The paper proposes a mixture distribution approach to analyze the frequency of low flows considering the seasonality of river discharges and implements the same to investigate low flow frequency at representative German and Austrian catchments. This is a part of a companion work, where part I show the seasonality and performance, wherein part 2, the comparative assessment, is shown using a copula-based dependency framework. The comments on the manuscript are summarized below:

1. Throughout the manuscript (See line 70 for example), the authors have claimed he is not aware of any study that used copulas to consider seasonal dependence in a mixed distribution approach. Ganguli and Reddy (2014) developed copula-based ensemble drought prediction models with up to 3 months' lead time considering the seasonality of SPI at a 6-month accumulation window. Two variants of drought forecast models were proposed: a single ensemble drought prediction model without seasonal partition and separate models for each of the four seasons in a year, combining them to constitute a yearly forecast model. The analyses showed that the seasonal prediction model performs better as compared to the model without seasonal partition. In addition, the incorporation of a copula-based conditional framework helps to provide an estimation of uncertainty.

2. Eqs. 2, 6-8 representations of random variables are not correct. In fact, for summer, the random variables are drawn from the population, $S = \{s_1, s_2, \ldots.., s_n\}$. Likewise, for winter, the random variables are drawn from the population, $W = \{w_1, w_2, \ldots.., w_n\}$. The probability of a low-flow event with magnitude during summer, s and winter, w seasons to be represented as $F_S(s)$ and $F_W(w)$, respectively. Further, typically subscript/sample space is shown using capital letters, whereas the argument/individual random variables are shown using small letters with the same notations. They cannot be different, for example, q as mentioned in the manuscript even after considering seasonal stratifications.

3. Line # 105, How is the copula parameter θ is, estimated? There is no direct relationship between Spearman's ρ and θ for the Gumbel-Hougaard copula. However, such a relationship exists for Kendall's τ and θ. Also, it would be good to see the gauge-wise performance of Gumbel-Hougaard copula for the summer and winter seasons either in the SI section or in the main manuscript to see how credible are the copula performance in modelling seasonal dependence.

4. Eq. 9, same error for random variable representation, $P_Q(q)$ instead of $P_m(q)$.

5. At first, Eq. 11 should appear, followed by Eq. 10. Again, representations of random variables should be corrected considering seasonal partition in line with Eq. 9 and others.

6. Line #155, there is a subtle difference between the two estimators.

7. Line # 168, "We note that this behavior…

8. Line # 173, how seasonality and seasonality ratio are determined in this study? Also, please discuss the associated implications of each of these indices in brief.

9. Line # 190 and paragraph therein: However, the copula-based approach is expected to preserve seasonal dependence patterns apart from the fact that they consider the marginal distribution of any form. On the other hand, the mixed distribution assumes only one type of probability distribution.

10. Line 195, could you provide a list of gauges, WMO ID, their latitude/longitude, catchment area, and years of available records in SI as part of the reproducibility of the work?

11. How the low flow is estimated in this study? Whether the constant/variable threshold approach is implemented to detect low flow signal.

12. Line 215: How relevant would be seasonal exceedance probability estimation since the concept of return period revolves around the sampling of annual and partial duration series?

13. Eq. 13, the relative absolute deviation will not show any over/underestimation effect. Therefore, the absolute unit would be more beneficial.

14. Fig. 3 caption; does the uncertainty of the annual probability estimator considers all catchments across the pan-EU scale?

15. Line # 288: the large differences between two estimators at low return period is consistent with the differences in quantile estimates between the annual maxima/minima and partial duration approach. In fact, the difference in return period estimation in Annual maxima/minima vs. partial duration series is generalized using a simple exponential relationship. Can the author derive such kind of generalized formula for the given EU catchments?

16. For Figs. 2, 4-5, and 7-8, please use a continuous color bar at the bottom of the figures and show the color discretization.

17. Table 3. The minimum quantile is always zero, indicating water level is always less than the stage recorder during the low flow period; therefore, instead of furnishing information on the Min quantile, the 1^{st} (25^{th} percentile), median, and 3^{rd} quantiles, including the interquartile range, would suffice. In fact, the IQR would show the catchment-wise variability in low flows for each estimator.

18. Line # 322, VIF is not defined earlier.

19. Line # 344: This suggests sensitivity towards BFI, which is, in turn, the function of catchment soil types and the availability of water bodies nearby.

20. Line 353: Laaha, 2022?

21. Line 386: the uncertainty could also stem from estimated copula parameters and the uncertainty due to marginal distribution. Therefore, sample lengths have a profound impact

on multivariate distribution. A list of available sample lengths is to be presented. For credible assessment of multivariate risk, sample lengths need to be at least more than 25 or larger.

22. Line 388: authors have pointed influence of catchment area, BFI, and to some extent, climate; however, terrain attributes, soil types, and land use/land cover do also have a profound impact on drought seasonality, persistence and recovery pattern.

23. Line 400: The pronounced differences in quantiles, mainly at low return periods, are consistent with annual vs. partial duration series, wherein the differences tend to diminish for high return period events. A generalization of this would add value.

24. This study is useful at a regional level focusing only EU zone. A discussion on how this study would add value for other parts of the globe, for example, in monsoon-dominated regions (South Asia and Africa) where marked seasonality is pronounced or in areas with relatively stable climate with subtle climatic variability (for example, sub-tropics) would be beneficial for audiences across the globe.

25. Last but not least, the study assesses the performance of mixed distribution vs. copula-based dependency framework for modelling low flows accounting seasonality. This message is not well reflected in the title. The title could be tuned in that direction, for example: A bivariate approach for low-flow frequency analysis considering seasonality Part 2: Comparative assessment of Mixed Probability vs Copula-based Dependence Framework.

26. A Minor comment:

Line 41: Ganguli and Reddy (2012) presented a bivariate risk assessment framework for meteorological droughts in Saurashtra and Kutch regions of Gujarat state in India. Based on the tail dependence measure, the Gumbel-Hougaard copula emerged as the best model for modeling joint dependency between drought severity and duration. The comparative assessment of traditional bivariate distributions, such as bivariate log-normal and bivariate logistic models relative to copulas suggested that the extreme value family of the Gumbel-Hougaard copula was better suited for the area.

References:

Ganguli, P. and Reddy, M. J.: Risk Assessment of Droughts in Gujarat Using Bivariate Copulas, Water Resour Manage, 26, 3301–3327, https://doi.org/10.1007/s11269-012-0073-6, 2012.

Ganguli, P. and Reddy, M. J.: Ensemble prediction of regional droughts using climate inputs and the SVM–copula approach, Hydrological Processes, 28, 4989–5009, https://doi.org/10.1002/hyp.9966, 2014.