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Quantification of devastating climate events under climate change through novel multivariate bias correction methods

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Compound events can be seen as combinations of multiple drivers and/or hazards that, together (i.e. concurrently or sequentially), can generate major societal or environmental impacts. On some specific events detailed below, we intent to build statistical relationships between the multiple climate variables constituting the compound events. These relationships will be learned on reanalysis data (ERA5 data), and then compared to the relationships learned on simulation data (CMIP6 simulations).

However, there are inevitable statistical biases between the reanalysis data and the simulated ones. Therefore, we plan to calibrate bias correction methods to adjust the simulations with respect to the reanalyses over the historical period (1950-2022), before applying them over future periods under various scenarios. Given the shortcomings of univariate bias correction methods, several multivariate bias correction methods will be tested and compared in the near-past (as well as compared to the univariate correction, as benchmark) and the best correction methods will be selected for projection.

For the moment, two events have been selected and studied: the mid-July 2021 flooding in Belgium and Germany and the May-June 2016 flooding in France.