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Under-appreciated heatwave risk in colder countries? A case study for Scotland

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High temperature extremes can have a wide range of impacts even in climatologically cooler countries, where absolute temperatures stay substantially lower than the extreme values seen elsewhere. An improved understanding of both the effect of anthropogenic climate change on hot extremes and the potential impacts of these extremes on all sectors of society is therefore needed to assess the need for, and potentially enable the development of, adaptation measures. Here, we present results from an interdisciplinary approach to combine a climatological analysis of past, present, and future heatwaves in the Northern United Kingdom with a study of impacts of the 2018 hot summer in Glasgow and beyond. Similarly to elsewhere in Europe, the year 2018 brought a cold event with snow in late winter, a dry spring, and a hot summer to this region.
An observational analysis shows that the warmest single night experienced in 2018 in the Northern UK was a rare event, expected to occur on average about once in every 50 years in the recent climate (1960-2010). The hottest single day, the hottest 5-day period, and the warmest 5-night period were all less rare, with return periods between 1 in 10 and 1 in 20 years. Temperatures recorded at a station near Glasgow, in contrast, show the hottest day ever recorded, highlighting the need for better station coverage and the consideration of the urban heat island effect as visible in remote-sensing data. Despite being rare, observed area-mean temperatures to do not exceed thresholds suggested to be relevant for health-related impacts in Northern England, and preliminary results show that impacts around Glasgow may have been small.
An event attribution study using a CMIP6-generation global climate model (HadGEM3A-GA6) shows that anthropogenic factors have increased the probability that 2018 exceeds the observed hot daytime extremes by factors of around 2.5. For hot night-time extremes, the risk increase is higher with factors of around 4. It will further be analysed whether anthropogenic forcings change the likelihood of the atmospheric circulation associated with the hot 2018 summer, and whether this contributes to the identified changes in the likelihood of hot events.
To assess future changes in hot extremes, we analyse regional climate projections recently provided by the Met Office as part of the UK Climate Projections (UKCP18) project that serves to inform national and regional climate change risk assessments and adaptation plans. The projections show that the observed 2018 hot temperature extremes are projected to occur every year by the end of the century, and every other year by the 2050s. Differences are again found for day- and nighttime extremes, with hot night frequency increasing faster than hot day frequency. Similar increases are also found for events that are hotter than those observed in 2018 and have potentially larger impacts. Cold extreme events such as the one experienced earlier in the same year across the UK, on the other hand, are projected to be extremely rare after 2050.