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**Climate Change Fingerprints Confirmed in Lucifer's
Wicked Heat:
Europe's Record Hot Summer Made Much Worse by
Human Activity**

Scientists with [World Weather Attribution](#) (WWA), using a combination of observed temperature data and climate models, have concluded that human-caused climate change made the record-breaking 2017 summer temperatures in the Euro-Mediterranean region [at least 10 times more likely](#). WWA is an [international coalition of scientists](#) focused on assessing possible climate change influences on extreme weather events.

"We found clear evidence of human influence on this summer's record warmth — both in the overall summer temperatures and in the heat wave dubbed Lucifer," said Geert Jan van Oldenborgh, senior researcher at the Royal Netherlands Meteorological Institute (KNMI). "In many towns and cities across Southern Europe, there is now a one in 10 chance of seeing a heat wave as hot as we saw during this past summer every summer," van Oldenborgh added. "In

the early 1900s, a summer like the one we just experienced would have been extremely rare.”

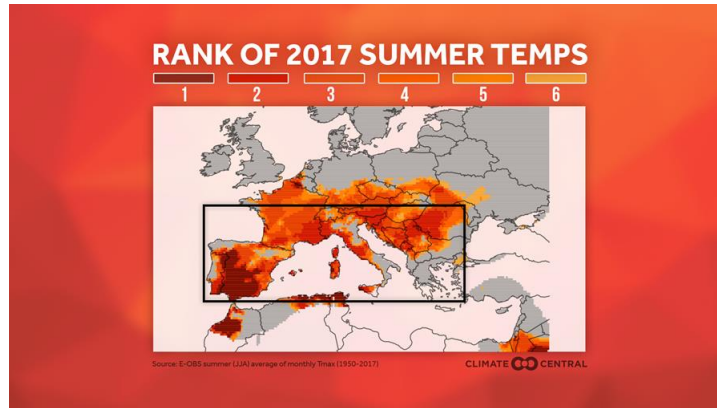


Figure 1: The rank of the June-August maximum temperature in 2017, based on E-OBS data. The area inside the box is the Euro-Mediterranean region (36–48° N, 10° W–28° E) used in this analysis.

The team performed two separate extreme heat attribution analyses. The scientists first looked at the entire summer — defined as the June through August average of the daily maximum temperature — across the Euro-Mediterranean land area (36–48° N, 10° W–28° E). Gridded observational data and four large ensembles of climate model simulations were used to assess the changing odds of seeing a summer as hot as 2017. **These multiple methods show that human-caused climate change made the summer of 2017 at least 10 times more likely than it would have been during the early 1900s.** According to the climate model simulations, by the 2050s, a summer like 2017 will be a typical summer in Southern Europe if greenhouse gases continue to increase in the atmosphere.

The team also looked at a specific heat wave period, the early August extreme event nicknamed Lucifer. The devilish name was coined after several countries across the Euro-Mediterranean region saw afternoon temperatures top out above 40°C (104°F). Some stations recorded minimum temperatures above 30°C (86°F). Maximum and/or minimum temperatures records were set in southeastern France (including Corsica), Italy, and Croatia. The heat wave has been tied to a [15 percent spike in hospital emergency admissions](#) in Italy.

The team defined this extreme heat event as the three-day mean of the maximum temperatures in the Southeast Europe land area (36° N–48° N, 8° E–24° E) and, in addition, carried out the same analysis for four stations in Spain (Madrid-Cuatro Vientos), France (Montélimar), Italy (Monte Cimone) and Croatia (Gospić). Both in an area-average over Southeast Europe and at these four stations, a positive trend in the occurrence of such three-day heat waves is evident. At all stations, the intensity of heat waves has increased by 1°C to 2°C (1.8°F to 3.6°F) since 1950, both in the observations and in the models that could reproduce these heat waves. **Overall, the team finds a heat wave like Lucifer is now *at least* four times more common than it was in the early 1900s because of global warming.**

Dr. Friederike Otto, a research scientist at the University of Oxford and the deputy director of the Environmental Change Institute (ECI), said the results are entirely consistent with what scientists have predicted. “Summers keep getting hotter. Heat waves are far more intense than when my parents were growing up in the 1950s. If we do nothing to reduce our greenhouse gas emissions, the kind of extreme heat we saw this past summer will be the norm when my young son is a grown man,” said Otto.

“It is critical that cities work with scientists and public health experts to develop heat action plans because such extreme heat will become the norm in the middle of the century,” said Robert Vautard, a researcher at the Laboratory of Climate and Environmental Sciences (LSCE). “Climate change is impacting communities right now and these plans save lives.”

The complete analysis can be found [here](#). After the embargo lifts, the report will be posted on the [WWA website](#).

For more information or interview requests:

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World Weather Attribution (WWA) is an international effort designed to sharpen and accelerate the scientific community's ability to analyze and communicate the possible influence of climate change on extreme-weather events such as storms, floods, heat waves and droughts.



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