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Overall comments:
General comments
This study explores the efficiency of gap-filling of streamflow data by using simulations of a hydrologic model. The main objective is to evaluate the annual trends and annual variables obtained from gap-filled streamflow data using two hydrological models (GR4J and SIMHYD) in 217 catchments in Australia. The results show that when the missing rate of streamflow data is less than 10%, the gap-filled streamflow data from hydrological models perform very close to the benchmark data. Interestingly, the relative streamflow trend bias caused by the gap-filling is not very large even in very dry catchments where typically the hydrological model calibration is poor. Authors conclude that the gap filling using hydrological modelling has little impact on the estimation of annual streamflow and its trends in selected catchments in Australia.

Overall, the study is very clearly written, has a good structure and it is within the scope of HESS. The presentation of take home messages is very compact and clear. I have only one question which remained unanswered after reading the manuscript. What is the impact of patterns of missing data in terms of dominant hydrologic regime in the catchments? I expect that the large dataset in Australia covers catchments with different hydrological (seasonal) runoff regime. Are the missing data more-less evenly distributed thorough the year in all catchments or are there some seasonal patterns of gaps? What is the impact if majority of missing data are from the most/least important season (in terms of maximum monthly runoff)? I would expect that if the majority of e.g. 10% missing data are from seasons with minimum monthly runoff then the impact on annual mean or trend will be smaller and vice versa. Are there some differences between catchments with different seasonal regime? Some more discussion around it will be interesting.
Finally I would like to congratulate the authors for a very nice analysis. I enjoyed reading it.

Response: We do appreciate the favourable comments from Juraj Parajka. Juraj highlights the science quality of this study and quality presentation.

To address the question Juraj raised regarding seasonal pattern of number of the missing days, we future plot a boxplot plot (Figure 4). Yes, the missing data are more-less evenly distributed through different seasons across all 39 catchments (with missing rate of 8% to 12%) within the 10% missing data group. This basically suggests the streamflow is missing randomly through the year. Having

said that, we actually conducted independent modelling experiments (but did not show them in the previous version) to test the consequence if the missing streamflow only occurs in high-flow or low flow seasons in the extreme cases. *In lines 324 to 334 the text now says "Streamflow data gap could only occur in high flow or low flow condition in the extreme case though majority of missing data for the Australian catchments are more or less evenly distributed through the year. We further tested the impact of filling streamflow data in high flow or low flow condition. In that case, the missing patterns were selected using only high flow (>95th percentile) or low flow (less than 50th percentile) data. The results obtained from the low flow gap-filling indicates that there is only a negligible influence on annual streamflow trend estimates when the missing rate of is less than 50%. In contrast, the high flow gap-filled shows a noticeable change in annual streamflow trend when the missing rate is 5% (or at 95th percentile). This is understandable since high flow is usually several orders of magnitude higher than low flow, and a certain error in filling high flow could have large impact on annual flow and its trends".*

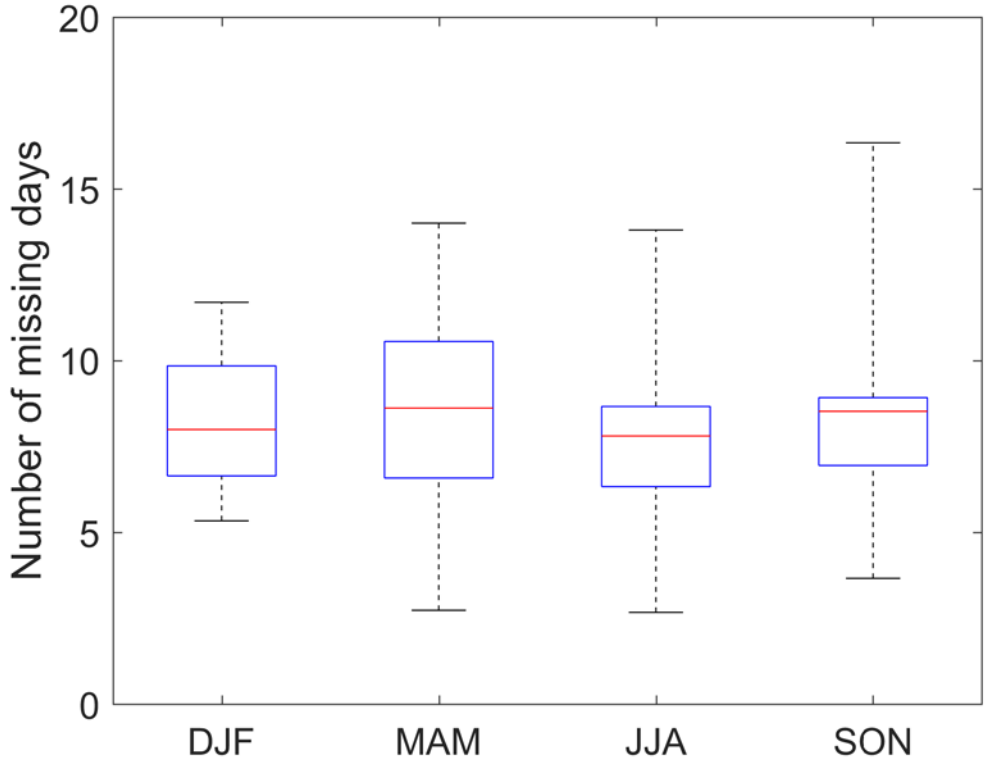

Fig. 4. Distribution of number of missing days across different seasons, summarised from 39 catchments with a missing rate ranging from 8% to 12% (i.e. 10% missing data group)