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Maximal reachable temperatures for Western Europe in current climate

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Human bodies, ecosystems and infrastructures display a non-linear sensibility to extreme temperatures occurring during heatwave events. Preparing for such events entails to know how high surface air temperatures can go. Here we examine the maximal reachable temperatures in Western Europe. Taking the July 2019 record-breaking heatwave as a case study and employing a flow analogues methodology, we find that temperatures exceeding 50 °C cannot be ruled out in most urban areas, even under current climate conditions. We analyze changes in the upper bound of surface air temperatures between the past (1940–1980) and present (1981–2021) periods. Our results show that the significant increase in daily maximum temperatures in the present period is only partially explained by the increase of the upper bound. Our results suggest that most of the warming of daily maximum surface temperatures result from strengthened diabatic surface fluxes rather than free troposphere warming.