



## **Studying extreme European heat waves and extreme teleconnection patterns with a rare event algorithm**

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We study the probability of extreme heat waves over Europe, in a comprehensive climate model. Our study uses a rare event algorithm, specifically designed for heat wave studies. This completely new approach allows to increase the number of sampled extreme heat waves by a factor of a few hundreds to a thousand, for a given numerical cost, compared to direct numerical simulations. This opens the door to so far impossible dynamical studies.

This new tool allows us to show that Europe extreme heat waves are related to a global teleconnection pattern involving North America and Asia. This is also consistent with a northward shift of the jet stream over Europe. We discuss the blocking phenomenology for very extreme heat waves with return times of hundreds of years.

We explain how this new tool opens the door to the dynamical study of those extreme events, to precursors and fluctuation paths, in a way that could not be foreseen using conventional tools.