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The role of antecedent conditions in translating precipitation events into extreme floods at the catchment scale and in a large-basin context

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S1 Seasonality of annual maximum flood (AMF) and annual maximum precipitation (AMP)

Figure S1 compares the seasonality of the AMF and AMP for the studied sub-catchments.

S2 Features for the random forest density distributions of the considered variables

Figures S2, S3, S4, illustrate the distribution of the variables triggering precipitation, soil moisture, and snow pack, respectively, used for the classification random forest from each sub-catchment and Figure S5 the distribution of the discharge conditions at relevant locations in the routing system.

S3 Sensitivity test of the matching/non-matching definition using the a multiple of the average catchment response time (ACRT)

The effect of the definition of what is a matching and what is a non-matching event was tested by applying different windows based on the average catchment response time (ARCT) on the amount and distribution of the non-matching events, i.e. using 0.5 times ACRT (Figure S6), using ACRT (Figure S7),using 1.5 times ACRT (Figure S8), and using 2 times ACRT (Figure S9).

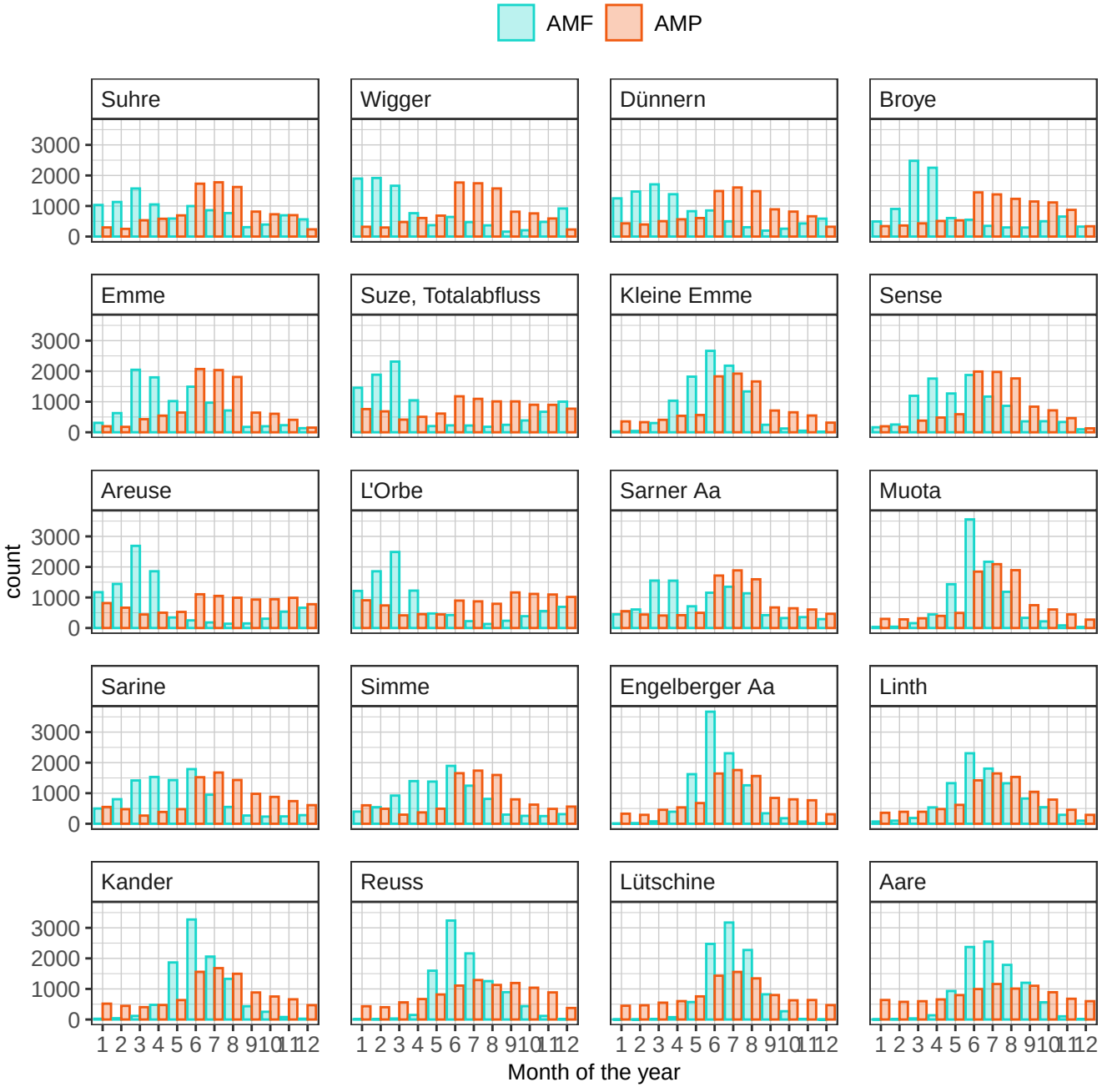

Figure S1. Comparison of the seasonality of the annual maximum discharge (AMF) versus the annual maximum precipitation (AMP), defined as the sum over the average catchment response time.

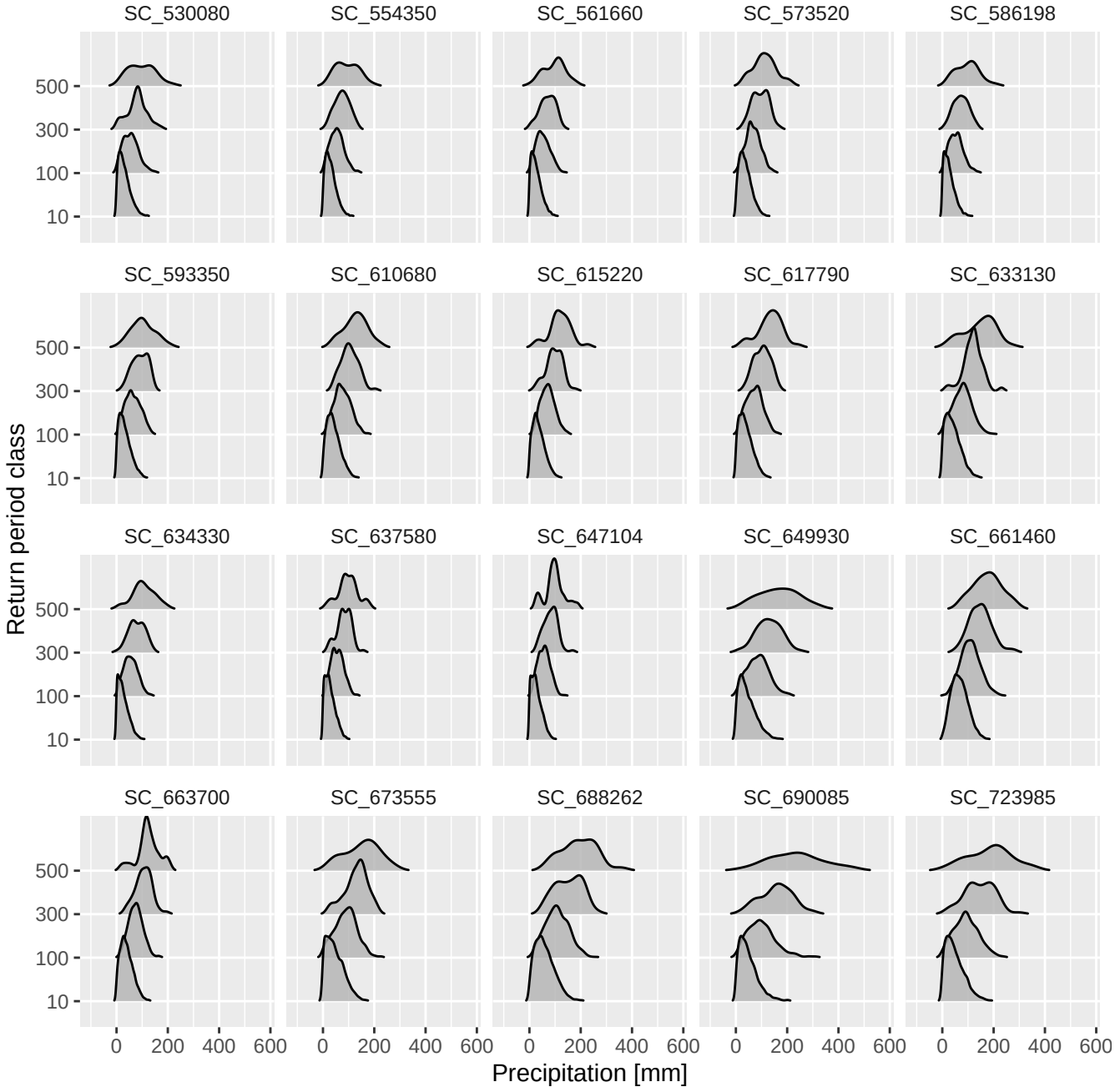

Figure S2. Density distributions of the precipitation in the sub-catchments associated to the flood at the outlet of the Aare basin.

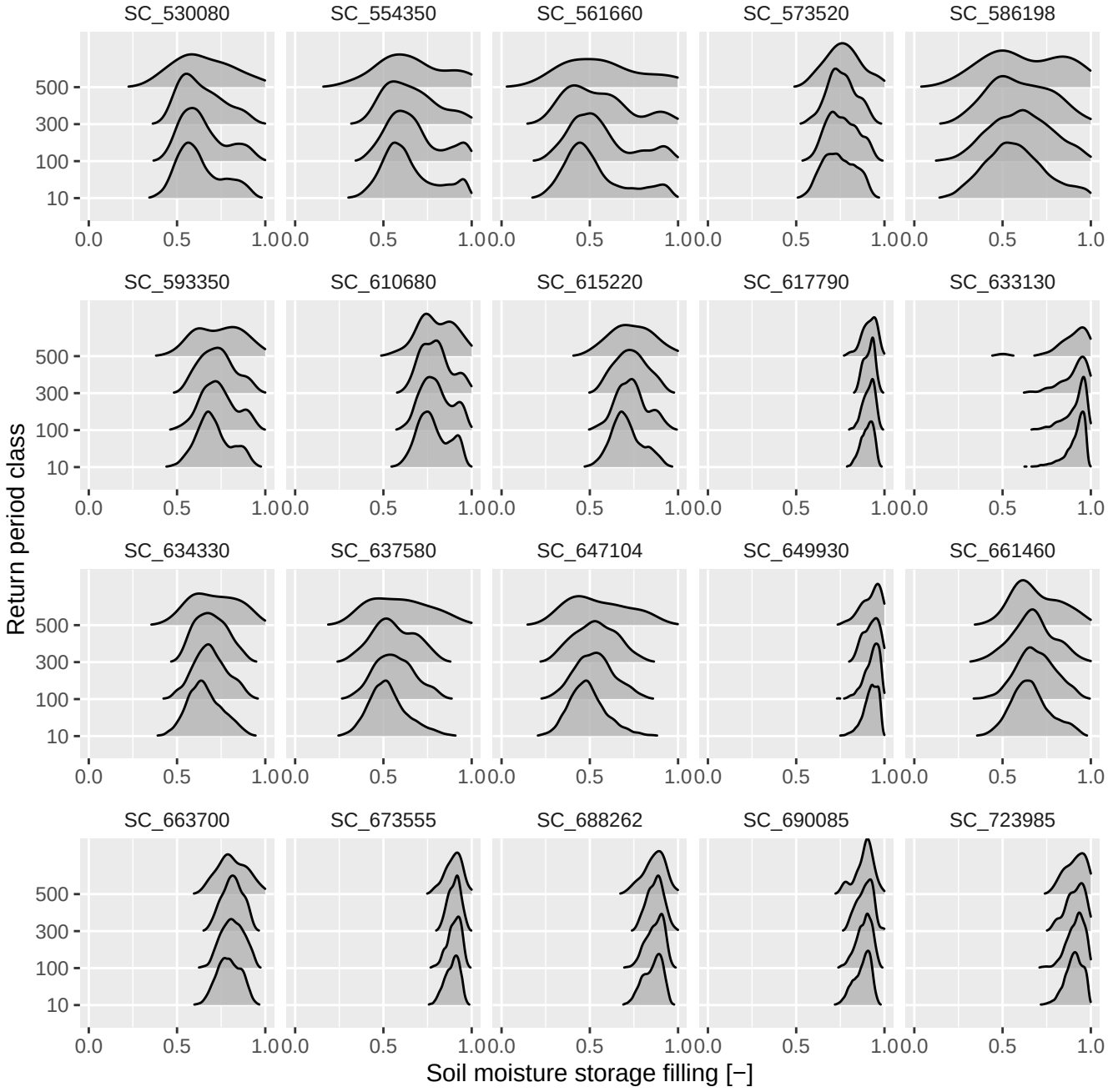

Figure S3. Density distributions of the soil moisture in the sub-catchments associated to the flood at the outlet of the Aare basin.

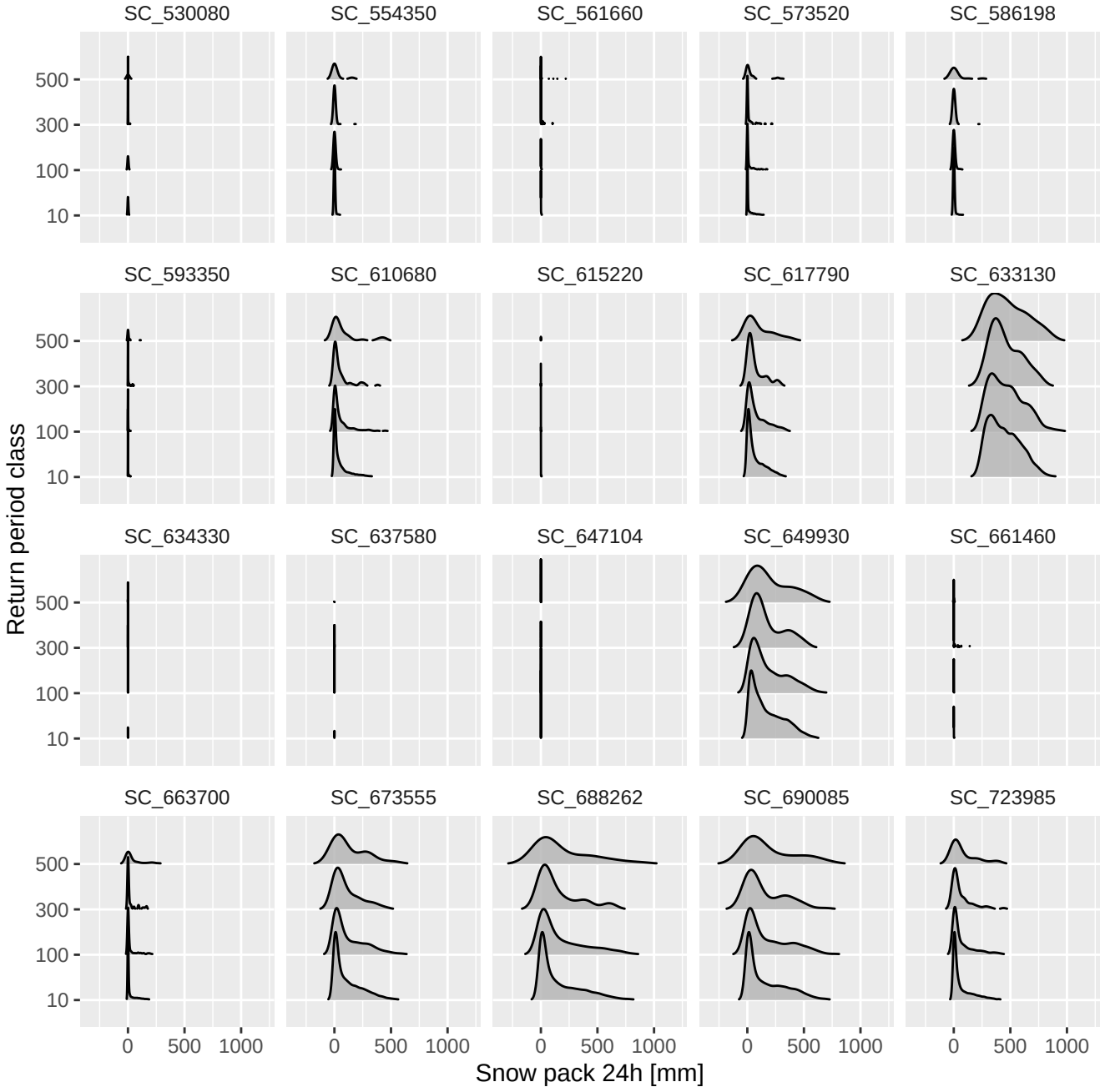

Figure S4. Density distributions of the snow pack in the sub-catchments 24 hours before the flood at the outlet of the Aare basin.

Figure S5. Density distributions of the flow conditions at the RS Minerve routing locations associated to the flood at the outlet of the Aare basin.

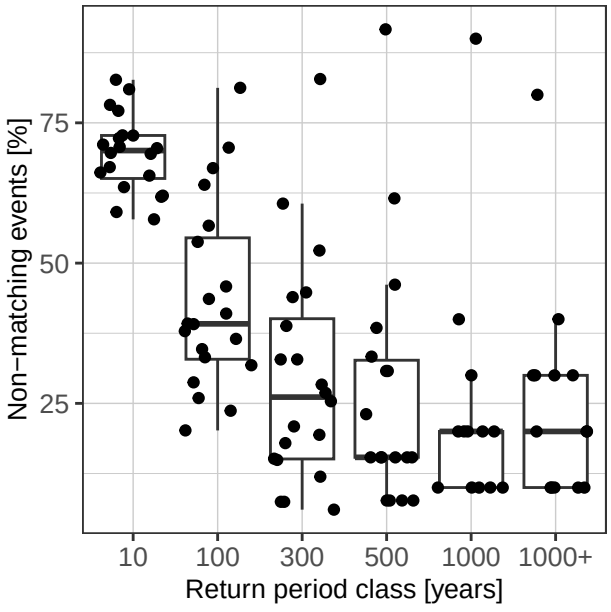

Figure S6. Effect of the definition of non-matching events on the absolute number and distribution of the non-matching events using 0.5 times ARCT.

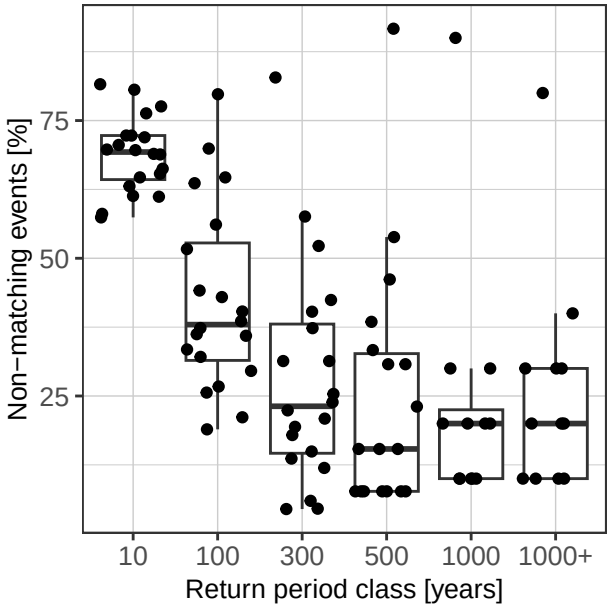

Figure S7. Effect of the definition of non-matching events on the absolute number and distribution of the non-matching events using ARCT.

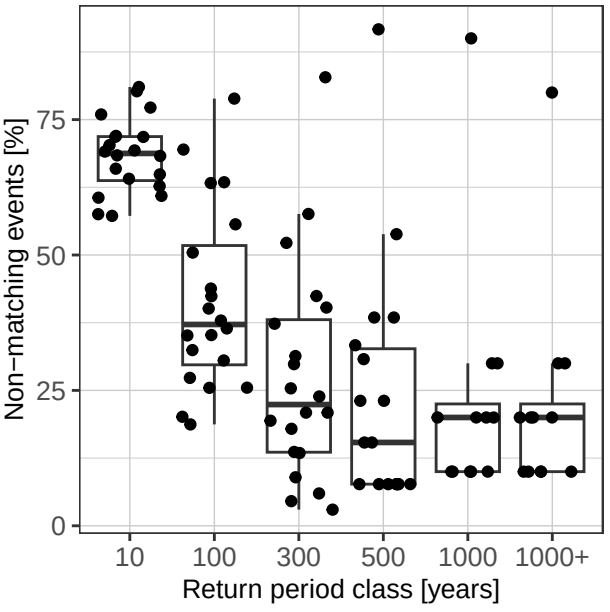

Figure S8. Effect of the definition of non-matching events on the absolute number and distribution of the non-matching events using 1.5 times ARCT.

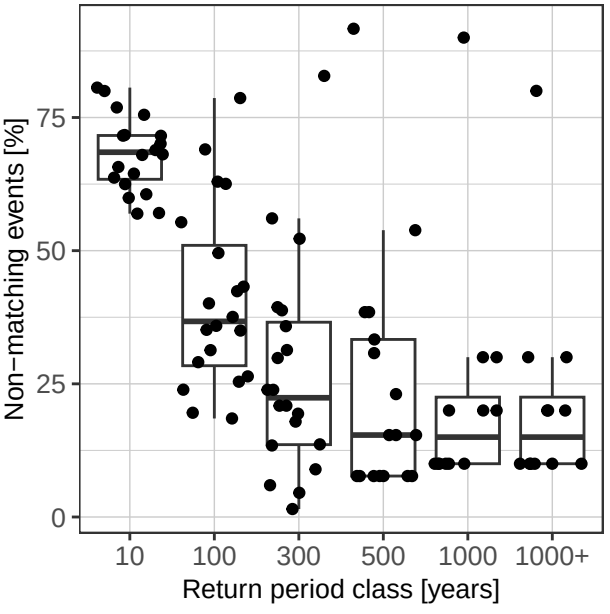

Figure S9. Effect of the definition of non-matching events on the absolute number and distribution of the non-matching events using 2 times ARCT.