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A data centred method to estimate and map changes in the full distribution of daily surface temperature

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Characterizing how our climate is changing includes local information which can inform adaptation planning decisions. This requires quantifying the geographical patterns in changes at specific quantiles or thresholds in distributions of variables such as daily surface temperature. Here we focus on these local changes and on a model independent method to transform daily observations into patterns of local climate change. Our method [1] is a simple mathematical deconstruction of how the difference between two observations from two different time periods can be assigned to the combination of natural statistical variability and/or the consequences of secular climate change. This deconstruction facilitates an assessment of how fast different quantiles of the distributions are changing. This involves both determining which quantiles and geographical locations show the greatest change but also, those at which any change is highly uncertain. For temperature, changes in the distribution itself can yield robust results [2]. We demonstrate how the fundamental timescales of anthropogenic climate change limit the identification of societally relevant aspects of changes. We show that it is nevertheless possible to extract, solely from observations, some confident quantified assessments of change at certain thresholds and locations [3]. We demonstrate this approach using E-OBS gridded data [4] timeseries of local daily surface temperature from specific locations across Europe over the last 60 years.

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