Response to Reviewer #2

Manuscript: *The September 2024 Austrian flood in a historical and climatic context*
EGUsphere discussion paper: **egusphere-2025-5435**

We thank Reviewer #2 for the constructive and thoughtful feedback, the positive assessment of the manuscript, and the helpful comments, particularly regarding the figures and wording. We address each of the points below in detail.

Comment 1: "Please check the literature list as it does not seem to be complete. Lauda (1908) (page 2, line 54) is not in the literature list (however, this might be a typing mistake). Also, Godina et al. (2005) (page 2, line 59) and HD NÖ, 2024 (pages 15, line 287 and page 17, line 316) are not in the list. Merz et al. (2014) seems to be missing as well. There is a reference to Penna et al. (2006), which I could not find in the text. You might also want to check on the references to Blöschl et al. (2019) (page 29, line 502), Blöschl et al. (2020) (page 29, line 504), and Blöschl et al. (online 2019, printed 2020) (page 31, line 546), as there seems to be some kind of confusion."

Response: We carefully reviewed the reference list and corrected all inconsistencies. The missing entries (Lauda, Godina et al., HD NÖ, Merz et al. 2014) have been added. The citation of Penna et al. (2006) was removed, as it no longer appears in the main text. The multiple references to Blöschl et al. were consolidated and checked for consistency.

Manuscript change: Reference list updated and checked; redundant citations corrected.

Comment 2: "Line 71. Different word order suggested - Smaller tributary catchments in Lower Austria were hit particularly hard."

Response: We adopted the suggested rewording for improved clarity.

Manuscript change: Sentence revised accordingly.

Comment 3: "Line 97. … to over 3000 m in the Alps. à … to over 3700 m in the Alps."

Response: We corrected the elevation range.

Manuscript change: "...to over 3700 m in the Alps."

Comment 4: "Line 126-Line 136. Some parts of these lines seem to be redundant. Please revise."

Response: We revised the passage to remove redundancy and better streamline the transition to the synoptic analysis.

Manuscript change: Section restructered and overlapping content removed.

Comment 5: "Line 140 (Figure 2) – is it possible to add the overlay of the Danube catchment as a red line? This would make orientation easier."

Response: We agree and added the Danube catchment outline to the figure.

Manuscript change: Danube catchment added in Figure 2; caption updated.

Comment 6: "Line 169 (Figure 3) – The figures do not have the same extent as Figure 2 – maybe this would be able to change. Adding an overlay of the Danube catchment as suggested before would help to orientate."

Response: We added the catchment boundaries as suggested to the figures. However, the spatial domain is intentionally larger than in Figure 3 to better display the continental atmospheric situation. However, we think with the added catchment boundaries the increases the readability of the figure.

Manuscript change: Figure 3 adjusted accordingly; caption revised.

Comment 7: "Line 179. After Figure 4, there are two punctuation marks."

Response: Corrected.

Manuscript change: Duplicate punctuation removed.

Comment 8: "Lines 200 ff. … roughly between St. Pölten and Vienna. You could add the two towns in Figures 4a-d for easier orientation. Also, the rivers Traisen and Perschling could be highlighted in the figures for the same reason."

Response: We added St. Pölten and Vienna as well as the Traisen and Perschling rivers to Figures 4a-d.

Manuscript change: Map annotations updated.

Comment 9: "Line 217. The four maps how heavy rainfall… The word “show” seems to be missing."

Response: Corrected.

Manuscript change: Typo fixed.

Comment 10: "Line 222 (Figure 5) – add locations of some towns and rivers for easier orientation."

Response: Done. We added St. Pölten, Lilienfeld, and Böheimkirchen as well as key rivers to the map.

Manuscript change: Figure 5 updated; caption modified.

Comment 11: "Line 253 – Traisen-Pielach area – add location of rivers in Figure 7."

Response: Locations of Traisen and Pielach rivers were added.

Manuscript change: Figure 7 revised accordingly.

Comment 12: "Line 256 and 257. Admont and Mittersill – where are they?"

Response: We added black rectangles indicating their locations.

Manuscript change: Figure 7 updated with annotations.

Comment 13: "Lines 290 ff. Text is not consistent with Figure 8: … rainfall intensities in St. Pölten and Böheimkirchen. In Figure 8, Lilienfeld and St. Pölten are shown."

Response: We revised the text to correctly refer to Lilienfeld.

Manuscript change: Text corrected to match figure.

Comment 14: "Line 300. Figure 8. For the classification of the flood magnitude it could help to add some HQx (30, 100) values in the figure."

Response: We added HQ100 reference lines to the hydrograph panels.

Manuscript change: Figure 8 and caption updated.

Comment 15: "Line 347 – At Korneuburg (not In Korneuburg)"

Response: Corrected.

Manuscript change: Text revised.

Comment 16: "Lines 355 ff. … the Inn-Traun-Enns area produced only moderate discharges. In figure 11, the tributaries downstream between Linz and Melk seem to contribute a lot to the flood (steep increase!), also in Figure 9 the hydrographs in these catchments seem to contribute more runoff than the tributaries in Lower Austria."

Response: We thank the reviewer for this observation. We rephrased the paragraph to better reflect the contributions of tributaries between Linz and Melk and acknowledge that these catchments—although geographically located west of core Lower Austria—delivered considerable flood volumes during the 2024 event. We now

refer more clearly to their steep hydrograph shapes and temporal alignment with the Danube peak.

Manuscript change: Section 5.2 revised accordingly to highlight tributaries between Linz and Melk and their synchronised contribution to downstream amplification.

Comment 17: "Line 368. The Lower Austrian tributaries supplied more than 1000 m³/s of additional discharge between Melk and Korneuburg. In the previous lines, the values for the Melk, Pielach, Ybbs, Traisen, Perschling and Große Tulln add up to roughly 3100 m³/s. Is this just because of the time lag in some of the catchments?"

Response: We agree that the phrasing could be misunderstood. The individual tributary peaks add up to a larger total, but not all of them were fully synchronised at the Danube. The stated net contribution of ~1000 m³/s reflects the cumulative downstream increase in Danube discharge, which results from the partial temporal overlap of tributary inflows, attenuation, and storage effects. We have clarified this aspect in the text.

Manuscript change: We added the sentence: *“The sum of tributary peaks exceeds the net increase in the Danube discharge, as not all inflows were fully synchronous; the ~1000 m³/s estimate reflects the effective downstream amplification after accounting for timing, losses, and routing effects.”*

Comment 18: "Line 389. The 2024 maximum discharge of 9800 m³/s remained below the HQ30 level (9340 m³/s). Please check the numbers."

Response: Thank you for noting this inconsistency. We checked the values and confirmed that the 2024 peak discharge at Korneuburg was approximately 9800 m³/s, which slightly exceeds the HQ30 estimate of 9340 m³/s but remains clearly below HQ100. The interpretation has been corrected accordingly.

Manuscript change: We revised the corresponding sentence in the manuscript to:

“At Korneuburg (101 537 km²), the 2024 maximum discharge of approximately 9800 m³/s slightly exceeded the HQ30 threshold (9340 m³/s) but remained well below the HQ100 reference (10 400 m³/s).”

Comment 19: "Line 403. The contrast across the basinS is striking. Please add S at the end of basin."

Response: Corrected.

Manuscript change: Typo fixed.

Closing: We thank Reviewer #2 for the thorough and constructive review, which led to many improvements in clarity and precision.