

Response to Reviewer 1

Comment 2

2) My critical comments are as follows: whereas the statistical and data aspects are flawless, the manuscript does not contain any discussion of physical drivers for rainfall variability or of possible imprint of volcanic eruptions or greenhouse gases (trends in the 20th century, sudden changes during the Krakatoa or Tambora eruptions?, Any connection to the Year of the Slaughter in Ireland 1739-1740 (Jones and Briffa, Climatic Change (2006) 79: 361-379? Any connection to the Central England temperature series? The study is silent about all these aspects, which leads me to my second critical comment.

Response

We thank the reviewer for these suggestions. Our paper presents the reconstructions. The paper is more than just a data paper, which also relates to the next point. It details the development of methods for reconstructing and comparing reconstructions. These methods and findings (especially regarding sleet and snow) are of interest beyond the datasets produced. We can modify the Results and Discussion sections to provide a more detailed analysis of the reconstructed series, including trend persistence, correlation with the NAO and reflection on notable historical extremes. We will move some material to Supplementary Information to accommodate these additional analyses. The paper is already long and we feel that analysis of volcanic and greenhouse-gas forcing is beyond the scope of this paper, but certainly fruitful areas for future work. Figure 1 below shows what we have in mind regarding the persistence of trends from the resulting reconstructions for SA9 and SA Upland. Assessment of trend persistence (i.e. dropping the start year of analysis incrementally to a set minimum number of years) provides insight into long-term variability and change and highlights the differences between reconstructions in the colder seasons. Our assessment of snow undercatch is crucial here and substantial implications for interpreting long term variability and change. The significant decreasing trends in summer, autumn and summer half year are especially important from a water management perspective.

Persistence of annual and seasonal rainfall trends to 2024

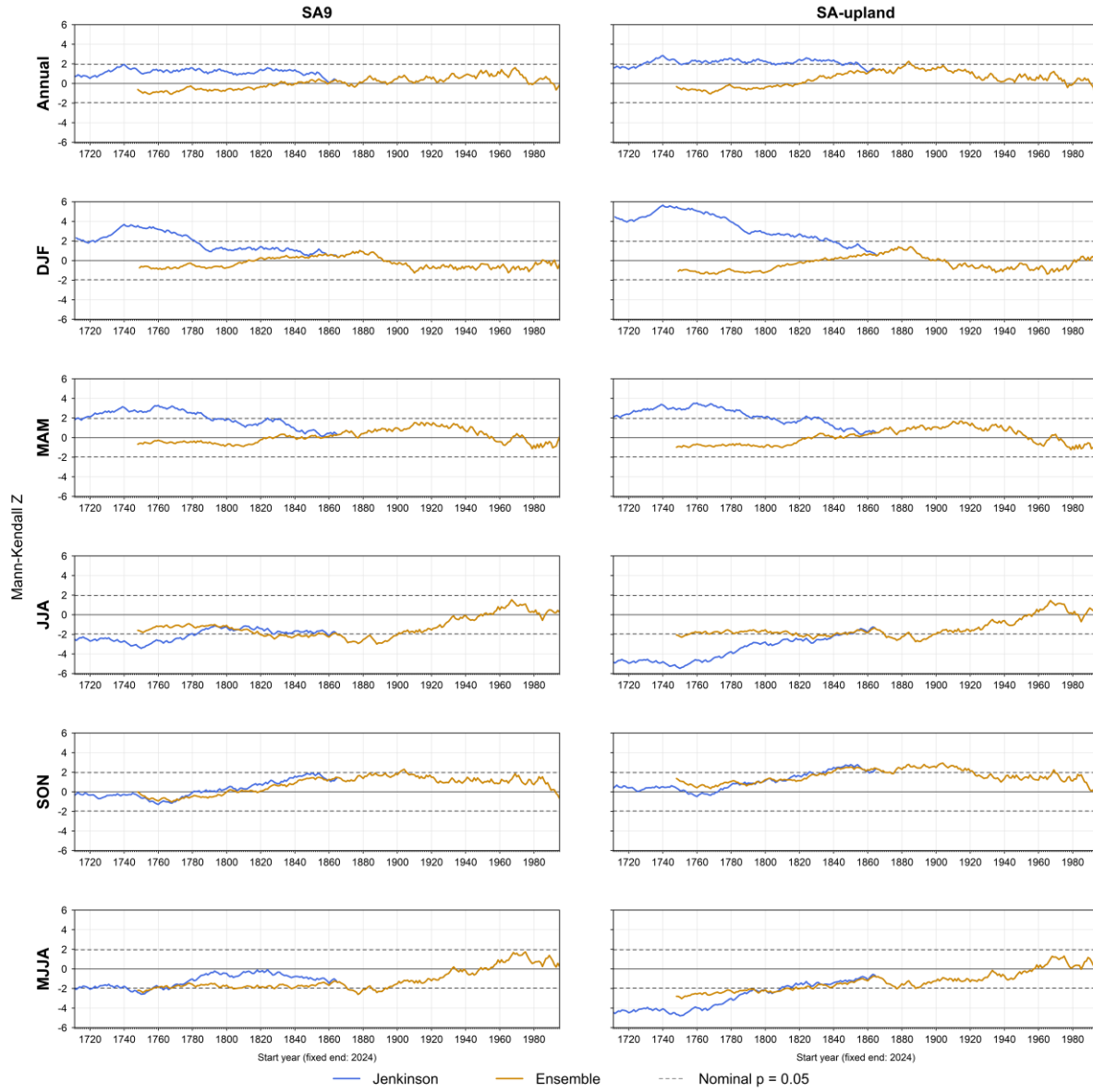


Figure 1 Persistence of annual and seasonal rainfall trends in the Jenkinson and Ensemble series for SA9 and SA-upland. Mann-Kendall Z statistics are calculated for progressively later start years with a fixed end year of 2024. Dashed lines denote the nominal significance threshold ($|Z| = 1.96$). Both reconstructions are appended with the same observed rainfall series from 1865 onwards; consequently, persistence trajectories converge once the analysis windows contain only the common observational record.

Comment 8

8) All reconstructions seem to underestimate the observed variability. For instance, in the scatter plots shown in Figures 4 and 5, the range of the x-axis (observations) is always larger than the y-axis (reconstructions). This difference in range can be misleading. The text does discuss the underestimation of extremes, but I do suggest redrawing the scatter plots using the same range for both axes.

Related to this point, it seems to me, just by eyeballing, that these scatter plots indicate a non-linear link between observations and reconstructions. Even with the unequal axis ranges, it seems that the data cloud is 'bent'. This, of course, may be related to the underestimation of extremes, or perhaps a deeper issue throughout the whole range of the reconstructions.

Response

The scatter plots have been redrawn using identical ranges on both axes and now include a 1:1 line. The revised presentation more clearly shows that the apparent curvature is primarily associated with compression at high rainfall totals rather than with an obvious systematic non-linear relationship. The underestimation of high rainfall totals is now discussed more clearly. A redrawing of Figure 4 is shown below.

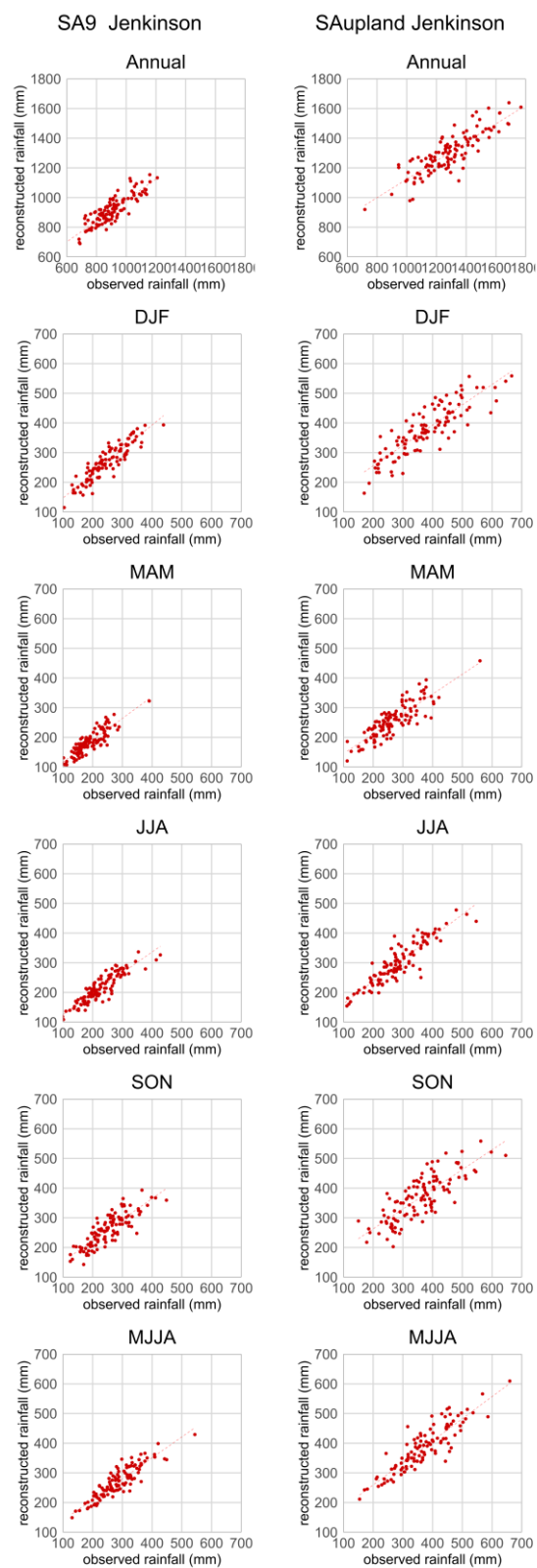


Figure 4 Observed versus reconstructed SA9 (left) and SA-upland (right) rainfall for the Jenkinson-based reconstructions over 1865-1977 at annual and seasonal timescales (DJF, MAM, JJA, SON, and MJJA).