I remain concerned about the generality of the choice of the two geographical boxes and the 75% lifetime threshold, particularly regarding contamination from the North Pacific storm track (another reviewer raised a similar comment). The authors' response is that changing the threshold to 90% removes their case study cyclone.

- The criterion seems to have been chosen to ensure the inclusion of a specific event, rather than being based on an objective definition of "Siberian cyclone." While the authors added a sentence to the manuscript explaining the choice, it does not resolve the underlying issue that the selection criteria might be arbitrary.

We thank the reviewer for this comment. We agree (as we did before) that our criteria are to a certain degree arbitrary, or as we prefer to put it, subjective and pragmatic. As far as we know there is no standard definition of "Siberian cyclones" and therefore we came up with a simple and pragmatic approach. We would like to make the point that such a degree of subjectivity pertains to all cyclone climatologies. Most of them, for instance, use a minimum lifetime criterion, which can be 1 to 3 days, where the latter clearly excludes many shorter-lived cyclones from the climatology. These choices are often not fully apparent to readers and users of climatologies, but they are always existing. Coming back to our approach, which asks for 75% of the cyclone track to occur in a "Siberian region", we still regard this choice as meaningful. In our view, it would not make sense to use a higher threshold, because we don't want to exclude cyclones (like our case study), which spend many days in Siberia, but happen to have a much shorter early or late phase of their lifecycle, which is outside the domain.

- The authors could provide a stronger, more objective justification. For example, they could show a plot of genesis locations and track densities for all cyclones to demonstrate that the 75% criterion effectively isolates a distinct population of cyclones that primarily evolve over Siberia, as opposed to those that quickly transition into the Pacific storm track.

We thank the reviewer for these suggestions. In addition to the locations of genesis (which is also shown in Fig.1 in the manuscript), we also show here – for all Siberian cyclones selected with our approach and the 75% threshold – the locations of maximum depth as well as the locations of lysis (Figs. R1, R2, R3). The figures clearly reveal that the selected cyclones are successfully confined to our area of interest, and few to no cyclones enter the North Pacific storm track. We added this information in the manuscript: “Although, the threshold of 75% was chosen pragmatically, additional analysis of the locations of genesis, maximum depth as well as lysis of the selected

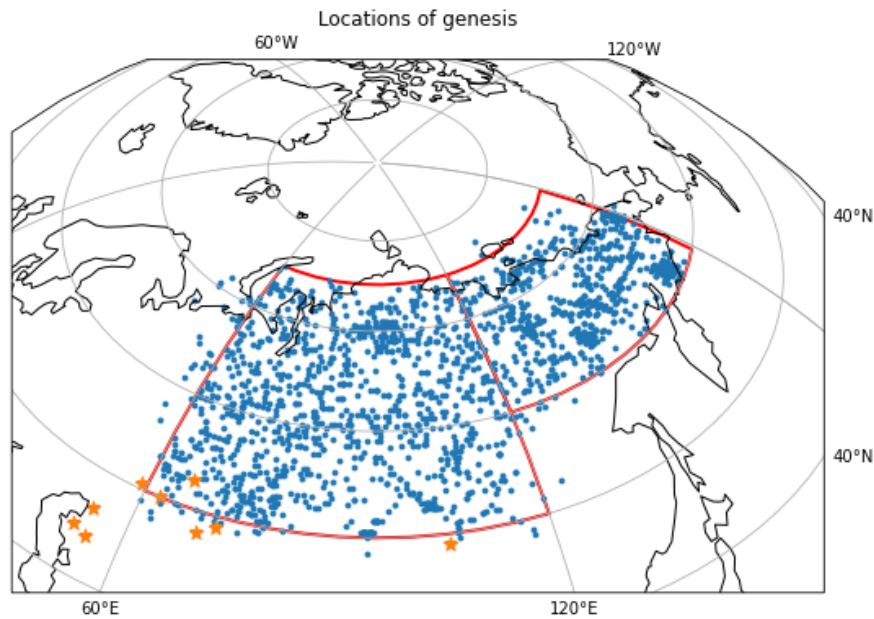


Fig. R1: Genesis locations of the Siberian summer cyclones selected with our pragmatic approach. Blue dots show regular Siberian summer cyclones, orange stars indicate the genesis locations of the 9 Siberian heat lows. The box used to select the Siberian summer cyclones is shown in red.

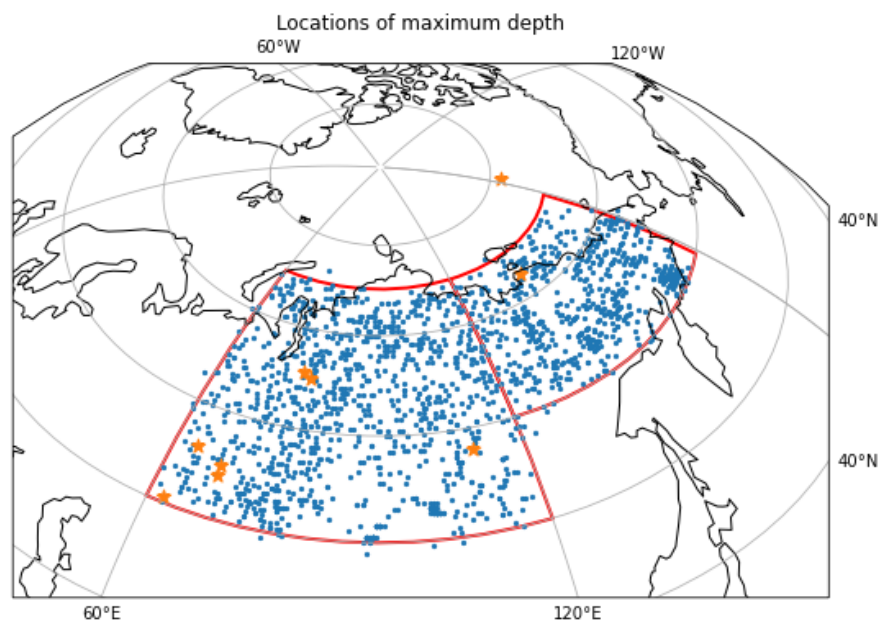


Fig. R2: As Fig. R1 but for the locations of maximum cyclone depth.

cyclones confirmed that this threshold successfully eliminates cyclones moving into the North Pacific storm track and that the selected cyclones indeed represent Siberian cyclones”.

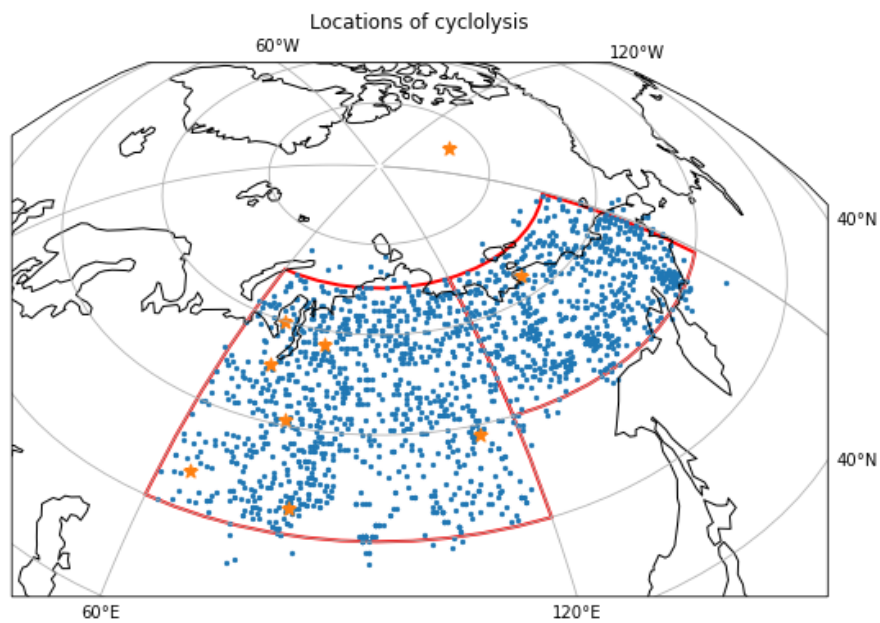


Fig. R1: As Fig. R1 but for the locations of lysis.