



2003 European Heat Wave

By: Sean Campbell

ATMS 111

02/23/2009

What is a Heat Wave?

- The World Meteorological Organization defines a **heat wave** as a length of five or more consecutive days of heat exceeding the average maximum temperature of the area by 5°C (9°F)
- In simpler terms, a heat wave is a prolonged period of excessively hot weather, which may be accompanied by high humidity
- Heat waves usually occur in the summertime in warm climates, an area of high pressure with little or no rain or clouds

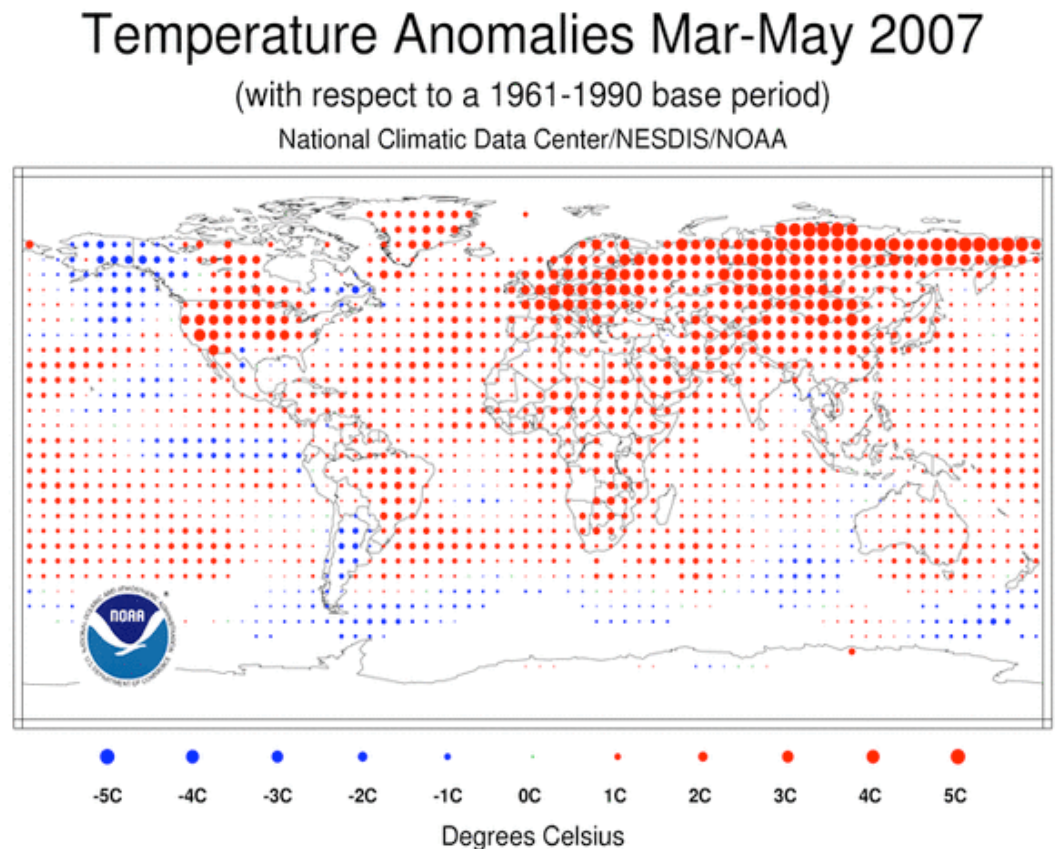


Figure adapted from: "The Climate of 2007," NOAA Satellite and Information Services

Notes: Slide 1

- Temperatures considered normal by people living in a warmer climate can be termed a heat wave in a cooler area of the world if the temperatures experienced are outside the normal climate pattern for that area.
- The figure illustrates the temperature anomalies over land and ocean surfaces in 2007. 'Anomaly' means a deviation from the common. A temperature anomaly is how much hotter or colder the surface temperature is from the average of the area, be it over land or ocean.

Sources for Slide 1:

- 1) "Heat Wave." Wikipedia. 21 Feb 2009 <http://en.wikipedia.org/wiki/Heat_wave>
- 2) "The Climate of 2007." NOAA Satellite and Information Services. <http://upload.wikimedia.org/wikipedia/commons/6/68/Temperature_anomalies_2007.gif>

2003 European Heat Wave

- One of the hottest summers on record in Europe
- Approximately 35,000 people died across the European continent as a result of the heat wave
- One of the most prominently featured incidences in every popular presentation of the global warming issue

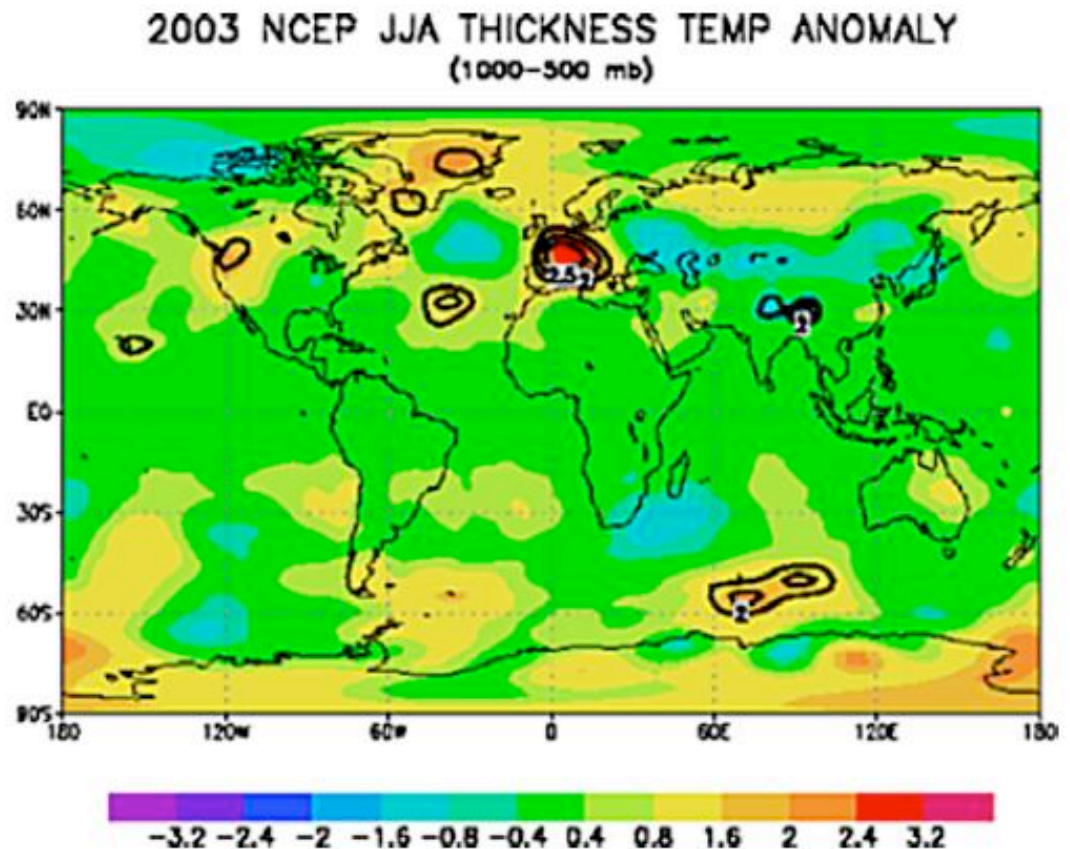


Figure adapted from: “Was the 2003 European summer heat wave unusual in a global context?” (2007),
Geophysical Research Letters

Notes: Slide 2

- When it comes to the toll on people, animals and plants, the duration of a heat wave and the warmth of the night-time lows are the real killers.
 - ie. A weeklong stretch of severe heat is far more detrimental and deadly than just two or three days of it.
- Heat waves are among the most lethal of weather. Deaths were mainly due to heat stroke, which is brought on by dehydration. The heat and humidity also aggravated health problems involving the heart and lung in many individuals having difficulty coping with the heat.
- For the summer as a whole, the European heat wave, as illustrated in the figure, appears quite unusual in that the 1000-500 mb thickness anomalies (as well as the surface temperature anomalies) exceeded three standard deviations in Europe while there were no similarly unusual anomalies elsewhere in the world.

Sources for Slide 2:

- 1) Henson, Robert. The Rough Guide to Climate Change. London: Rough Guides Ltd, 2008.
- 2) McClung, Graham. "What Causes Heat Waves, And Why Are They Dangerous?" Home Weather Stations Guide. 10 Dec 2006.
<http://www.home-weather-stations-guide.com/heat-waves.html>
- 3) Chase, T. N., K. Wolter, R. A. Pielke Sr., and I. Rasool, 2006. Was the 2003 European summer heat wave unusual in a global context? *Geophysical Research Letters*, 33, L23709, doi:10.1029/2006GL027470.

2003 Heat Wave Statistics

- The 10th of August was **London's** hottest day on record, 37°C (100.2°F)
- August 2003 was the warmest August on record in the northern hemisphere
- National records were also broken in **Roth, Germany** (40.4°C/104.7°F), **Grono, Switzerland** (41.5°C/106.7°F), and **Amareleja, Portugal** (47.3°C/117.1°F)
- The elderly were among the worst affected
- France suffered the worst losses, with 14,802 people dying from causes attributable to the blistering heat



Notes: Slide 3

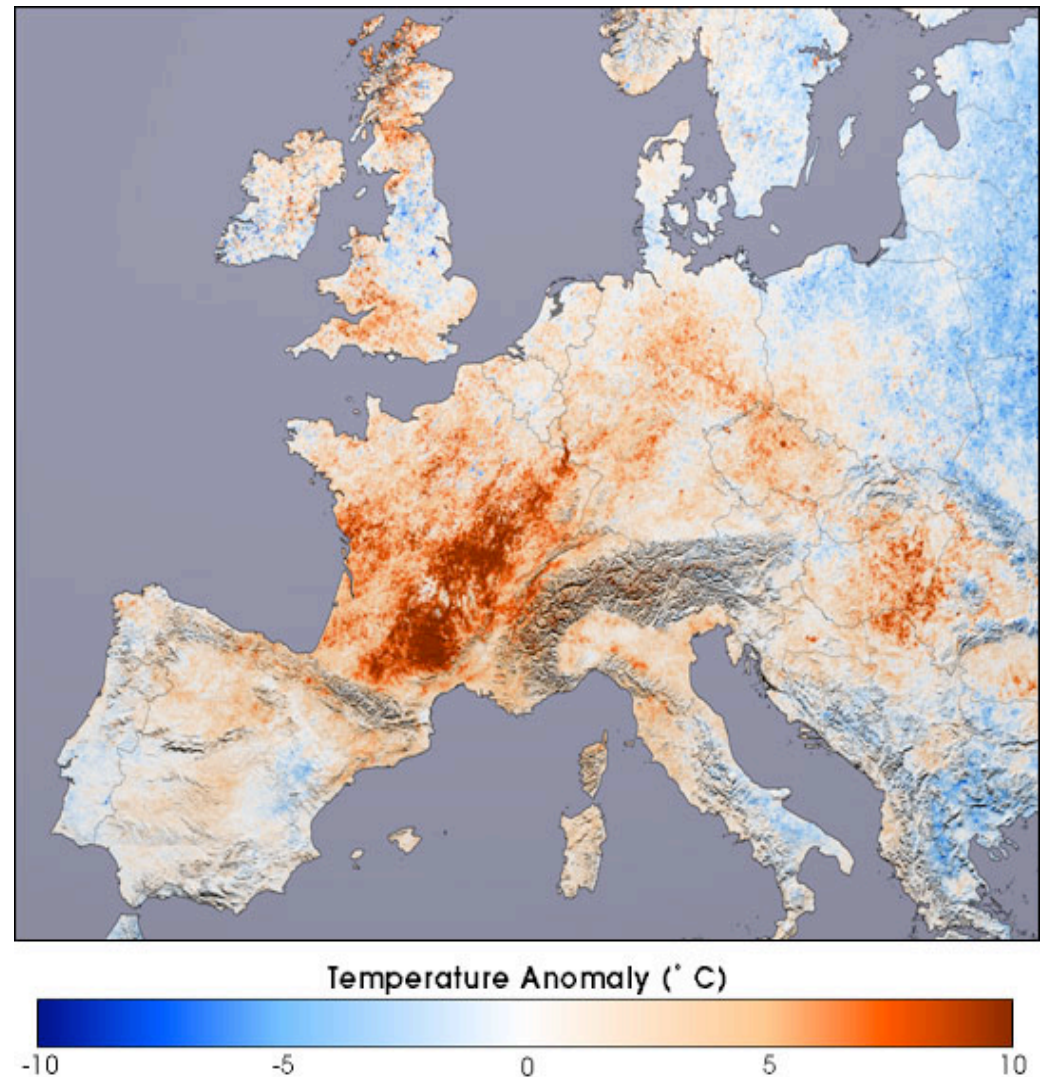
- The record breaking temperature of 37°C (100.2°F) on August 10th at London's Heathrow Airport was the first day in nearly 300 years of record-keeping that any place in Britain had topped the 100°F mark.
- For comparison value, the death toll in France is more than 19 times the death toll from the SARS epidemic worldwide.
- Heat is a selective killer; it targets the very young and especially the very old. In this select population of people whose metabolism can't adjust readily to extreme temperatures, deaths are among the highest. People tend to die alone, often in urban areas behind locked doors and closed windows.

Sources for slide 3:

- 1) Henson, Robert. The Rough Guide to Climate Change. London: Rough Guides Ltd, 2008.
- 2) Bhattacharya, Shaoni. "European Heatwave Caused 35,000 Deaths." New Scientists. 10 Oct 2003. <
<http://www.newscientist.com/article/dn4259-european-heatwave-caused-35000-deaths.html>>

Cause of 2003 Heat Wave

- Scientists have cited a variety of factors that led up to the lethal European heat wave of 2003:
 - 1) An anticyclone stationed above western Europe prevented precipitation and led to record high temperatures over sustained periods.
 - 2) Anthropogenic climate change (global warming).
 - 3) Lingering effects from the decaying El Nino event of 2002-03, as well as an unusually active West African monsoon.



Notes: Slide 4

- According to Kevin Trenberth (Director of the National Center for Atmospheric Research in Colorado), “A change in global sea temperatures and unusual conditions in the tropics and the tropical area of the Indian Ocean was a factor in creating and sustaining settled air conditions over Europe.”
- During the European spring season, mature El Nino events tend to create anomalies over the Northern Atlantic that are associated with below-normal rainfall over the Western Mediterranean. Also, the West African monsoon reached further north and was more intense than usual, which led to a hotter and drier summer west of the Mediterranean region.

Sources for Slide 4:

- 1) Wolter, Baldi, Chase, Otterman, and Rasool. “Possible causes of the south-central European heat wave of 2003 – a diagnostic perspective.” Geophysical Research Abstracts, Vol. 7, 10447, 2005.
- 2) Feanny, Camille and Porter, Kiesha. “Europe recalls lethal 2003 heat wave – Continent looks at the causes, solutions of weather-related tragedy.” CNN. 3 Aug 2004.

Country by Country

- **France** – 14,802 deaths. Experienced seven consecutive days of temperatures above 40°C.
- **UK** – 2,139 deaths. Record-breaking temperature of 38.5 °C (101.3 °F) was recorded on August 10, 2003. Rail travel was disrupted across the country (rails buckling), and the London Eye shut down due to excessive heat in the ferris-wheel pods.
- **Italy** – Approx. 3000 deaths. Temperatures were around 38 °C (100 °F) in most cities for weeks.
- **Portugal** – 2100 deaths. Extensive forest fires. 1st of August recorded as hottest day in centuries (8 °C/118 °F).
- **Holland** – 1,500 deaths. Heat wave broke no records.
- **Spain** – 141 deaths. Records broken in multiple cities.
- **Germany** – 300 deaths. Records broken in multiple cities. Rivers were at their lowest recorded level this century, affecting shipping across the Elbe and Danube river.
- **Switzerland** – Melting glaciers in the Alps caused avalanches and flash floods. Nationwide record temperature of 41.5 °C (106.7 °F) recorded in Grono, Graubunden.