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June 2017: the Earliest European Mega-heatwave of Reanalysis Period

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This work examines the exceptional characteristics of the mega-heatwave that affected western and central Europe in June 2017. A novel algorithm was designed to track the spatio-temporal evolution of extreme temperature patterns, being particularly well suited to monitor mega-heatwaves. We show that the intensity, extension and persistence of the June 2017 event were comparable to those of historical European mega-heatwaves but it occurred earlier. The most affected area was south-western Europe, where the event was the longest heatwave of the reanalysis period, and caused the warmest temperatures from daily to seasonal scales, devastating forest fires and human casualties. The peak of the mega-heatwave was characterized by an unprecedented subtropical warm air intrusion due to a record-breaking subtropical ridge that displayed signatures closer to those of July and August ridges. Using the analogue method, we found that the atmospheric circulation was the main triggering factor of the event. Nevertheless, the recorded temperature anomalies were higher than those expected from past flow analogues and thermodynamical changes of the last decades made a substantial contribution to the exceptionality of the event. This episode could be an actual manifestation of summers that are becoming longer and with an earlier occurrence of high-summer mega-heatwaves.