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Multi-method attribution of the 2023 boreal summer temperature extremes in the Mediterranean region

Neven-Stjepan Fuckar^{1,2}, Myles Allen², and Michael Obersteiner²

¹School of Geography and Sustainable Development, University of St Andrews, St Andrews, UK

²Environmental Change Institute, School of Geography and the Environment, University of Oxford, Oxford, UK

As global climate change accelerates a spectrum of extreme events (e.g., heatwaves, droughts, etc.) are occurring in many parts of the world at an increasing frequency and intensity threatening the socio-economic fabric of our modern civilisation. The boreal summer (JJA) 2023 was globally the warmest, while July and August 2023 were the two warmest months on the observational record. Embedded in these global conditions were series of strong heatwaves that in the Mediterranean region often reached above 40deg.C in daily maximums of surface (2m) air temperature (SAT). We apply multi-method attribution approach to illuminate the role of climate change in setting this expectational monthly and seasonal SAT conditions in the Mediterranean.

We utilise a collection of observations and reanalysis products combined with large ensembles of CMIP5 and CMIP6 historical and future simulations to analyse the role of atmospheric circulation and anthropogenic factors leading to these extreme events on monthly and seasonal timescales. We also use large ensembles of historical and counterfactual simulations of weather@home2 (climateprediction.net numerical experiments) globally distributed to and executed by volunteers on their home computers to assesses to what extent anthropogenic forcing altered the probability and magnitude of these extremes. We explore conditional perspective of the atmospheric circulation in this attribution analysis. The initial results indicate a significant role of the global climate change in modifying likelihood and intensity of these boreal SAT summer extreme events.