

Attribution of singular weather events to climate change: the 2003 heat wave

More and more studies are seeking to assess more specifically the anthropogenic footprint on singular meteorological events after they have occurred. The question is not about whether if the event was caused by climate change, because in most cases the event could very well have occurred without human modification of the climate, solely because of the natural variability of the climate. The point is to **estimate whether the probability of the event occurring has been modified by climate change**, and if so, by how much. This is referred to as a risk ratio (RR) or **risk fraction attributable** ($FAR = 1 - 1/RR$) to climate change (and therefore, indirectly, to human activities).

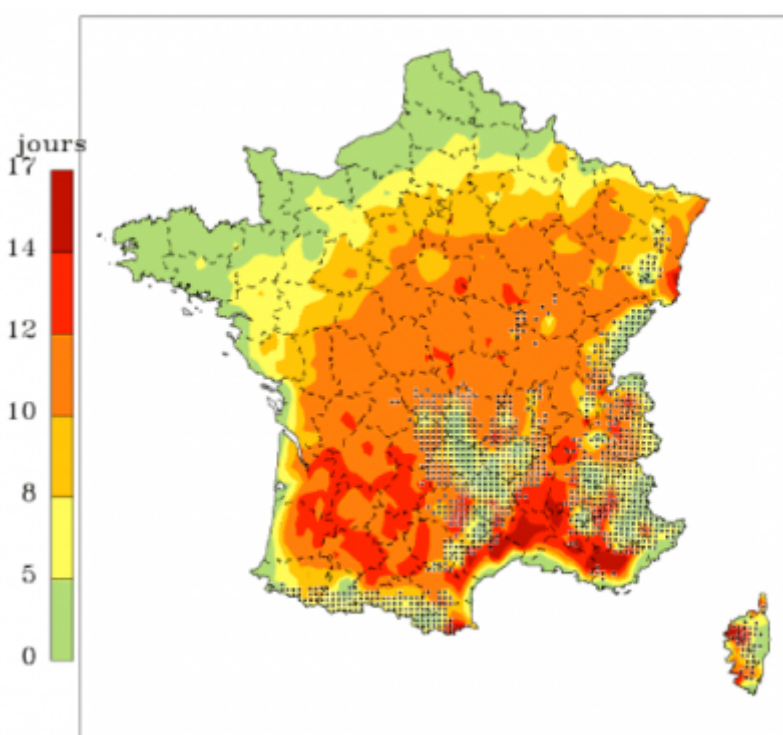


Figure 1: Number of days with a maximum temperature above 35°C over the period from 1 to 18 August 2003 [Source: © Météo France]

One of the well studied examples is the heat wave that hit Western Europe hard in the **summer of 2003**. This extremely severe event (see Figure 2 of the article "[The Climate Machine](#)") was statistically very unlikely because it was not observed in recent centuries. Has the global warming of the 20th century, largely due to human activities, increased the probability of such an event, and if so by how much? To answer this question, Stott *et al* [1] compared different climate simulations of European temperature during the 20th century. By taking into account or not the effects of human activities on temperature, they were able to show that these anthropogenic factors had **multiplied the probability of such a heat wave by a factor of 4** (between 2 and 10). The RR risk ratio is therefore 4 (between 2 and 10) and the fraction attributable to human activities is 75% (between 50 and 90%).

References and notes

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