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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Evolution of extreme temperatures over Europe

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Abrupt changes in the frequency of extreme temperature events are emerging with climate warming across large areas of the globe. A reliable assessment of such
changes is thus crucial for quantifying their potential effects in the near future. The way, however, probability of extremes evolves in a changing climate is still poorly understood. Extremely warm events are generally deemed as a signature of deep changes in surface temperatures, such as an increase in variability, although there is no compelling evidence to date for changes beyond the mean. Here we shed light on this issue, and show how the temporal behavior of warm and cold extremes can be determined to high accuracy by statistically modeling temperature anomalies and their changes. Focusing on the European zone, detailed comparison with observations over the past decades puts forward the dominant role of the mean in explaining exceptionally hot events, and rules out contributions from potential changes in variability and higher distributional moments. The key strength of the present approach is its ability to relate isolated, severe events to long-term trends in a statistically meaningful manner, enabling present and future evolution of temperature extremes to be reliably estimated on the basis of average distributional properties of temperature anomalies.