Supplementary material to:

Vegetation Response to Climatic Variability: Implications for Root Zone Storage and Streamflow Predictions

Supplementary material 1: Scenarios A-2 and B-2

Supplementary material 2: Geographical plots of ΔI_E

Supplementary material 3: Change in flow per catchment

Supplementary material 4: Change in Qmax & Qmin

Supplementary material 1: Scenarios A-2 and B-2

Distinctions are also made based on which period is used to make a prediction about the other period (1 or 2). Scenario 1 (A/B) is generated by utilising the omega value of the first decade (p1, 1999-2008) to predict the root zone storage capacity for the second decade (p2, 2009-2018). The model is then executed for the period of 2009-2018. Scenario 2 (A-2/B-2) makes predictions by reversing time. The omega value of the second decade (p2, 2009-2018) is used to predict the root zone storage capacity for the first decade (p1, 1999-2008), meaning that the model is executed for the period of the first decade (p1, 1999-2008).

- *Scenario A* uses the omega value of p1 with a sampled ΔI_E from the distribution calculated from all the data (Meuse, CAMELS USA, CAMELS GB) to make a prediction about the evaporation and root zone storage capacity of p2, 2009-2018.
- *Scenario A-2* uses the omega value of p1 with a sampled ΔI_E from the distribution calculated from all the data (Meuse, CAMELS USA, CAMELS GB) to make a prediction about the evaporation and root zone storage capacity of p1, 1999-2008.
- *Scenario B* uses the omega value of p1 with a sampled ΔI_E from the distribution calculated from the Meuse data to make a prediction about the evaporation and root zone storage capacity of p2, 2009-2018.
- *Scenario B-2* uses the omega value of p1 with a sampled ΔI_E from the distribution calculated from the Meuse data to make a prediction about the evaporation and root zone storage capacity of p1, 1999-2008.

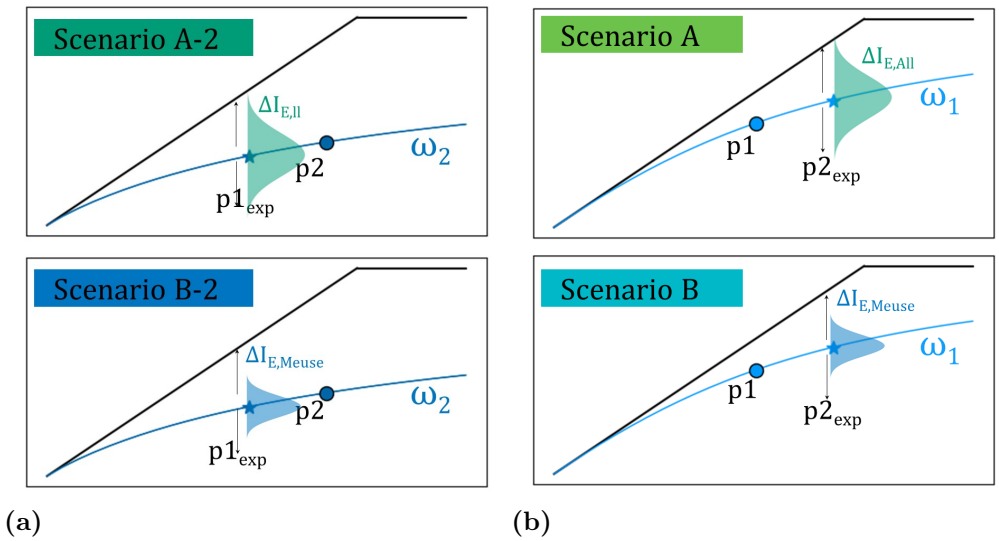

Figure S1: Overview of the scenario structures. p1 is the time period of 1999-2008 and p2 of 2009-2018. (a) Scenario structure variant 1 (b) Scenario structure variant 2

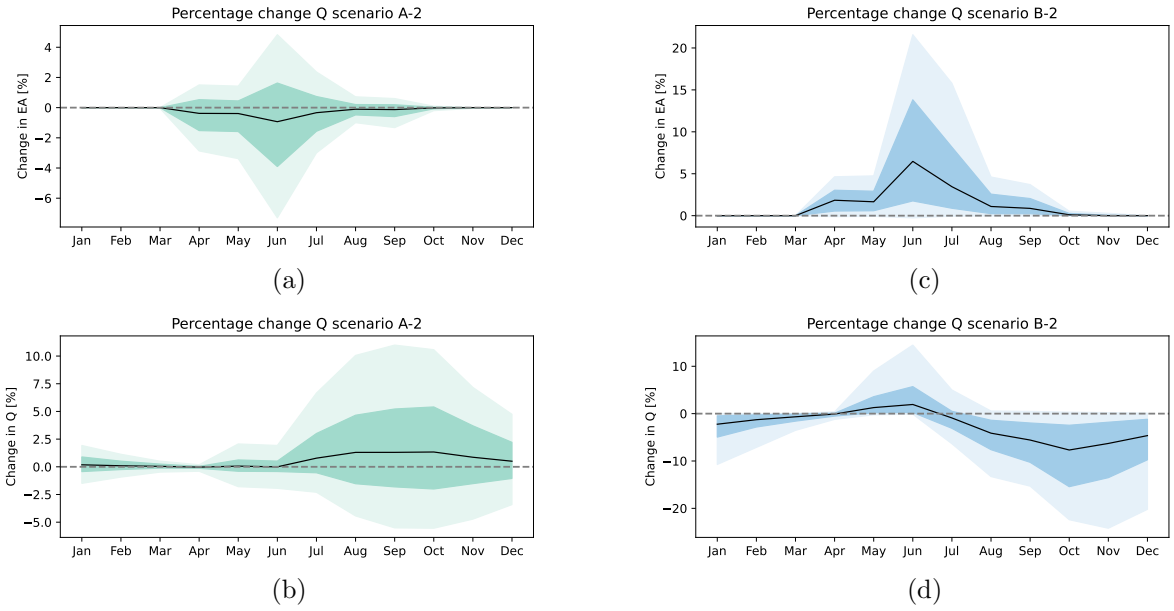

Figure S2: Change in evaporation and streamflow for scenarios A-2 and B-2. The change is calculated for every run as the difference between the evaporation or streamflow with the reference run ($\Delta I_E = 0$). The output for all years, catchments, and runs has been put together. The lightly shaded area represents the 90th and 10th percentiles, while the slightly darker shaded area represents the 25th to 75th percentiles. The black line represents the median.

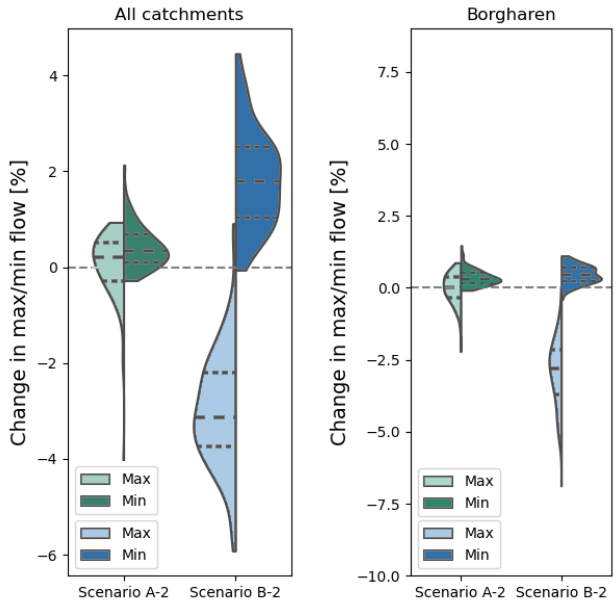

Figure S3: Change in maximum flow ($Q_{\max}$, left part of the violin) and 7-day minimum flow ($Q_{\min}$, right part of the violin), in percentage of the reference run, for (a) all catchments together and (b) Borharen. The quartiles are indicated with dashed lines.

Supplementary material 2: Geographical plots of ΔI_E

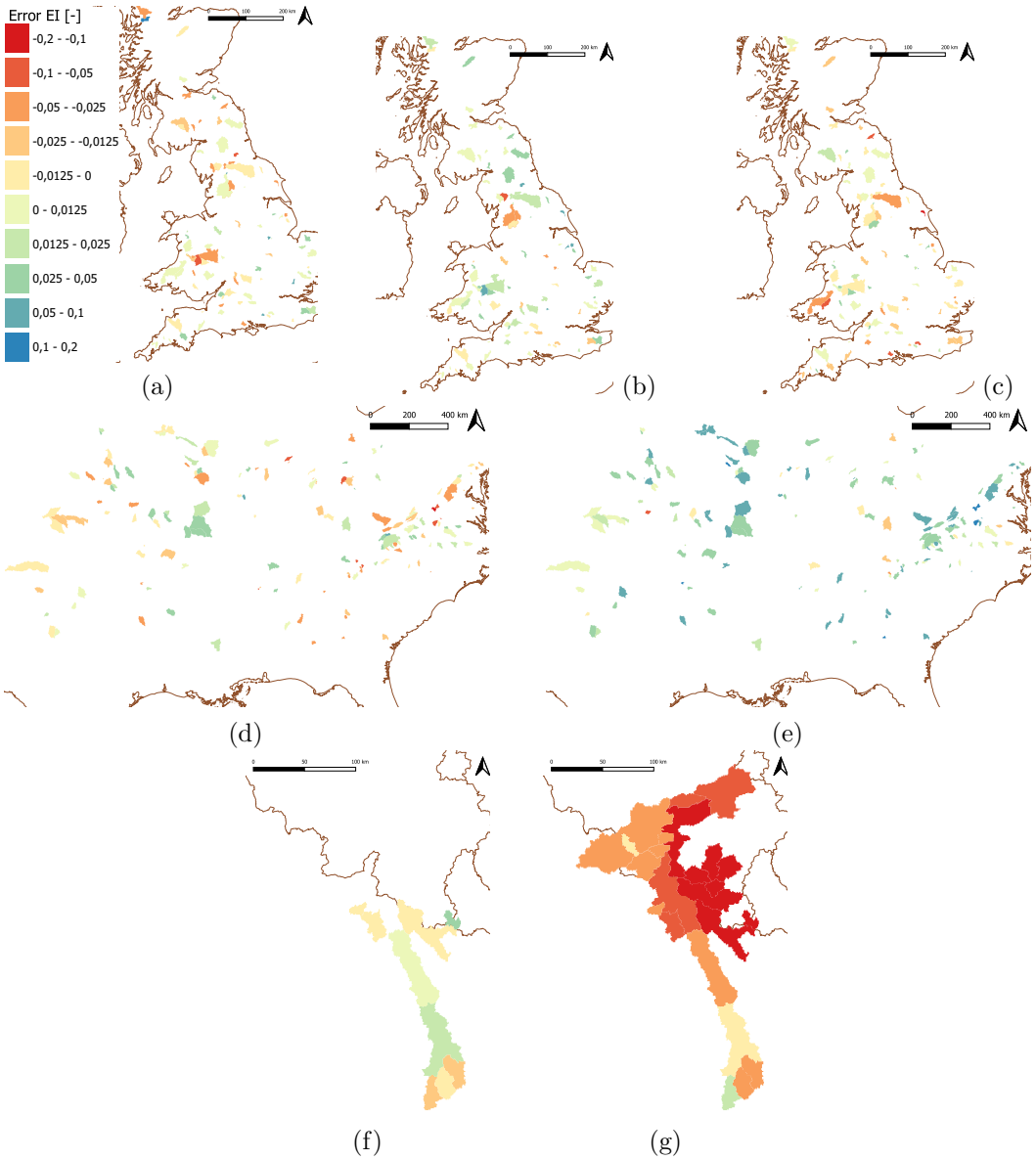

Figure S4: Errors in estimating I_E for different time periods across multiple regions. The first row represents the GB region for the periods (a) 1981-1990, (b) 1991-2000, and (c) 2001 - 2010. The second row represents the USA region for the periods (d) 1990-1999 and (e) 2000-2009. The third row represents the Meuse region for the periods (f) 1999-2008 and (g) 2009-2018. In all figures, the colours indicate the error in I_E (ΔI_E), ranging from -0.2 (red) to +0.2 (blue).

Supplementary material 3: Change in flow per catchment

The following images show the outcomes of the model concerning alterations in evaporation and streamflow for each catchment. The changes in evaporation (EA) and streamflow (Q) are represented in units of [mm/d]. To calculate the change, the difference between evaporation or streamflow and the reference run ($\Delta I_E = 0$) was determined for each run. The results for all years and runs were then aggregated. The 90th and 10th percentiles are depicted in the lightly shaded area, while the slightly darker shaded area represents the 25th to 75th percentiles. The median is denoted by the black line.

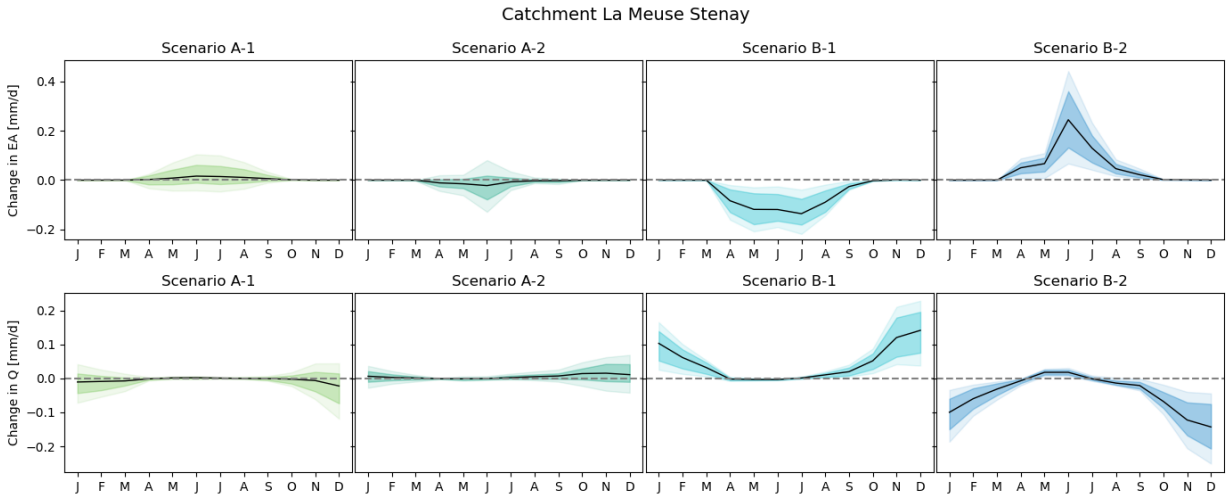

Figure S5: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Meuse Stenay.

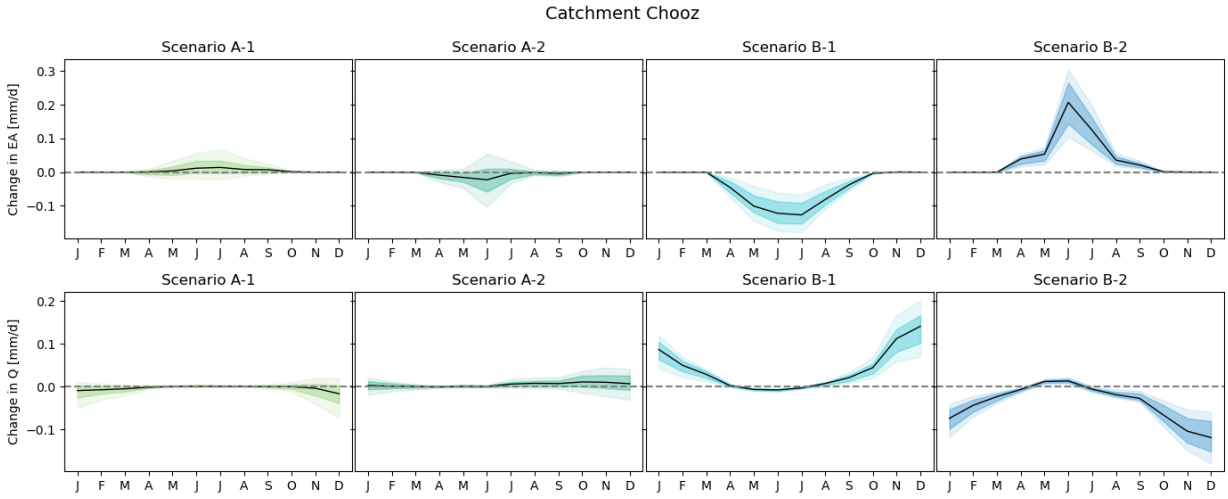

Figure S6: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Chooz.

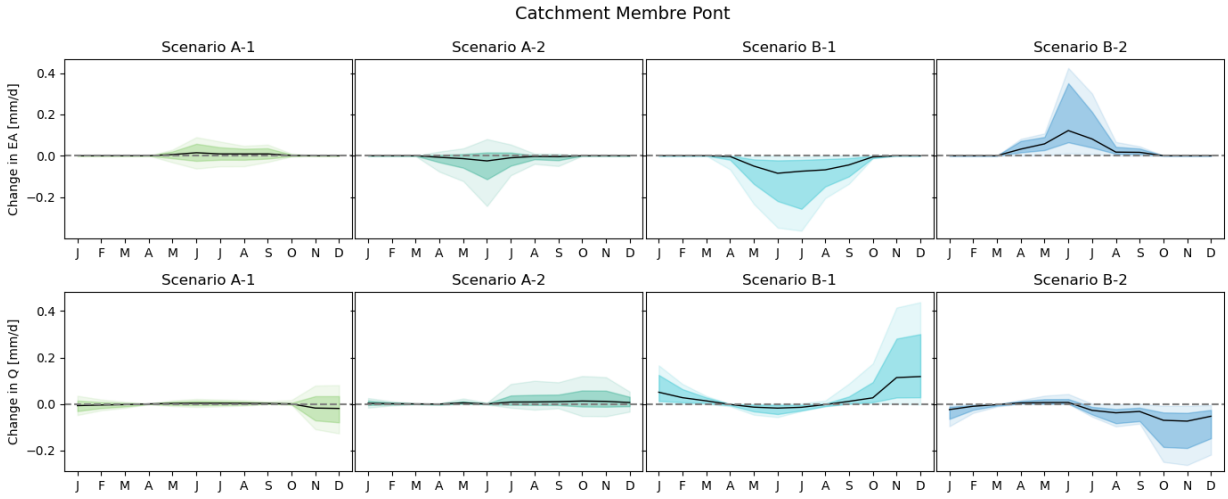

Figure S7: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Membre Pont.

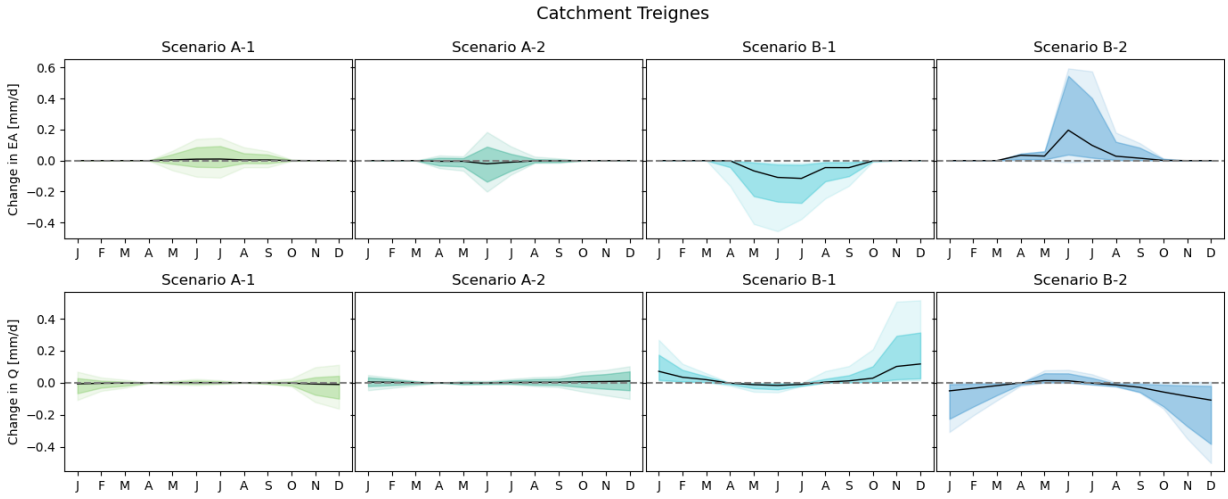

Figure S8: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Treignes.

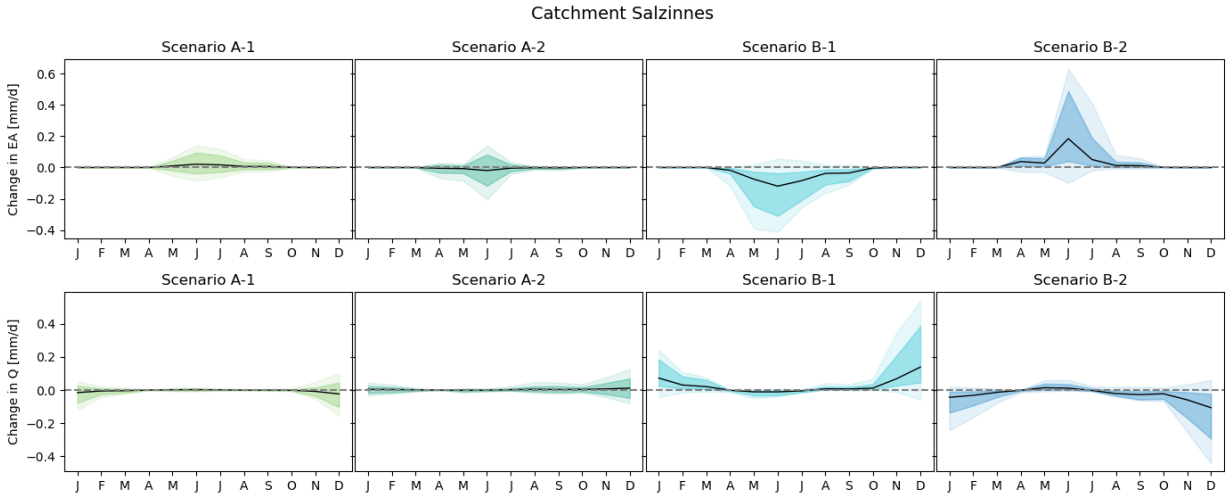

Figure S9: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Salzinnes.

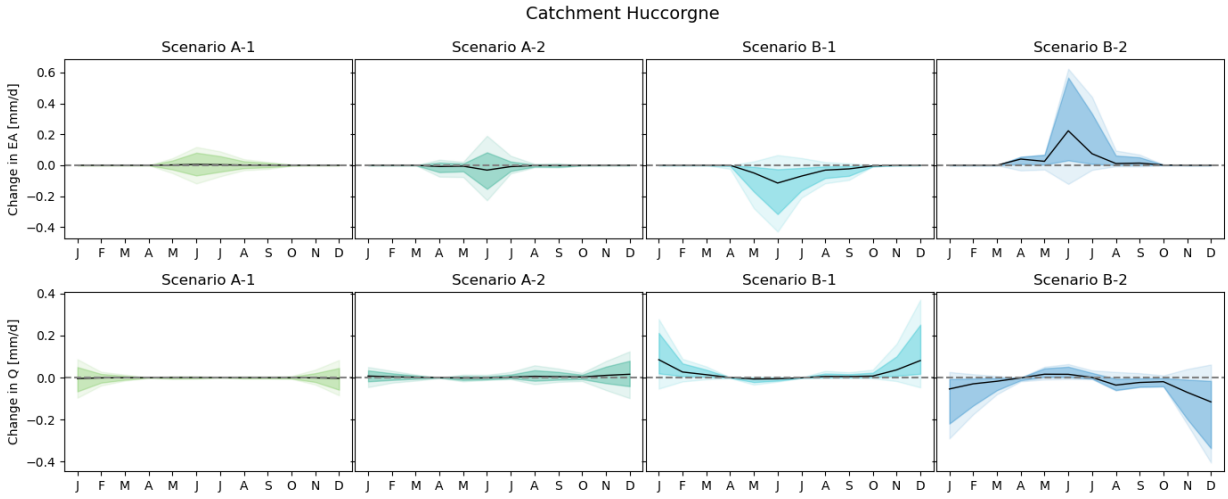

Figure S10: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Huccorgne.

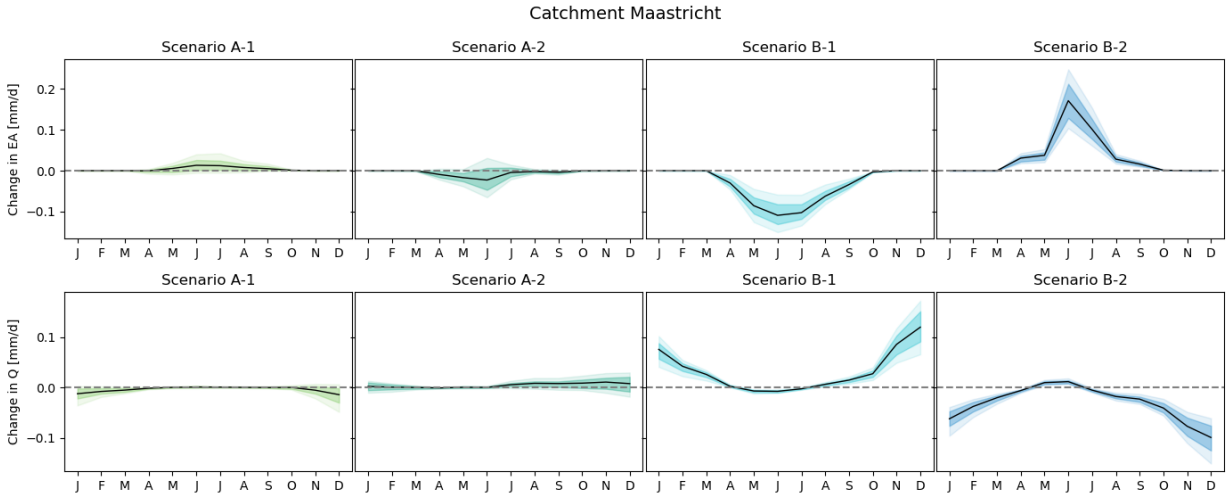

Figure S11: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Maastricht.

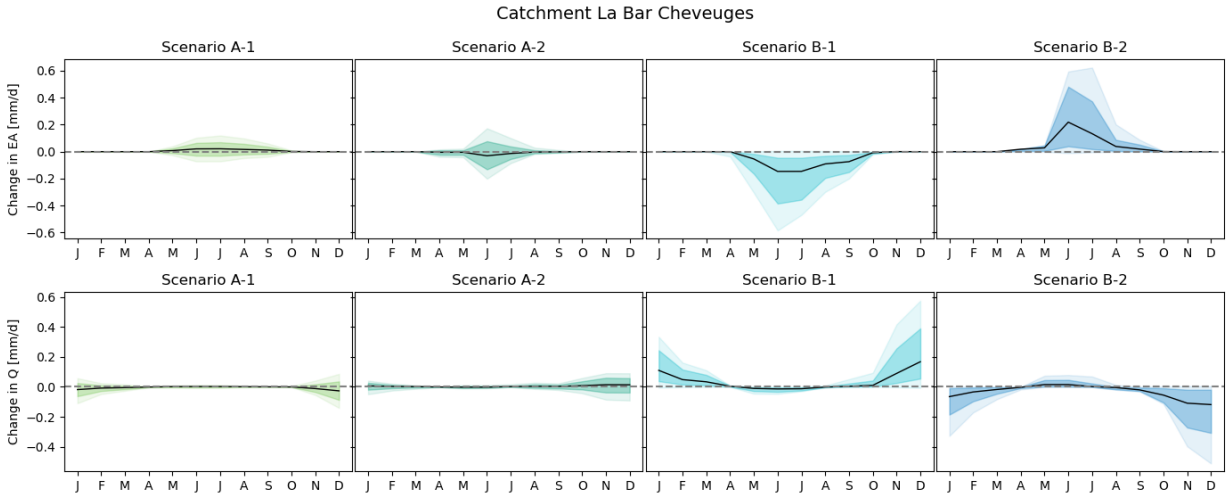

Figure S12: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Bar Cheveuges.

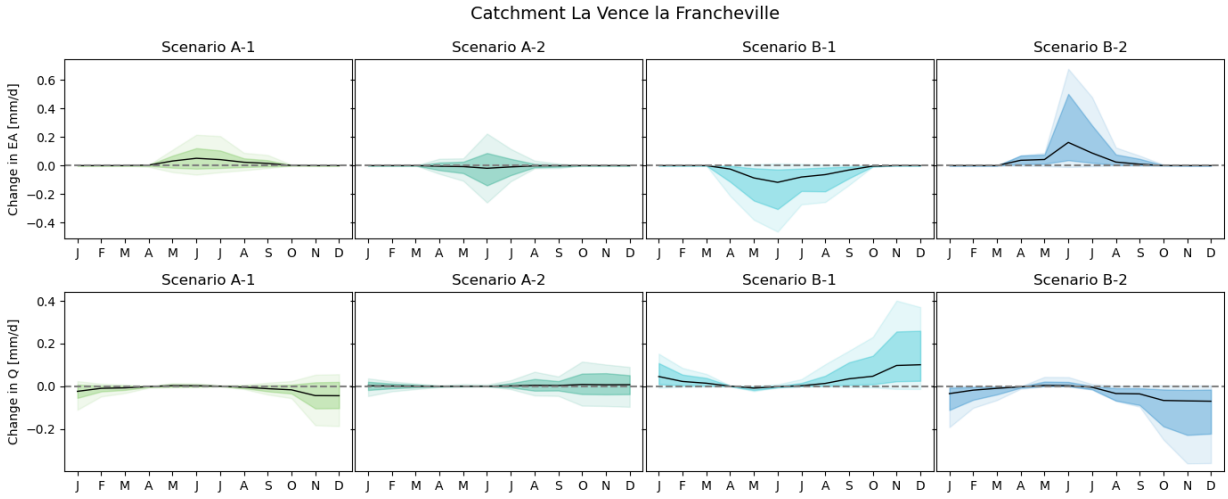

Figure S13: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Vence la Francheville.

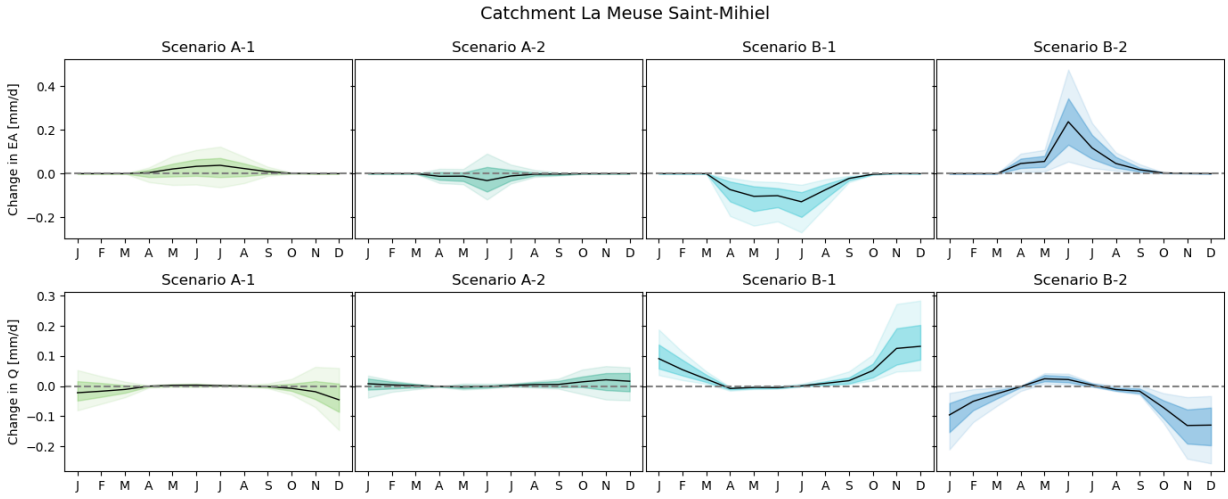

Figure S14: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Meuse Saint Mihiel.

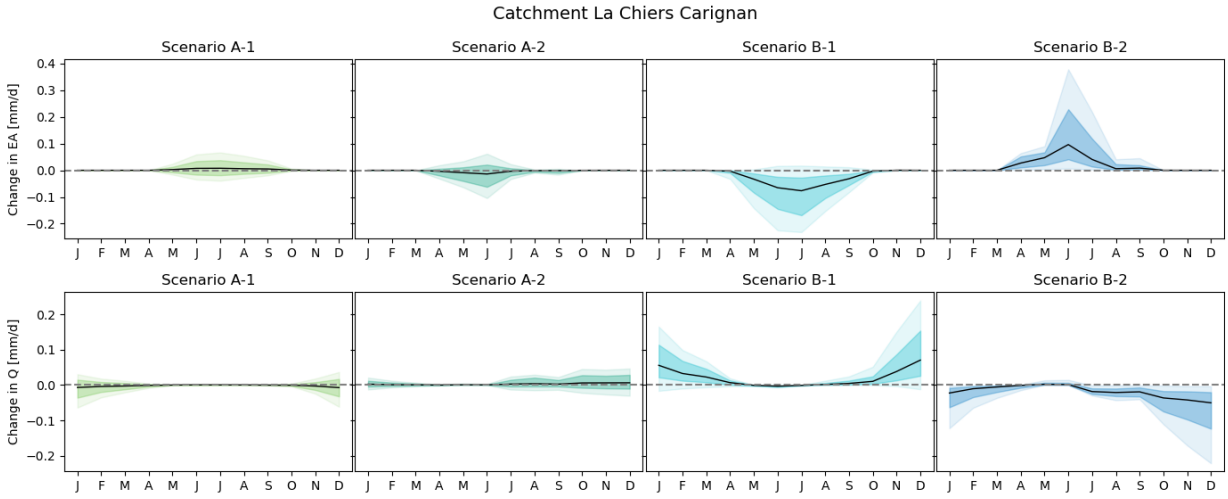

Figure S15: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Chiers Carignan.

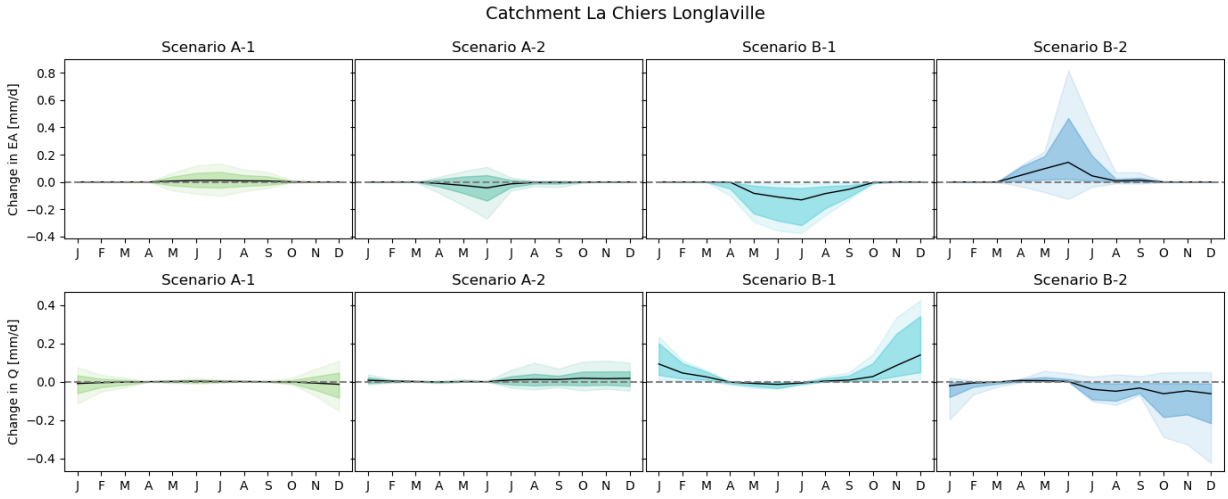

Figure S16: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Chiers Longlaville.

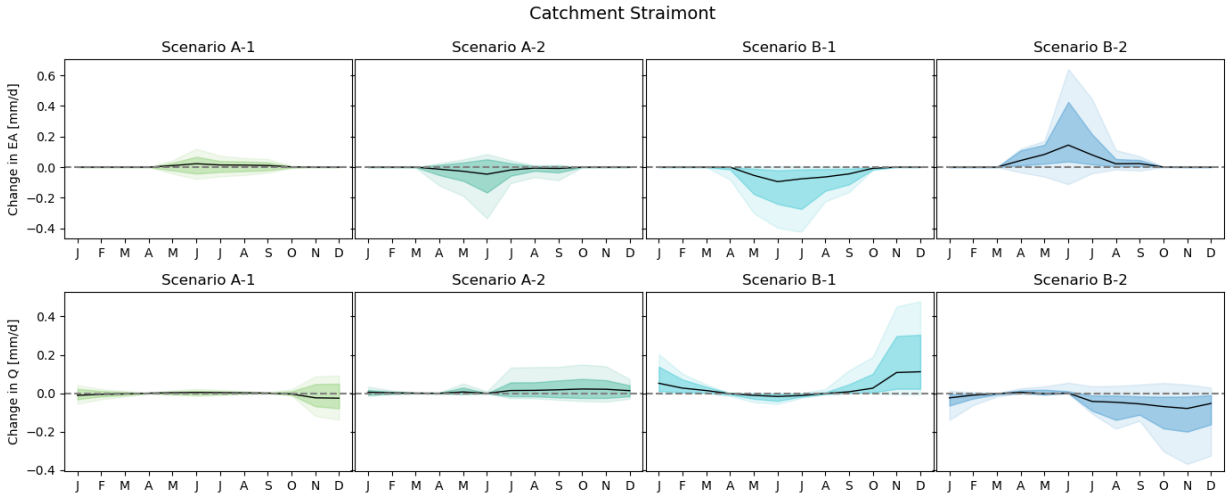

Figure S17: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Staimont.

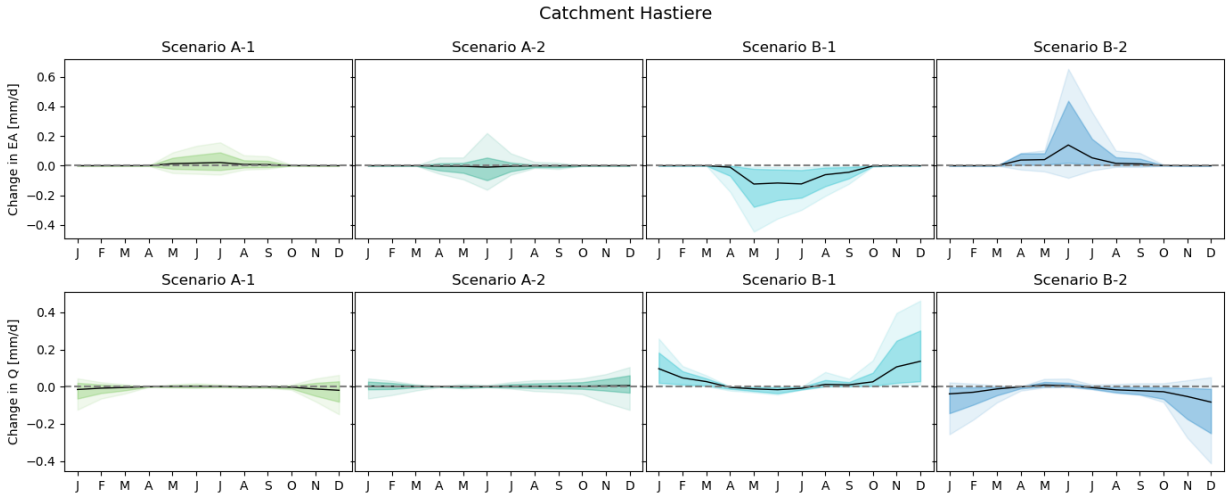

Figure S18: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Hastiere.

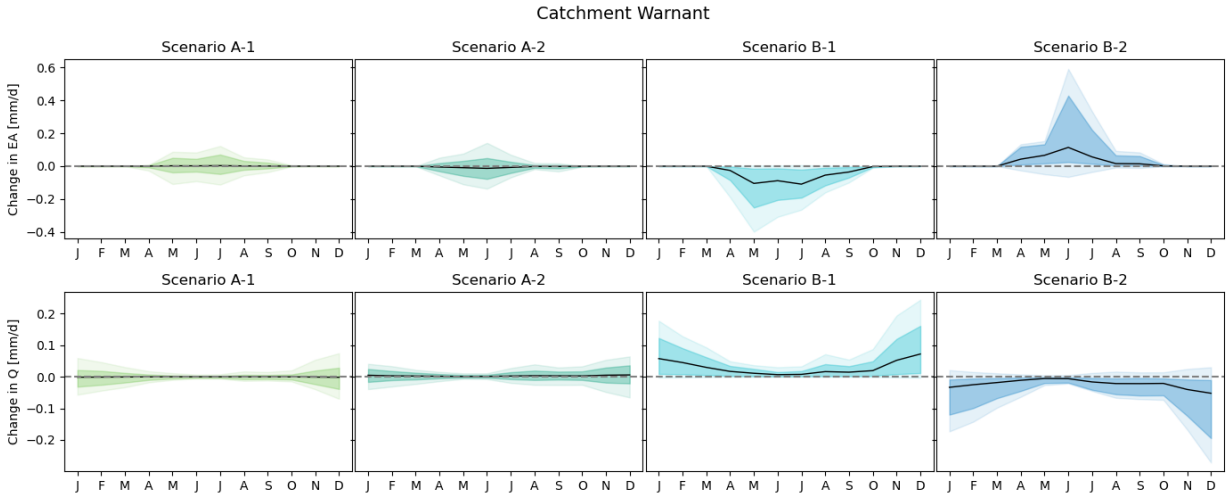

Figure S19: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Warnant.

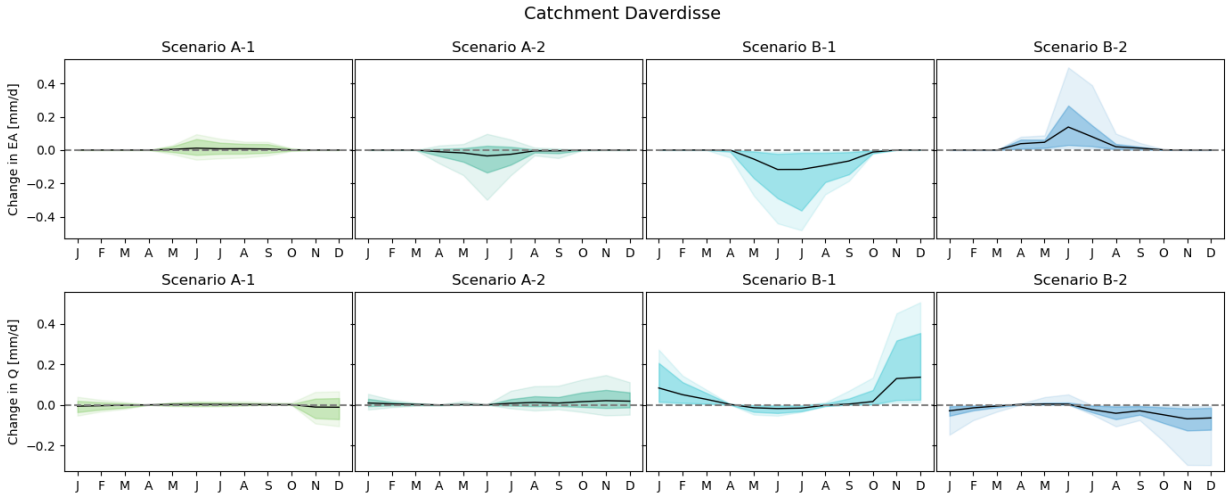

Figure S20: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Daverdisse.

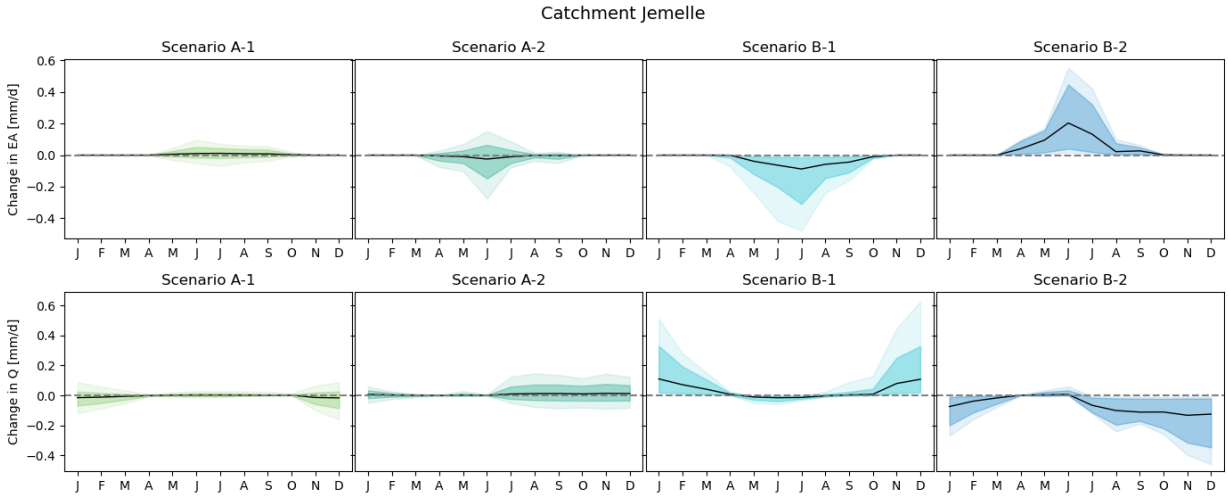

Figure S21: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Jemelle.

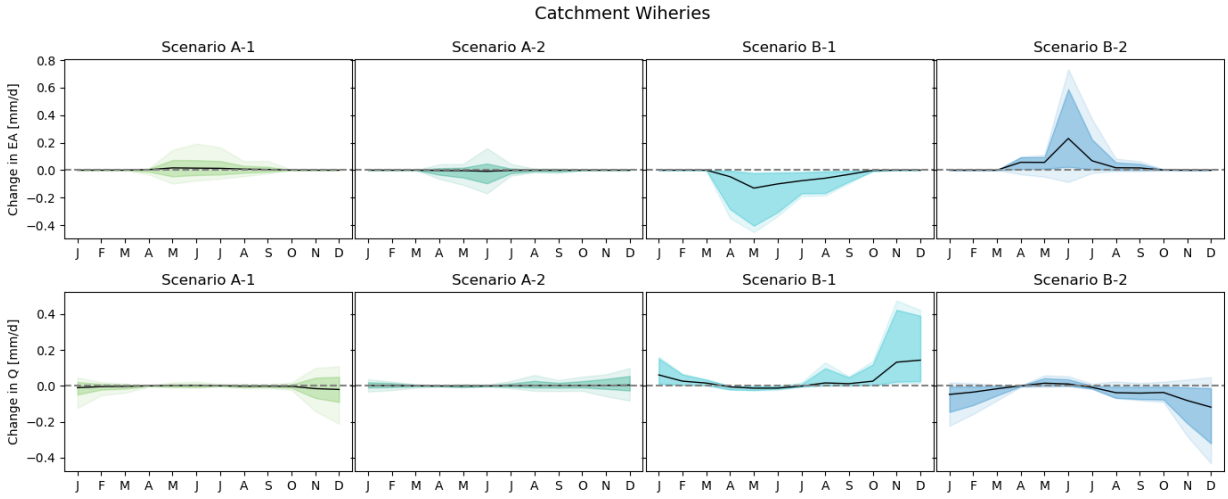

Figure S22: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Wiheries.

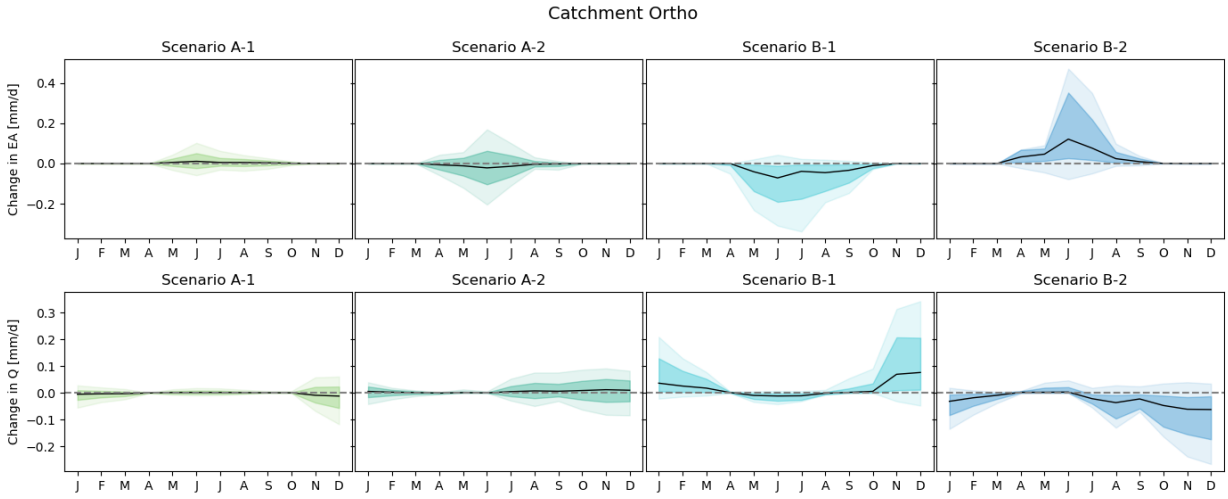

Figure S23: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Ortho.

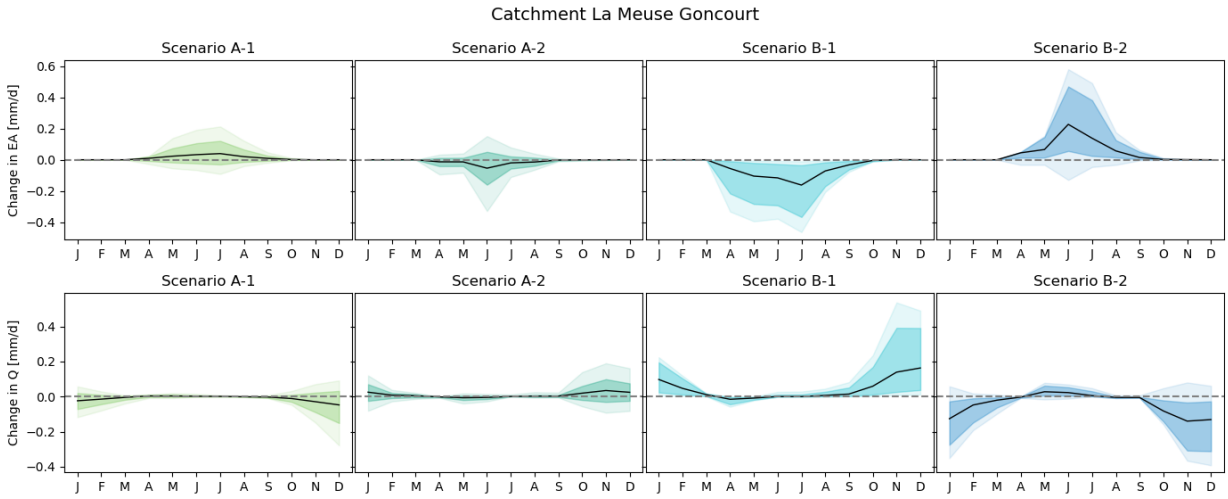

Figure S24: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Meuse Goncourt.

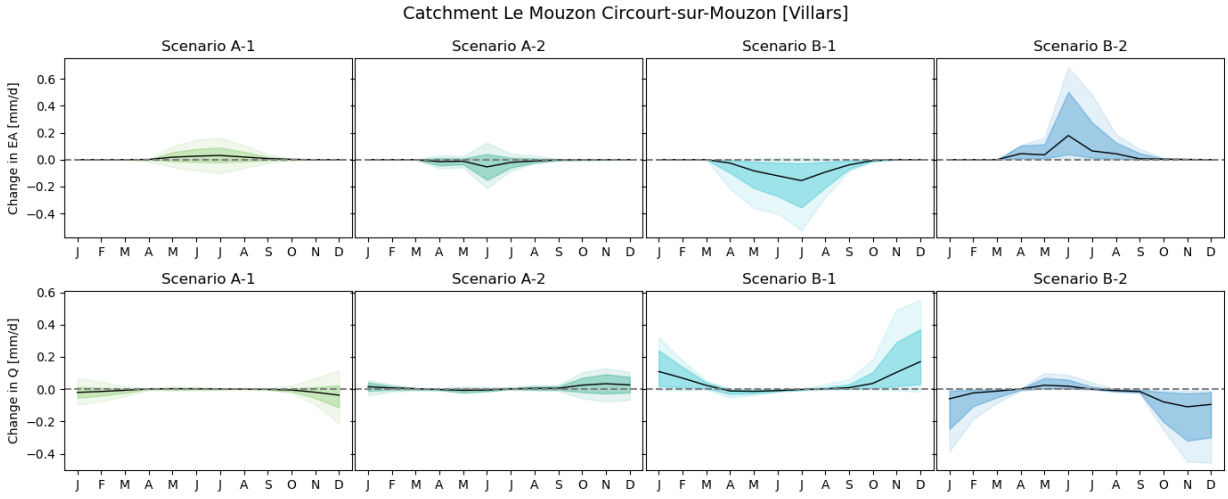

Figure S25: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for La Mouzon Circourt-sur-Mouzon [Villars].

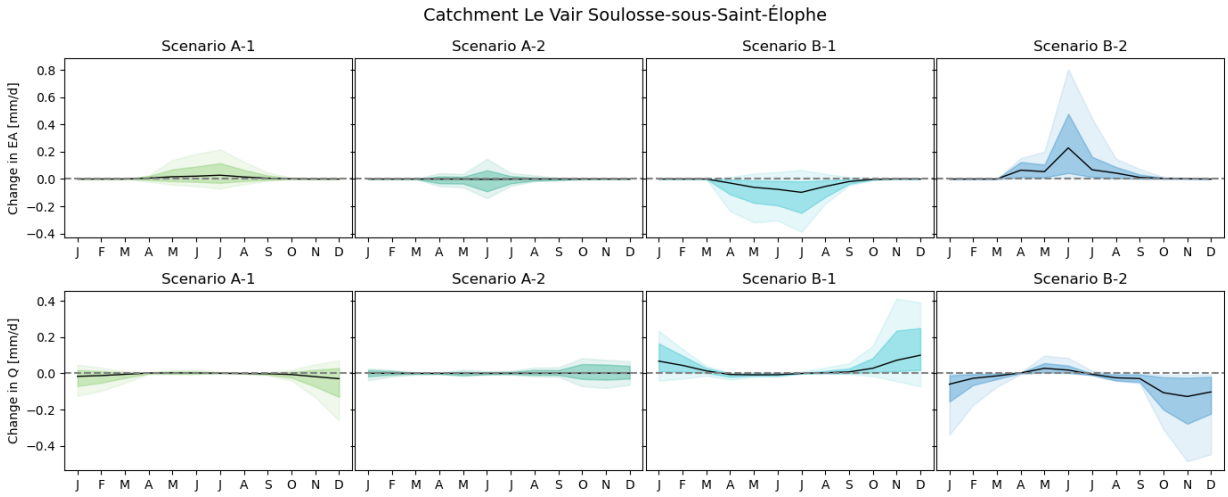

Figure S26: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Le Vair Soulosse-sous-Saint-Élophe.

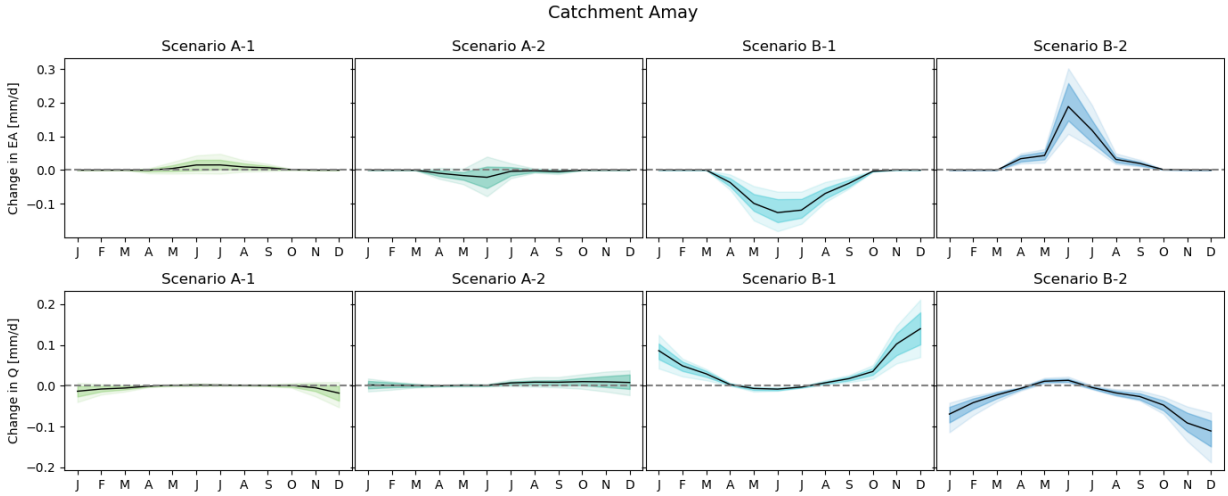

Figure S27: Change in evaporation (EA) and streamflow (Q), both in [mm/d] for Amay.

Supplementary material 4: Change in $Q_{\max}$ and $Q_{\min}$ per catchment

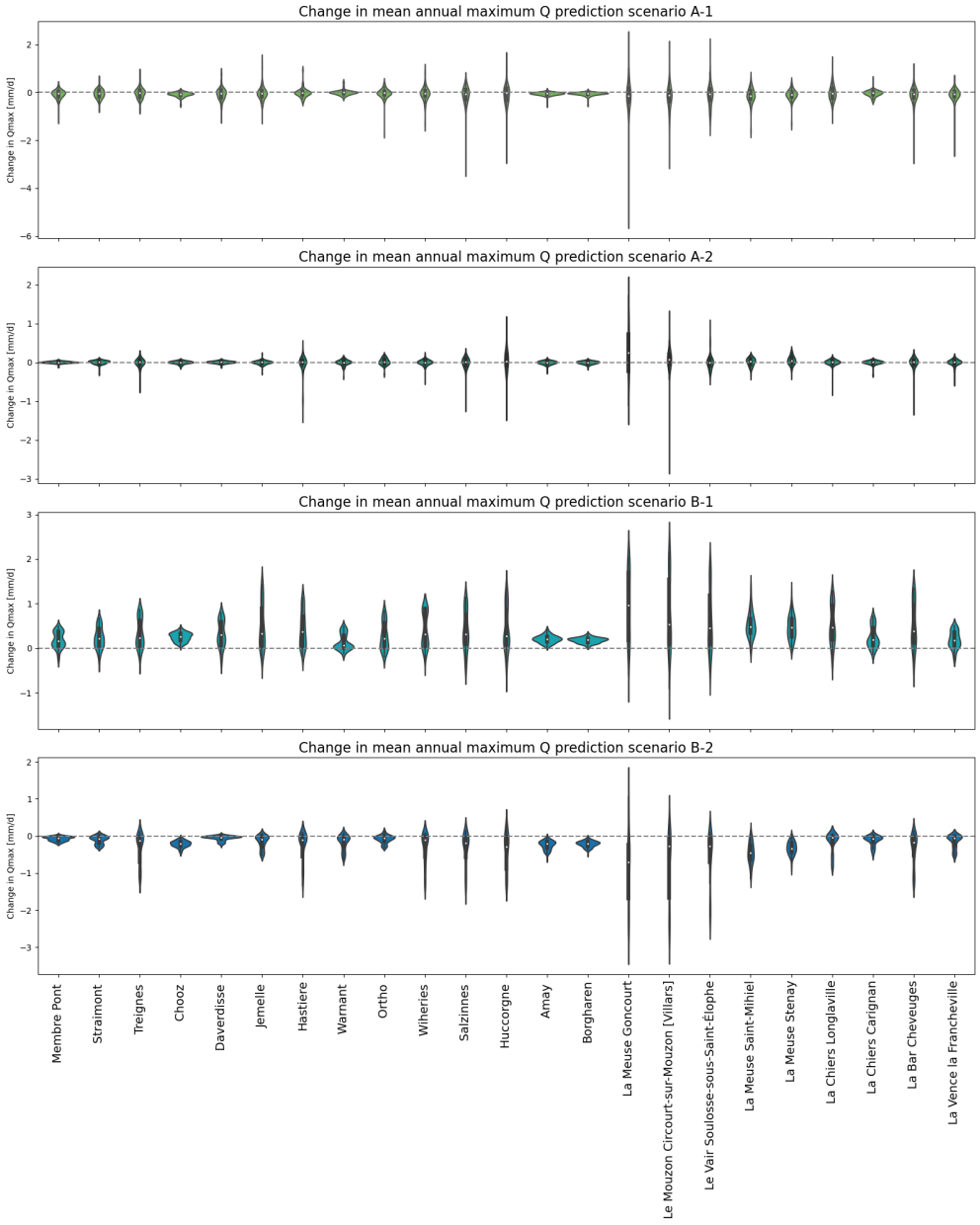

Figure S28: Change in maximum flow ($Q_{\max}$) for each catchment, compared to the reference run, where $\Delta I_E = 0$.

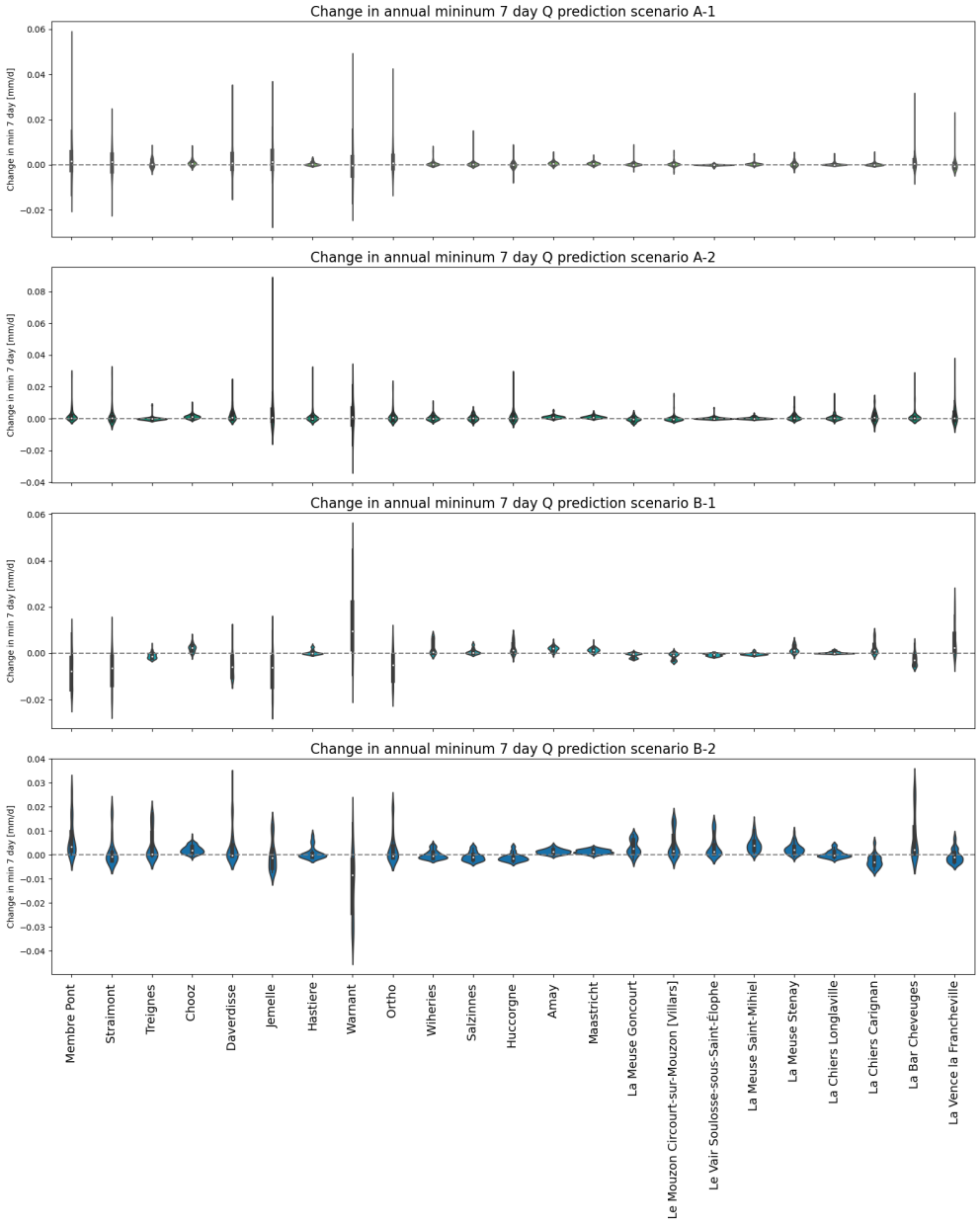

Figure S29: Change in minimum 7 day flow ($Q_{\min}$) for each catchment, compared to the reference run, where $\Delta I_E = 0$.