Searching for respite from the heat in one of Rome's fountains.Max Roxxi/Reuters

Parts of Europe are having a devastatingly hot summer. Already we've seen heat records topple in western Europe in June , and now a heatwave nicknamed “Lucifer” is bringing stifling conditions to areas of southern and eastern Europe.

Several countries are grappling with the effects of this extreme heat, which include wildfires and water restrictions .

Temperatures have soared past 40 in parts of Italy, Greece and the Balkans, with the extreme heat spreading north into the Czech Republic and southern Poland.

Some areas are having their hottest temperatures since 2007 when severe heat also brought dangerous conditions to the southeast of the continent.

The heat is associated with a high pressure system over southeast Europe, while the jet stream guides weather systems over Britain and northern Europe. In 2007 this type of split weather pattern across Europe persisted for weeks, bringing heavy rains and flooding to England with scorching temperatures for Greece and the Balkans.

Europe is a very well-studied region for heatwaves. There are two main reasons for this: first, it has abundant weather observations and this allows us to evaluate our climate models and quantify the effects of climate change with a high degree of confidence. Second, many leading climate science groups are located in Europe and are funded primarily to improve understanding of climate change influences over the region.

The first study to link a specific extreme weather event to climate change examined the record hot European summer of 2003. Since then, multiple studies have assessed the role of human influences in European extreme weather. Broadly speaking, we expect hotter summers and more frequent and intense heatwaves in this part of the world.

We also know that climate change increased deaths in the 2003 heatwaves and that climate change-related deaths are projected to rise in the future.

Climate change's role in this heatwave

To understand the role of climate change in the latest European heatwave, I looked at changes in the hottest summer days over southeast Europe – a region that incorporates Italy, Greece and the Balkans.

I calculated the frequency of extremely hot summer days in a set of climate model simulations, under four different scenarios: a natural world without human influences, the world of today (with about 1□ of global warming), a 1.5□ global warming world, and a 2□ warmer world. I chose the 1.5□ and 2□ benchmarks because they correspond to the targets described in the Paris Agreement.

As the heatwave is ongoing, we don't yet know exactly how much hotter than average this event will turn out to be. To account for this uncertainty I used multiple thresholds based on historically very hot summer days. These thresholds correspond to an historical 1-in-10-year hottest day, a 1-in-20-year hottest day, and a new record for the region exceeding the observed 2007 value.

While we don't know exactly where the 2017 event will end up, we do know that it will exceed the 1-in-10 year threshold and it may well breach the higher thresholds too.

A clear human fingerprint

Whatever threshold I used, I found that climate change has greatly increased the likelihood of extremely hot summer days. The chance of extreme hot summer days, like this event, has increased by at least fourfold because of human-caused climate change.

Likelihood of extreme hot days like 2017

LOCATION	EVENT	Chance of similar event per year			
		NATURAL	CURRENT	1.5°C	2°C
SE Europe Hottest summer day	1-in-10 years	4% (1-10%)	31% (18-46%)	42% (28-54%)	56% (44-68%)
	1-in-20 years	3% (1-8%)	27% (15-41%)	36% (23-48%)	50% (37-64%)
	New Record	1% (0-3%)	14% (5-23%)	20% (10-29%)	31% (18-47%)

Climate change is increasing the frequency of hot summer days in southeast Europe. Likelihoods of the hottest summer days exceeding the historical 1-in-10 year threshold, one-in-20 year threshold and the current record are shown for four scenarios: a natural world, the current world, a 1.5□ world, and a 2□ world. Best estimate likelihoods are shown with 90% confidence intervals in parentheses.Author provided

My analysis shows that under natural conditions the kind of extreme heat we're seeing over southeast Europe would be rare. In contrast, in the current world and possible future worlds at the Paris Agreement thresholds for global warming, heatwaves like this would not be particularly unusual at all.

There is also a benefit to limiting global warming to 1.5□ rather than 2□ as this reduces the relative frequency of these extreme heat events.

As this event comes to an end we know that Europe can expect more heatwaves like this one. We can, however, prevent such extreme heat from becoming the new normal by keeping global warming at or below the levels agreed upon in Paris.

You can find out more about the methods used here .

Disclosure

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Read more http://theconversation.com/southeast-europe-swelters-through-another-heatwave-with-a-human-fingerprint-82139