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How to introduce climate change into extreme precipitation predetermination? First attempts to tamper with the MEWP method.

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The MEWP (Multi-Exponential Weather Pattern, Garavaglia et al. 2010) distribution is part of the operational method in use at EDF (Electricité de France) for computing dam spillways design floods, i.e. the magnitude of the flood that occurs at a given return period. The return periods of interest lie in the 100 – 10,000 years range. Relying on a purposely-designed classification of atmospheric circulations into weather patterns, and assigning a catchment-specific asymptotical coefficient to each of these patterns, the MEWP distribution provides the daily areal rainfall as a function of the return period. In its current state, the method relies on the implicit assumption of climate stationnarity.

In this work we seek to introduce climate change into the MEWP framework. Since the MEWP distribution basically contains two sorts of parameters, namely *frequencies* of the weather patterns, and *magnitudes* of the events occurring within each of these patterns, we examine the plausible evolution of these two sets of parameters under climate change, and the sensitivity of the final result to these two sorts of changes. On the one hand, the future *frequencies* are assessed thanks to GCM outputs from CMIP5, and significant, albeit not greater than the internal variability, changes are observed. On the other hand, the future *magnitudes* can be suspected to follow the Clausius-Clapeyron relationship (e.g. Pall et al., 2007, and Lenderink et van Meijgaard, 2008). We assess the validity of this hypothesis on the observed daily areal precipitation series for more than a hundred catchments in France.

The sensitivity analysis shows that, for the return periods at stake, the impact of *frequency* changes is small relative to that of *magnitude* changes, while this would not be true for smaller return periods. Therefore, we propose to incorporate climate change into the MEWP distribution in a simple but realistic way, by taking account of the *magnitude* change only. We conclude with some insights into the next steps that will allow a more sophisticated representation of climate change in the MEWP distribution.

References:

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